High Pressure Technology

High Pressure Components and Systems for critical service applications

Standard and customizable components

Flexible hoses – Extreme temperature valves
Safety valves – Air driven pumps – Bottles – Vessels

Specific components and systems

Specific valves and fittings
Specifics equipments and systems – Optical cells
Hand pump systems – Filling benches – CIP, WIP & HIP

NOVA SWISS
www.novaswiss.fr

Nova Swiss SARL and its Quality System

Nova Swiss SARL develops, produces and supplies high pressure components, equipments and systems for critical applications involving pressure ranges up to 150.000 psi (10.000 bar).

Nova Swiss SARL can also take charge of the maintenance (periodic regulatory servicing and reproof tests) or upgrades of high pressure installations.

As one of the leading suppliers of specific high pressure equipments and systems, Nova Swiss SARL works for major companies in the oil & gas, chemicals, industrial equipments, and military industries or R&D laboratories, in most high pressure applications, including ultra-pure gas (O2, H2) and hydraulic applications.

Our main customers :
IFP Energies Nouvelles, Total, Technip, MBDA, Sagem, French army, EADS, PSA, Delphi, CEA, AREVA, European universities and research centers, etc.

Contents :

High functional reliability in extreme environments
Our products are based on state-of-the-art technology. Their distinguishing features are mature product of development and design, the high precision, made-to-fit connection geometries and ease of use. Nova Swiss® high pressure components have proven their service-worthiness under adverse environmental conditions and high physical strain.

High operating reliability
Nova Swiss® high pressure components are designed and manufactured in compliance with the European Pressure Equipment Directive 97/23/EC. Our integrated management system according to ISO 9001 version 2008 is your assurance of top quality, as well as user-friendly and safety-oriented designs.

Calculations and norms
All parts under pressure are manufactured, designed and computed according to the major calculation codes (ASME or CODAP) and international material norms.

Traceability
All material certificates of each manufactured parts under pressure can be asked on request. All these parts are fully traceable, starting from the finished product and reaching all the way back to the raw material. All delivered equipments are identified with an unique serial number.

Accident prevention
Nova Swiss® high pressure specific components and systems are the embodiment of a modern ergonomic product design. The products are easy to install and to handle. A technical notice including a risk analysis is systematically delivered with the equipment. The mounting and operating instructions are detailed in the manual, and have to be strictly followed in order to avoid any working accident.

Nova Swiss® pressure ranges :

There are seven Nova Swiss® standard pressure existing ranges :

- imperial : 10, 20, 30, 60 and 150 (kpsi)
- metric : 40 and 70 (4000 bar and 7000 bar)

Specific equipments are codified using imperial pressure ranges. Conversions from bar to psi are given by : 1 bar = 14.51 psi.

Fluid :

Chemical compatibility between the fluid used in your application and the materials chosen for your equipment (metallic parts and seals) has to be checked. Indeed, chemical reactions are more aggressive under pressure and temperature.

Codified materials table :

Nova Swiss® Material code	Common name	W.Nr	Type
M100	304	1.4301	Stainless steel
M101	304L	1.4307	
M102	316	1.4401	
M103	316L	1.4404	
M104	316Ti	1.4571	
M105	APX4 (X4 CrNiMo 16.5.1)	1.4418	
M106	17-4PH	1.4542	
M107	Incoloy A286	1.4980	
M200	Inconel 600	2.4816	Nickel alloy
M201	Inconel 625	2.4856	
M202	Inconel 718	2.4668	
M203	Monel 400	2.4360	
M204	Monel K500	2.4375	
M205	Hastelloy C276	2.4819	
M300	Titanium TA6V	3.7165	Titanium alloy

Non exhaustive list : other materials on request.

Provided certificates :

All high pressure equipments are delivered with the following certificates :

- certificate of conformity (hydraulic & functional tests)
- declaration of conformity to PED 97/23/EC
- EC declaration of conformity

On request :

- 3.1 material certificates
- specific material approval certificates
- ATEX certificate
- TPED certificate

Temperature :

The working temperature of the fluid is essential to choose the right raw materials and to compute the correct sizes for your specific equipment. In this booklet, temperatures are indicated in Celsius degrees (°C). Conversions have to be made from other unit systems to the Celsius scale.

Application :

Working cycles and real applications should be taken into account in order to make your equipment totally safe by choosing the right safety coefficients and appropriated protections.

Codified connections table :

Pressure	Connection	Code	Tube-Ø	
Nova Swiss® standard imperial connections				
10 kpsi	BSPP	4B	1/4"	6,4 mm
690 bar		6B	3/8"	9,5 mm
		8B	1/2"	12,7 mm
10 kpsi	NPT	4N	1/4"	6,4 mm
690 bar		6N	3/8"	9,5 mm
		8N	1/2"	12,7 mm
20 kpsi	MPCT	4M	1/4"	6,4 mm
1380 bar		6M	3/8"	9,5 mm
		9M	9/16"	14,3 mm
		12M	3/4"	19,1 mm
		16M	1"	25,4 mm
60 kpsi	HPCT	4H	1/4"	6,4 mm
4140 bar		6H	3/8"	9,5 mm
		9H	9/16"	14,3 mm
150 kpsi	-	3M	3/16"	4,76 mm
10337 bar				
Nova Swiss® standard metric connections				
4000 bar	E	4E	1/4"	6,4 mm
		6E	3/8"	9,5 mm
		9E	9/16"	14,3 mm
7000 bar	E	4E	1/4"	6,4 mm
Nova Swiss® laboratory connections range				
15 kpsi	LHP	1L	1/16"	1.6 mm
1033 bar		2L	1/8"	3,2 mm
Other common connections				
6 kpsi	BSPP	1B	1/16"	1.6 mm
413 bar		2B	1/8"	3,2 mm
6 kpsi	NPT	1N	1/16"	1.6 mm
413 bar		2N	1/8"	3,2 mm

High Pressure Flexible Hoses
HPFH Standard range

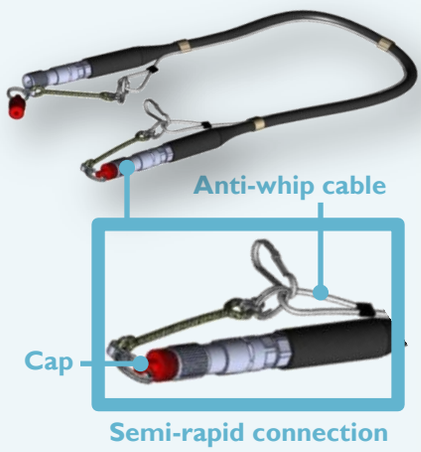
General description :
The Nova Swiss® flexible hose HPFH is designed for pure gas (1) applications under high pressure up to 30.000 psi (2000 bar).

Applications :
Aerospace, Military industries, Chemicals, R&D dept., etc.

Technical data :
- Material : stainless steel (high chemical compatibility properties)
- Flexibility : spiraled tube + spring sheath + 4 types of tube end
- Choice of 12 connections (see below and table page 3)
- Nominal diameter : 0.5 mm or 0.9 mm depending on pressure
- Protection : thermoplastic sheath + captive cap
- Safety : anti-whip cable + crab
- PED 97/23/EC category : art. 3.3

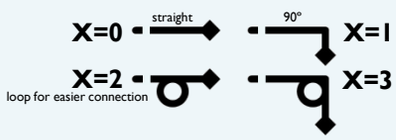
Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2)
- Technical instructions and compliancy certificates (English or French)

Standard range :
- Pressure : 15.000 and 30.000 psi
- Temperature : from -32°C to +60°C
- Length : no limit (already produced : 30 m)
- Connections (see table below) :
  - HP standard Nova Swiss® connections
  - semi-rapid Nova Swiss® connections (700 bar maximum)
  - fast connections (400 bar maximum)



Specific requests :
- Temperature > 60°C, pressure > 30.000 psi (up to 100.000 psi)
- Specific connections, or specific material in contact with the fluid
- Additional tests (fatigue life, fluid, temperature, etc.)

Inlet & Outlet end codification:



HPFH standard range codification (2) :

HPFH-	PP-	IC-	OC-	LLLLL-	IEX-	OEX-	AF

- Aggressive fluid ➤ **O2** for O2 / **H2** for H2 / **AF** for other
- Outlet end ➤ **OE0** (default) / **OE1** / **OE2** / **OE3**
- Inlet end ➤ **IE0** (default) / **IE1** / **IE2** / **IE3**
- Lenght (mm) ➤ ex. : **00500** for 500 mm / **15000** for 15 m
- Outlet connection ➤ **4M**, **6M**, **4H**, **6H**, **4E**, **6E**, **4N**, **6N**, **4B**, **6B**, **QC** = semi-rapid, **FC** = fast
- Inlet connection ➤ **4M**, **6M**, **4H**, **6H**, **4E**, **6E**, **4N**, **6N**, **4B**, **6B**, **QC** = semi-rapid, **FC** = fast
- Pressure (kpsi) ➤ **15** for 15 kpsi / **30** for 30 kpsi

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Safety Valves
HPSV Standard range

www.novaswiss.fr

General description :
The Nova Swiss® HPSV range is composed of two high pressure safety valves (certified CE), that can be set from 70 to 36.000 psi (2500 bar), for a fluid working temperature from -40 to +360°C.

Applications :
Protection of high pressure installations from 70 to 36.000 psi.

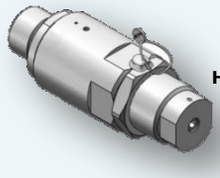
Technical data :
- Fluid : liquids or gases (1)
- Materials : see table below
- Inlet connection : 4E (see table page 3)
- Outlet connection : HPSV1 : free exhaust / HPSV2 : 4N
- Reduced external size for HPSV1
- PED 97/23/EC agreement and marking (category IV)
- ATEX agreement for 3 versions (see table below)

Tests and settings :
- Hydraulic test and gas leakage test (N_2)
- Setting at the demanded pressure

Provided documentation :
Technical instructions and compliancy certificates (English or French).

HPSV1

HPSV2



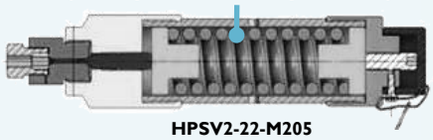
HPSV1-16-M105
3D model

Safety valve data table :

Reference	ATEX (option)	Material	Setting range	Temperature	Ø	Flow rate	Inlet	Outlet	Size
HPSV1-16-M105		APX4	5 / 1100 bar	-40 / +75°C	1.0 mm	80 / 200 L/h	4E	-	Ø27xL86 mm
(previous ref. : 7-1000-492)			0.07 / 16 kpsi						
HPSV2-12-M103	**-AT**	316L	5 / 800 bar	-10 / +250°C	2.4 mm	160 / 600 L/h	4E	4N	Ø44xL246 mm
(previous ref. : 7-1000-249)			0.07 / 12 kpsi						
HPSV2-36-M105		APX4	5 / 2500 bar	-10 / +250°C	2.4 mm	160 / 600 L/h	4E	4N	Ø44xL246 mm
(previous ref. : 7-1000-040)			0.07 / 36 kpsi						
HPSV2-36-M105-ET		APX4	5 / 2500 bar	-20 / +360°C	2.4 mm	160 / 600 L/h	4E	4N	Ø44xL246 mm
(previous ref. : 7-1000-227)									
HPSV2-22-M205		Hastelloy C276	5 / 1500 bar	-10 / +250°C	2.4 mm	160 / 600 L/h	4E	4N	Ø44xL246 mm
(previous ref. : 7-1000-041)			0.07 / 22 kpsi						
HPSV2-30-M207-ET	**-AT**	Incoloy A286	5 / 1900 bar	-20 / +360°C	2.4 mm	160 / 600 L/h	4E	4N	Ø44xL246 mm
(previous ref. : 7-1000-250)			0.07 / 27 kpsi						
HPSV2-30-M300	**-AT**	Titanium TA6V	5 / 2000 bar	-10 / +250°C	2.4 mm	160 / 600 L/h	4E	4N	Ø44xL246 mm
(previous ref. : 7-1000-251)			0.07 / 30 kpsi						

Specific requests (2) :
- Other material
- Additional tests (fatigue life, fluid, temperature, etc.)
- Special certificate or documentation in another language

Internal components depend on the application (fluid, pressure, temperature)



HPSV2-22-M205
3D model

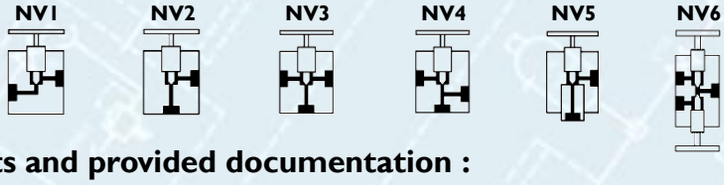
(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

Extreme Temperature Air Operated Valves
NVX-PP-CC-ATX-ET-MAT-AF

General description :
Nova Swiss SARL designs and produces air operated valves for high pressure liquid and gas applications, operating from -200°C to +300°C due to an extension adapted for extreme temperatures.

Applications :
All high pressure installations demanding a remote control and working under extreme temperatures from -200°C to +300°C (+450°C with an external cooling system on the extension).

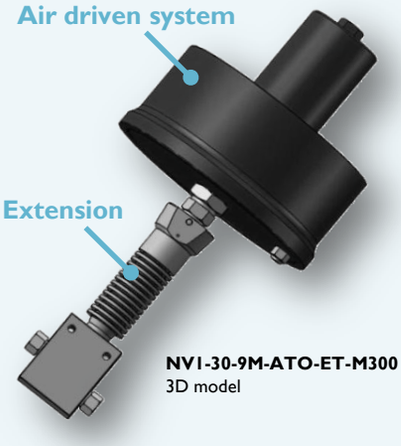
Technical data :
- Fluid : liquids or gases (1)
- Materials : see table page 3 (existing : M103, M107 and M203)
- PED 97/23/EC category : art. 3.3
- Air driven alimentation : 5 to 8 bar maximum
- Contact for position detection :
  - electric (max. 250V / 5A)
  - switch or inductive contact EEx
- Connections & valves type according to Nova Swiss® standards :



Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2)
- Technical instructions and compliancy certificates (English or French)

Specific requests :
- Other material
- ATEX agreement and marking
- Additional tests (fatigue life, fluid, temperature, etc.)

NV1-20-9M-ATO-ET



NV1-30-9M-ATO-ET-M300
3D model

Extreme temperature air operated valves codification (2) :

NVX	-PP	-CC	-ATX	-ET	-MAT	-AF
					material code (see page 3) : **M103** = 316L (by default)	**O2** for O2 / **H2** for H2 / **AF** for other
					minimal codification	options
			ATO for Air To Open / **ATC** for Air To Close			
		connection code Nova Swiss (see page 3) - ex. : **4E**				
	10 for 10 kpsi / **20** for 20 kpsi / **30** for 30 kpsi / **40** for 40 kpsi / **60** for 60 kpsi					
NV1 / **NV2** / **NV3** / **NV4** / **NV5** / **NV6**						

Nota : extreme temperature air operated valves Nova Swiss® are currently in homogenization progress and re-characterization in order to complete and extend the existing range.

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

Extreme Temperature Valves
NVX-PP-CC-ET-MAT-AF

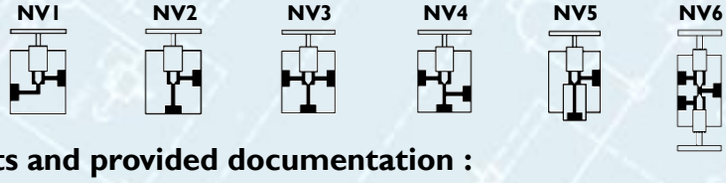
www.novaswiss.fr

General description :
Nova Swiss SARL designs and produces manual valves able to be handled under high pressure for liquid or gas applications, from -200°C to +300°C due to an extension adapted for extreme temperatures.

This extension is designed to move the seal from the very hot or cold area : calories generated in the column of fluid are dissipated, and the sealing components are remained in safe conditions.

Applications :
All high pressure installations working under extreme temperatures from -200°C to +300°C (+450°C with an external cooling system on the extension).

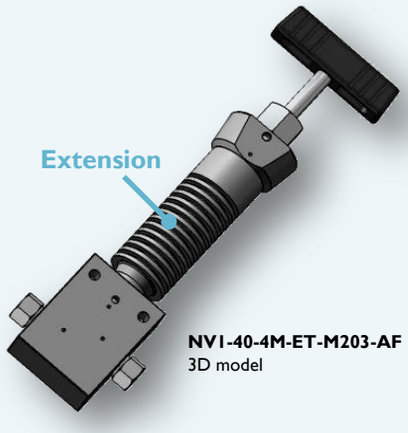
Technical data :
- Fluid : liquids or gases (1)
- Materials : see table page 3 (existing : M103, M107 and M203)
- PED 97/23/EC category : art. 3.3
- Connections & valves type according to Nova Swiss® standards :



Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2)
- Technical instructions and compliancy certificates (English or French)

Specific requests :
- Other material
- ATEX agreement and marking
- Additional tests (fatigue life, fluid, temperature, etc.)

NV1-20-9M-ET



NV1-40-4M-ET-M203-AF
3D model

Extreme temperature valves codification (2) :

minimal codification

NVX -PP -CC -ET -MAT -AF

options

- **Valve type** ➤ **NV1** / **NV2** / **NV3** / **NV4** / **NV5** / **NV6**
- **Pressure (kpsi)** ➤ **10** for 10 kpsi / **20** for 20 kpsi / **30** for 30 kpsi / **40** for 40 kpsi / **60** for 60 kpsi
- **Connection** ➤ connection code Nova Swiss (see page 3) - ex. : **4E**
- **Aggressive fluid** ➤ **O2** for O2 / **H2** for H2 / **AF** for other
- **Material** ➤ material code (see page 3) : **M103** = 316L (by default)

Nota : extreme temperature air operated valves Nova Swiss® are currently in homogenization progress and re-characterization in order to complete and extend the existing range.

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Bottle I

HPBI Standard range

General description :
The Nova Swiss® bottle HPBI is designed for liquid and gas very high pressure applications up to 60.000 psi (4000 bar). This bottle is declined in 7 standard models (3 volumes and 3 pressure ranges), with a multiple connection choice. It also can be customized in order to answer different technical needs.

Applications :
- PVT laboratories (Petro-chemicals, Bio-materials, Biology, etc.)
- High pressure gas or liquid tank

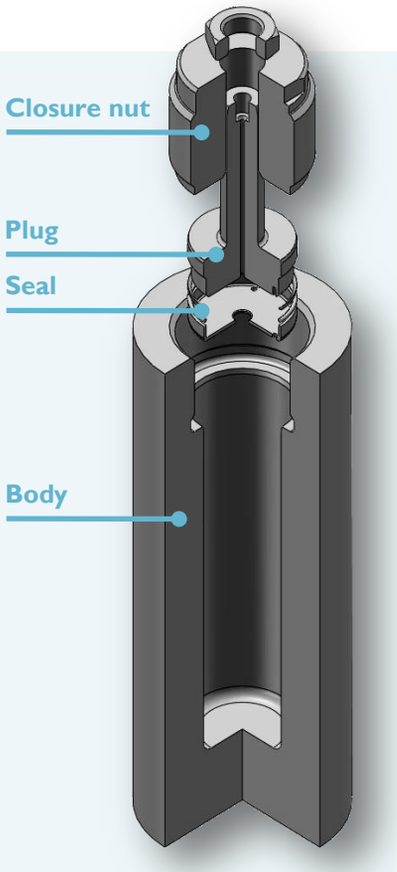
Technical data :
- One opening of plug type on top (threaded closure)
- One connection on the plug
- Material : stainless steel (high mechanical characteristics)
- Sealing : elastomer O or U-ring (depending on application)
- PED 97/23/EC agreement and marking (up to category IV)

Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2)
- Technical instructions and compliancy certificates (English or French)

Standard range :
- Fluid : liquids or gases (except high corrosive fluid) (1)
- Pressure ranges : 15.000, 30.000 and 60.000 psi
- Temperature : from -20°C to +100°C
- Volumes : 0.5 L, 1 L and 1.5 L
- HP standard Nova Swiss® connections (see table below)

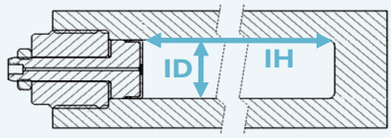
Dimensions (mm) / Volumes / Pressures / Connections :

		0.5 L	1 L	1.5 L	Connection
15 kpsi	ID – IH	75 - 115	85 - 180	100 - 195	M-H-E
30 kpsi		75 - 115	75 - 230	85 - 180	H-E
60 kpsi		45 - 315			H-E
	Tube	4 - 6	4 - 6	4 - 6 - 9	



HPB1-30-4E-1000
3D model

Material and profile of seal are defined according to applications



HPBI standard range codification (2) :

HPBI-PP-CC-VVVV

- Volume (ml) ➤ **0500** for 0.5 L / **1000** for 1 L / **1500** for 1.5 L
- Connection ➤ depending on Pressure / Tube in the above table – ex. : **4M** or **6E** for 0.5 L and 20 kpsi
- Pressure (kpsi) ➤ **15** for 15 kpsi / **30** for 30 kpsi / **60** for 60 kpsi

High Pressure Bottle I
HPBI Customizable range

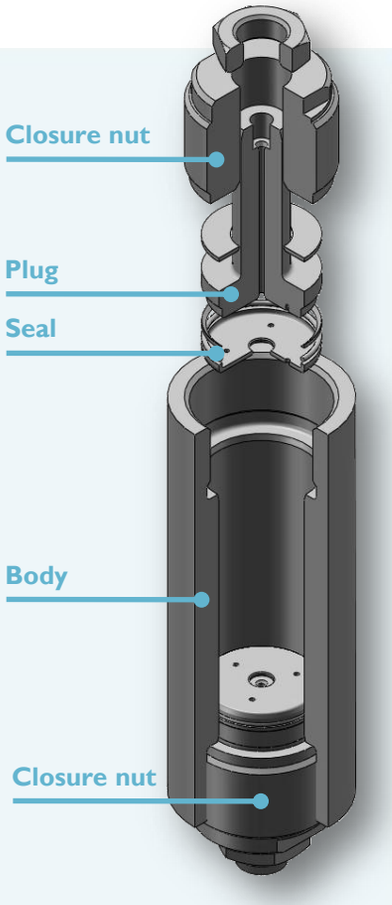
Customizable conception :
The design of the Nova Swiss® bottle HPBI is fully customizable. Any evolution from the Standard range (pressure, material, dimensions, etc.) can be taken into account very easily.

Thus, most of the different technical needs can be covered by the settings and options listed below.

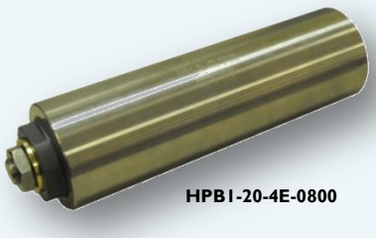
Settings and options :
- Special pressure, possibly higher than 60.000 psi
- Special connections
- Special volume
- Aggressive liquid or gas (specific material and degreasing)
- Special internal diameter
- Additional connection on the bottom
- Material : see table page 3
- Second opening (easy access and cleaning)

Specific request (2) :
- Temperature > 100°C (up to 260°C and more under conditions)
- Alternative material
- ATEX agreement and marking
- TPED agreement and marking
- Additional tests (fatigue life, fluid, temperature, etc.)

Additional equipments :
- Cooling system (water jacket)
- Heating system (electric collar or water jacket)
- Valves, safety equipment, instrumentation, etc.
- TPED protections or installation on an adapted frame



HPBI-15-4E-0750-H2-55-TC-M205-2O
3D model



HPBI-20-4E-0800

HPBI customizable range codification (2) :

HPBI	-PP	-TC	-VVVV	-AF	-ID	-BC	-MAT	-ON

- **Aggressive fluid** ➤ **O2** for O2 / **H2** for H2 / **AF** for other
- **Internal diameter (mm)** ➤ ex. **55** for 55 mm
- **Bottom connection** ➤ connection code (see page 3) ex. : **1L** or **SP** for a specific connection / **TC** for thermocouple / **TP** for PT100
- **Material** ➤ material code (see page 3) – ex. : **M203** = Monel 400
- **Opening number** ➤ **1O** for 1 opening (by default) / **2O** for 2
- **Volume (ml)** ➤ ex. : **0750** for 0.75 L
- **Top connection** ➤ connection code (see page 3) / **SP** for a specific connection (to be communicated)
- **Pressure (kpsi)** ➤ ex. : **25** for 25 kpsi

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Bottle 2
HPB2 Standard range

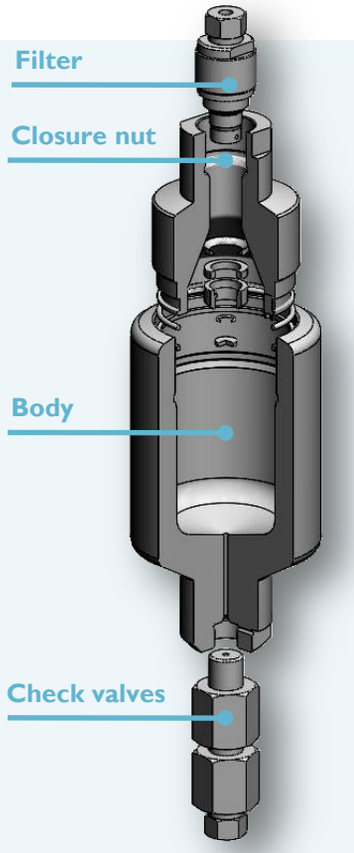
General description :
The Nova Swiss® bottle HPB2 is designed for gas high pressure applications up to 20.000 psi (1350 bar). This bottle is declined in 6 standard models (3 volumes and 2 pressure ranges), with a multiple connection choice. It also can be customized in order to answer different technical needs.

Applications :
Military industries (ejection systems), gas tanks, etc.

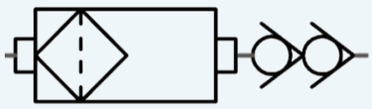
Technical data :
- One opening of plug type on top (threaded closure)
- Two connections (inlet/outlet)
- 15 µm inlet filter
- Two check valves mounted on outlet
- Material : stainless steel (high mechanical characteristics)
- Sealing : elastomer O-ring
- PED 97/23/EC agreement and marking (up to category IV)

Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2)
- Technical instructions and compliancy certificates (English or French)

Standard range :
- Fluid : gases (except high corrosive gases) (1)
- Pressure ranges : 10.000 and 20.000 psi
- Temperature : from -32°C to +60°C
- Volumes : 0.25 L, 0.5 L and 0.75 L
- HP standard Nova Swiss® connections (see table below)

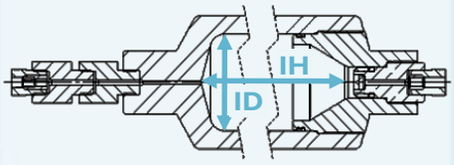


HPB2-10-4E-0250
3D model


HPB2 functional diagram

Dimensions (mm) / Volumes / Pressures / Connections :

		0.25 L	0.5 L	0.75 L	Connection
10 kpsi	ID - IH	64 - 78	64 - 156	64 - 234	B-N-M-H-E
20 kpsi					M-H-E
	Tube	4 - 6	4 - 6	4 - 6	



HPB2 standard range codification (2) :

HPB2-PP-CC-VVVV

- Volume (ml) ➤ **0250** for 0.25 L / **0500** for 0.5 L / **0750** for 0.75 L
- Connections ➤ depending on Pressure / Tube in the above table – ex. : **4B** or **6E** for 0.5 L and 10 kpsi
- Pressure (kpsi) ➤ **10** for 10 kpsi / **20** for 20 kpsi

High Pressure Bottle 2
HPB2 Customizable range

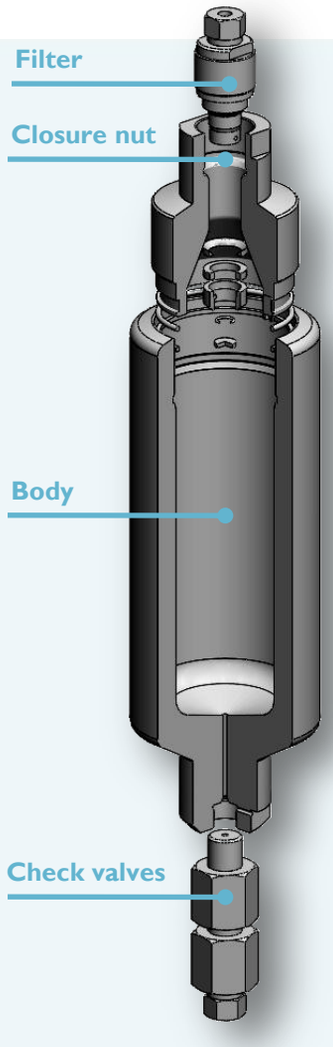
Customizable conception :
The design of the Nova Swiss® bottle HPB2 is fully customizable. Any evolution from the Standard range (pressure, material, dimensions, etc.) can be taken into account very easily.

Thus, most of the different technical needs can be covered by the settings and options listed below.

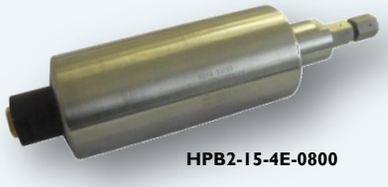
Settings and options :
- Special pressure, possibly higher than 20.000 psi
- Special connections
- Special volume
- Aggressive liquid or gas (specific material and degreasing)
- Special internal diameter
- Material : see table page 3

Specific request (2) :
- Temperature > 60°C (up to 260°C and more under conditions)
- Alternative material
- ATEX agreement and marking
- TPED agreement and marking
- Additional tests (fatigue life, fluid, temperature, etc.)

Additional equipments :
- Cooling system (water jacket)
- Heating system (electric collar or water jacket)
- Valves, safety equipment, instrumentation, etc.
- TPED protections or installation on an adapted frame



HPB2-10-4E-1000-M103
3D model



HPB2-15-4E-0800

HPB2 customizable range codification (2) :

HPB2 -PP -CC -VVVV -AF -ID -MAT

- **Aggressive fluid** ➤ **O2** for O2 / **H2** for H2 / **AF** for other
- **Internal diameter (mm)** ➤ ex. : **55** for 55 mm
- **Material** ➤ material code (see page 3) – ex. : **M104** = 316Ti
- **Volume (ml)** ➤ ex. : **1000** for 1 L
- **Connections** ➤ connection code (see page 3) / **SP** for a specific connection (to be communicated)
- **Pressure (kpsi)** ➤ ex. : **25** for 25 kpsi

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Vessel 1
HPV1 Standard range

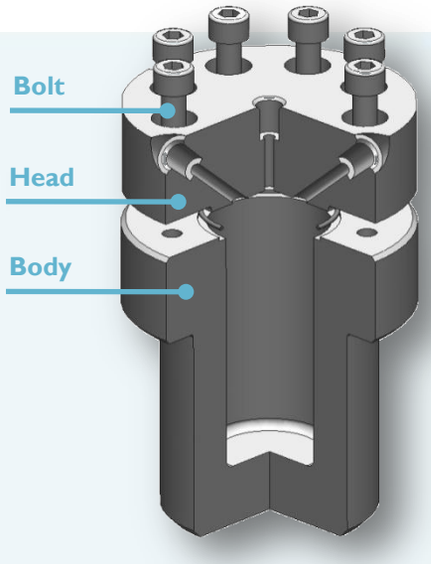
General description :
The Nova Swiss® vessel HPV1 is designed for liquid and gas high pressure applications up to 8.000 psi (550 bar), under temperatures up to +550°C. This vessel is declined in 6 standard models (3 volumes and 2 pressure ranges), with a multiple connection choice. It also can be customized in order to answer different technical needs.

Applications :
PVT laboratories (Petro-chemicals, Bio-materials, Biology, etc.).

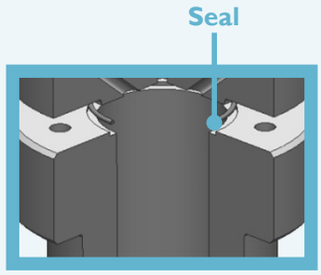
Technical data :
- One opening head type on top / screwed bolts
- Five connections (inlet/outlet, thermocouple, sampling tube)
- Material : stainless steel (high chemical compatibility properties)
- Sealing : elastomer or metallic O-ring (depending on application)
- PED 97/23/EC agreement and marking (up to category IV)
- Designed for a fixed head and removable body

Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2)
- Technical instructions and compliancy certificates (English or French)

Standard range :
- Fluid : liquids or gases (except high corrosive fluid) (1)
- Pressure ranges : 4 kpsi (275 bar) and 8 kpsi (550 bar)
- Temperature : from -200°C to +550°C
- Volumes : 0.25 L, 0.5 L and 0.75 L
- HP standard Nova Swiss® connections (see table below)



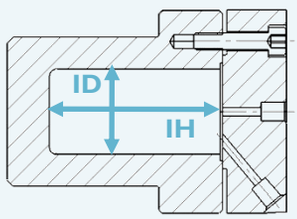
HPV1-08-2L-0750
3D model



Material and profile of seal are defined according to applications

Dimensions (mm) / Volumes / Pressures / Connections :

		0.25 L	0.5 L	0.75 L	Connection
4 kpsi	ID - IH	45 - 160	55 - 210	65 - 230	L-B-N-M-H-E
8 kpsi					L-M-H-E
	Tube	1 - 2 - 4	1 - 2 - 4	1 - 2 - 4	



HPV1 standard range codification (2) :

HPV1 -PP -CC -VVVV

- Volume (ml) ➤ **0250** for 0.25 L / **0500** for 0.5 L / **0750** for 0.75 L
- Connections ➤ depending on Pressure / Tube in the above table – ex. : **1B** or **4E** for 0.5 L and 4 kpsi
- Pressure (kpsi) ➤ **04** for 4 kpsi (275 bar) / **08** for 8 kpsi (550 bar)

High Pressure Vessel I
HPV1 Customizable range

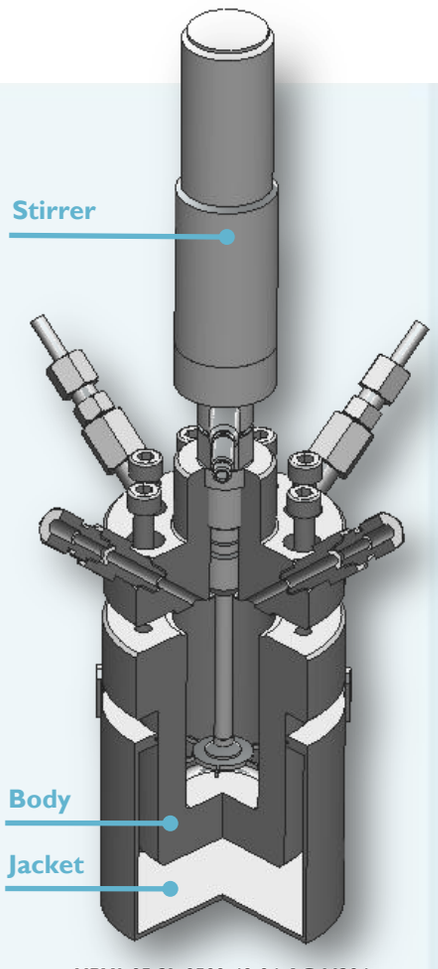
Customizable conception :
The design of the Nova Swiss® vessel HPV1 is fully customizable. Any evolution from the Standard range (pressure, material, dimensions, etc.) can be taken into account very easily.

Thus, most of the different technical needs can be covered by the settings and options listed below.

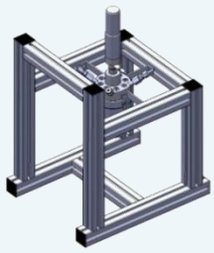
Settings and options :
- Special pressure, possibly higher than 8.000 psi
- Special connections
- Special volume
- Aggressive liquid or gas (specific material and degreasing)
- Special internal diameter
- Number of connections on the head (up to 8), stirrer connection or additional connection
- Material : see table page 3

Specific request (2) :
- Temperature > 550°C (up to 700°C and more under conditions)
- Alternative material
- ATEX agreement and marking
- Additional tests (fatigue life, fluid, temperature, etc.)

Additional equipments :
- Cooling system (water jacket)
- Heating system (electric collar or water jacket)
- Valves, safety equipment, instrumentation, etc.
- Installing and tubing on an adapted frame



HPV1-05-2L-0500-40-04-AG-M204
3D model with water jacket



Specific frame for HPV1

HPV1 customizable range codification (2) :

HPV1 -PP -CC -VVVV -AF -ID -NC -AC -MAT

- **Pressure (kpsi)** ➤ ex. : **05** for 05 kpsi
- **Connections** ➤ connection code (see page 3) / **SP** for a specific connection (to be communicated)
- **Volume (ml)** ➤ ex. : **1000** for 1 L
- **Aggressive fluid** ➤ **O2** for O2 / **H2** for H2 / **AF** for other
- **Internal diameter (mm)** ➤ ex. **55** for 55 mm
- **Number of connections on the head** ➤ ex. **05** for 5 connections
- **Additional connection** ➤ connection code (see page 3) ex. or **SP** : specific connection on the bottom / **ST** : stirrer on the top
- **Material** ➤ material code (see page 3) – ex. : **M100** = 304

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Vessel 2
HPV2 Standard range

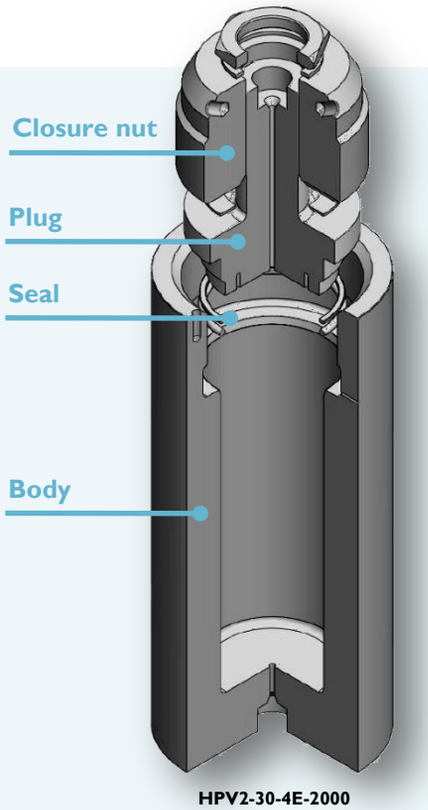
General description :
The Nova Swiss® vessel HPV2 is designed for liquid and gas very high pressure applications up to 60.000 psi (4000 bar). This vessel is declined in 7 standard models (3 volumes and 3 pressure ranges), with a multiple connection choice. It also can be customized in order to answer different technical needs.

Applications :
Isostatic pressing, Chemicals, Petrochemicals, etc.

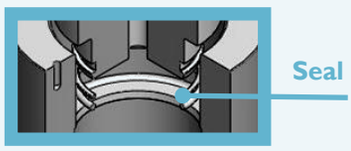
Technical data :
- One opening of plug type on top (threaded closure)
- Two connections (top and bottom)
- Material : stainless steel (high mechanical characteristics)
- Sealing : elastomer O or U-ring (depending on application)
- PED 97/23/EC agreement and marking (up to category IV)

Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2)
- Technical instructions and compliancy certificates (English or French)

Standard range :
- Fluid : liquids or gases (except high corrosive fluid) (1)
- Pressure ranges : 15.000, 30.000 and 60.000 psi
- Temperature : from -20°C to +100°C
- Volumes : 2 L, 3 L and 4 L
- HP standard Nova Swiss® connections (see table below)



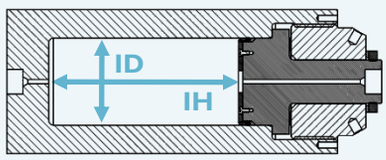
HPV2-30-4E-2000
3D model



Material and profile of seal are defined according to applications

Dimensions (mm) / Volumes / Pressure / Connections :

		2 L	3 L	4 L	Connection
15 kpsi	ID - IH	125 - 170	125 - 255	125 - 340	M / H / E
30 kpsi		100 - 255	100 - 385	100 - 510	H / E
60 kpsi		45 - 315			H / E
	Tube	4 – 6 - 9	4 – 6 - 9	4 - 6 - 9	



HPV2 standard range codification (2) :

HPV2 -PP -CC -VVVV

- Volume (ml) ➤ **2000** for 2 L / **3000** for 3 L / **4000** for 4 L
- Connection ➤ depending on Pressure / Tube in the above table – ex. : **4M** or **6E** for 2 L and 15 kpsi
- Pressure (kpsi) ➤ **15** for 15 kpsi / **30** for 30 kpsi / **60** for 60 kpsi

High Pressure Vessel 2
HPV2 Customizable range

www.novaswiss.fr

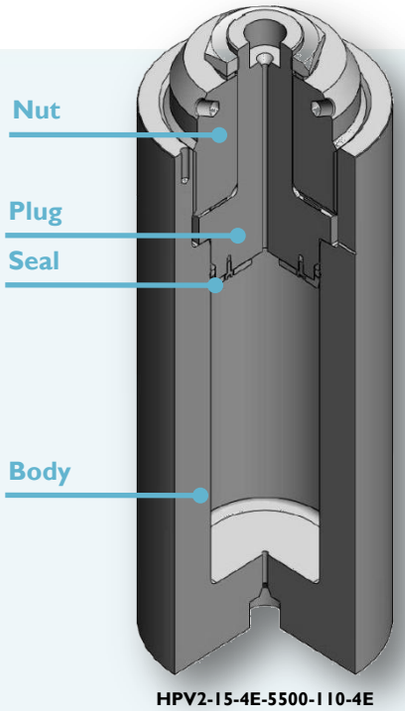
Customizable conception :
The design of the Nova Swiss® vessel HPV2 is fully customizable. Any evolution from the Standard range (pressure, material, dimensions, etc.) can be taken into account very easily.

Thus, most of the different technical needs can be covered by the settings and options listed below.

Settings and options :
- Special pressure, possibly higher than 60.000 psi
- Special connections
- Special volume
- Aggressive liquid or gas (specific material and degreasing)
- Special internal diameter
- Additional connections
- Material : see table page 3
- Bottom opening (easy access and cleaning)
- Valve included in the top plug (residual air bleed valve)

Specific request (2) :
- Temperature > 100°C (up to 260°C and more under conditions)
- Alternative material
- ATEX agreement and marking
- Additional tests (fatigue life, fluid, temperature, etc.)

Additional equipments :
- Cooling system (water jacket)
- Heating system (electric collar or water jacket)
- Valves, safety equipment, instrumentation, etc.
- Installing and tubing on an adapted frame



HPV2-15-4E-5500-110-4E
3D model


HPV2-25-4E-4200-100-4E-IV

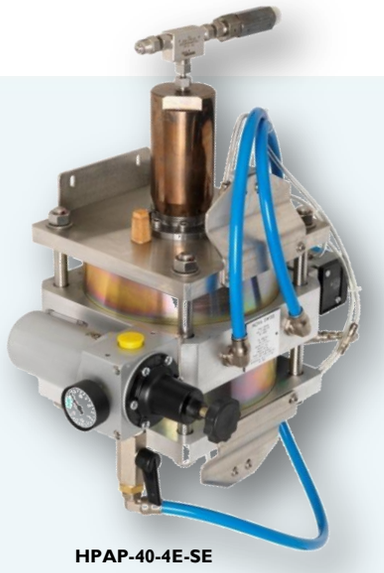
HPV2 customizable range codification (2) :

HPV2-PP-TC-VVVV-AF-ID-BC-MAT-ON-TV

- **Pressure (kpsi)** ➤ ex. : **25** for 25 kpsi
- **Top connections** ➤ connection code (see page 3) / **SP** for a specific connection (to be communicated)
- **Volume (ml)** ➤ ex. : **3500** for 3.5 L
- **Aggressive fluid** ➤ **O2** for O2 / **H2** for H2 / **AF** for other
- **Internal diameter (mm)** ➤ ex. **55** for 55 mm
- **Bottom connection** ➤ connection code (see page 3) ex. : **1L** or **SP** for a specific connection / **TC** for thermocouple / **TP** for PT100
- **Material** ➤ material code (see page 3) – ex. : **M202** = Inconel 718
- **Opening number** ➤ **1O** for 1 opening (by default) / **2O** for 2
- **Top valve** ➤ **0V** for 0 valve (default) / **1V** for 1 valve

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Air driven Pumps
HPAP Standard range



HPAP-40-4E-SE

General description :

The Nova Swiss® HPAP range is composed of 2 versions of air driven high pressure pumps, simple ended or double ended for higher performances and less pulsations frequency.

Each version is available in 2 pressure ranges : 60.000 psi and 100.000 psi (4000 bar and 7000 bar).

Applications (2) :

- Isostatic pressing (food processing, powders compacting, etc.)
- All liquid high pressure applications up to 100.000 psi

Technical data :

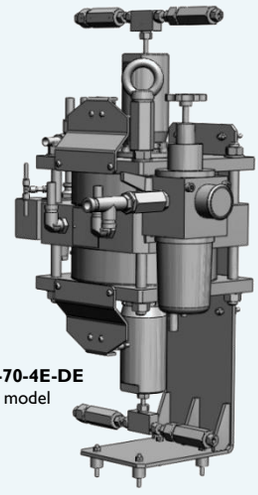
- Fluid : liquids (1)
- Fluid temperature : from +5°C to +40°C
- Material in contact with fluid : stainless steel
- Connections : 4E (see table page 3)
- Air driven alimentation : from 1.6 to 6.5 bar
- Liquid pressure regulated by a regulator on the driven air side
- Automatic stop at the set pressure

Advantages :

- Easy to operate and to make the maintenance
- Simple design based on a pressure intensifier
- No air needed to keep the pressure
- Automatic leakage compensation on the high pressure side
- Reduced sizes and not expensive for very high pressure uses

Tests and provided documentation :

- Hydraulic functional test
- Technical instructions and compliancy certificates (English or French)

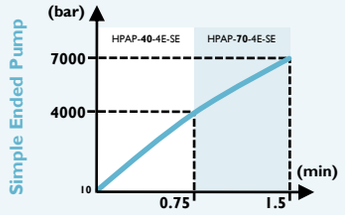


HPAP-70-4E-DE
3D model

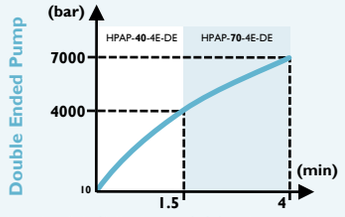
Standard versions summary table :

Ref.	Pressure	Type	LP Alim.	Air cons.	Mass	Dimensions
HPAP-40-4E-SE	4000 bar	Simple Ended	1.6 – 6.5 bar	82 Nm³/h	34 kg	Ø27xL86 mm
(previous ref. : 7-1000-397)	60 kpsi					
HPAP-40-4E-DE	4000 bar	Double Ended	1.6 – 6.5 bar	100 Nm³/h	40 kg	Ø44xL246 mm
(previous ref. : 7-1000-398)	60 kpsi					
HPAP-70-4E-SE	7000 bar	Simple Ended	1.6 – 6.5 bar	82 Nm³/h	34 kg	Ø27xL86 mm
(previous ref. : 7-1000-395)	100 kpsi					
HPAP-70-4E-DE	7000 bar	Double Ended	1.6 – 6.5 bar	100 Nm³/h	40 kg	Ø44xL246 mm
(previous ref. : 7-1000-396)	100 kpsi					

* **Nota :** contact us for more technical information about settings and performances.



Vessel = 0.5 L (full of water) / Air drive = 6 bar



Vessel = 2 L (full of water) / Air drive = 6 bar

Time to reach 4000 and 7000 bar *

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Specific VFT

Specific products

General description :
In order to answer the particular needs of our customers (material, temperature, marking, connections, etc.), Nova Swiss SARL designs and produces specific components based on the Nova Swiss® VFT standard ranges (Valves, Fittings and Tubes).

We can also produce particular components designed by our customers according to the PED 97/23/EC.

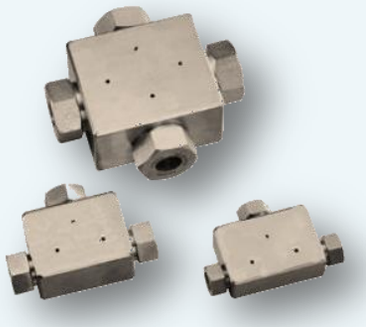
Applications :
All high pressure applications up to 10.000 bar (150.000 psi) and more under conditions.

Technical possibilities (2) :
- Fluid : liquids or gases (1)
- Pressure : up to 10.000 bar
- Fluid temperature : from -20°C to +700°C (under conditions)
- Material : see table page 3 or specific request
- PED 97/23/EC agreement and marking (art. 3.3)
- Connections :
  - HP standard Nova Swiss® connections (see table page 3)
  - semi-rapid Nova Swiss® connections (700 bar maximum)
  - fast connections (400 bar maximum)
  - connections of double collar type

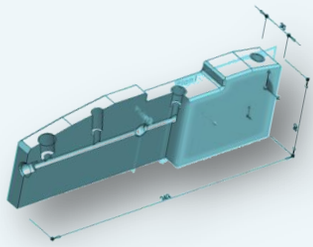
Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2 , He, etc.)
- Additional tests (fatigue life, fluid, temperature, etc.)
- Technical instructions and compliancy certificates (English or French)

Specific distribution block mounted with its instrumentation

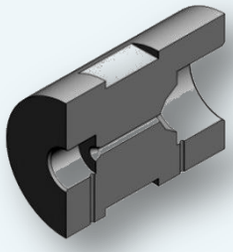
Nova Swiss® double block and bleed valve made in Hastelloy C276



Nova Swiss® fittings made in Titanium TA6V



Specific distribution block
3D model



Customer designed fitting
3D model

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Specific Equipments & Systems

Specific products

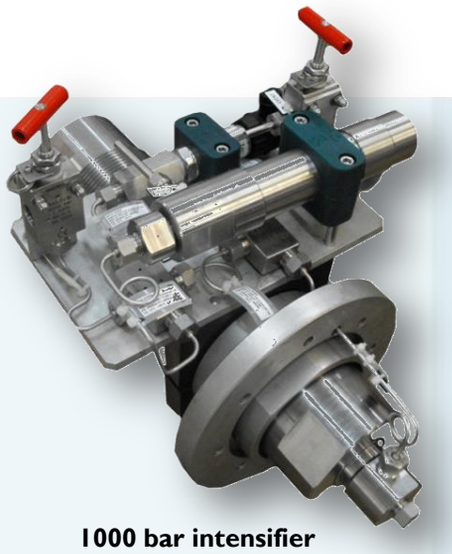
General description :
Nova Swiss SARL designs and produces a lot of high pressure equipments, adapted to the operating conditions of our customers (fluid, pressure and temperature), and specific functional requirements.

We can also produce particular equipments designed by our customers, tested and certified them according to the PED 97/23/EC (documentation, marking and notified body agreement).

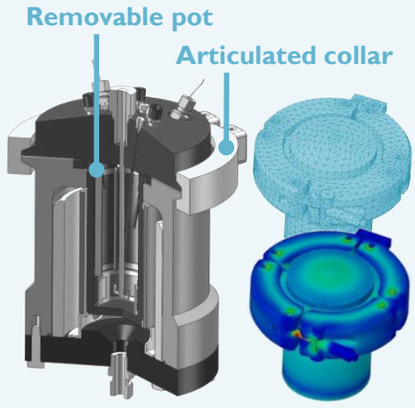
Applications :
All high pressure applications up to 10.000 bar (150.000 psi) and more under conditions.

Technical possibilities (2) :
- Fluid : liquids or gases (1)
- Pressure : up to 10.000 bar
- Fluid temperature : from -20°C to +700°C (under conditions)
- Material : see table page 3 or specific request
- Removable body or auto-fretted internal protection coat
- Closing : threaded closure, head with bolts or articulated collar
- HP standard Nova Swiss® connections (see table page 3)
- Connections of double collar type, etc.
- Electrical connections up to 400 bar
- Guidance of piston stem or force transmitter
- Tubing, safety equipments and complete instrumentation
- Magnetic stirrer, sampling tube, etc.
- PED 97/23/EC agreement and marking (up to category IV)

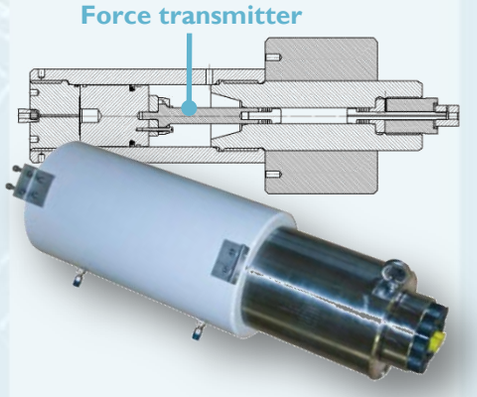
Tests and provided documentation :
- Hydraulic test and gas leakage test (N_2 , He, etc.)
- Additional tests (fatigue life, fluid, temperature, etc.)
- Technical instructions and compliancy certificates (English or French)



1000 bar intensifier
and its additional components

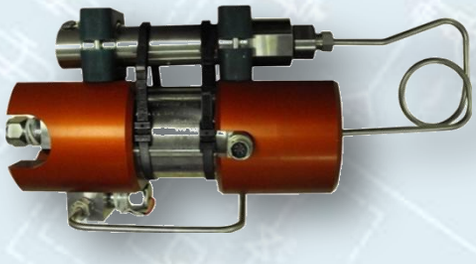


Batch reactor
100 mL /250 bar / 450°C
3D & FEM models



10.000 bar / 20°C intensifiers
picture & assembly drawing

TPED high pressure bottle equipped with safety valve and pressure sensors



Catalyze reactor
220 bar / 550°C

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Optical Cells

www.novaswiss.fr

Specific products

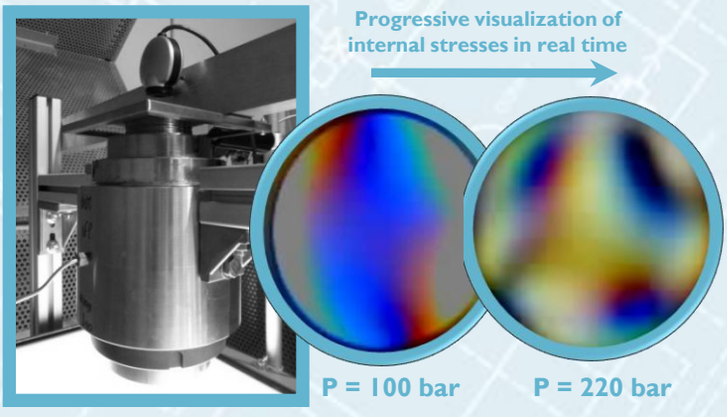
General description :
Nova Swiss SARL designs and produces a lot of high pressure optical cells, adapted to the operating conditions of our customers (fluid, pressure and temperature), and specific functional requirements.

We can also produce particular optical cells designed by our customers, and we can certify their conformity according to the PED 97/23/EC demands (files, and tests).

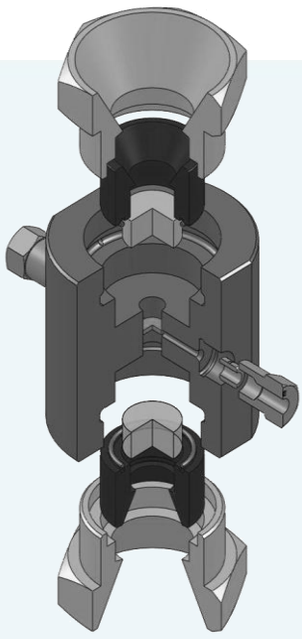
Applications :
- PVT laboratories (Petro-chemicals, Bio-materials, Biology, etc.)
- Visualization and measurement under pressure

Technical possibilities (2) :
- Fluid : liquids or gases (1)
- Pressure : up to 10.000 bar
- Fluid temperature : from -20°C to +700°C (under conditions)
- Material : see table page 3 or specific request
- Window materials : plexiglas, quartz, sapphire, or diamond
- Optical axis : 1 scope or more
- HP standard Nova Swiss® connections (see table page 3)
- PED 97/23/EC agreement and marking (up to category IV)

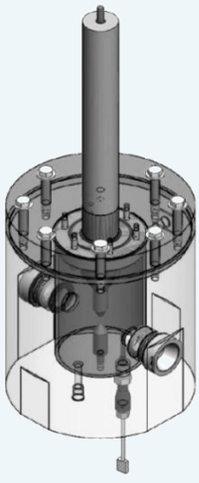
Tests and provided documentation :
- Hydraulic test of mechanical parts
- Hydraulic test of windows with photo-elastisymmetry control of internal stresses in real time
- Gas leakage test (N_2 , He, etc.) and functional tests
- Technical instructions and compliancy certificates (English or French)



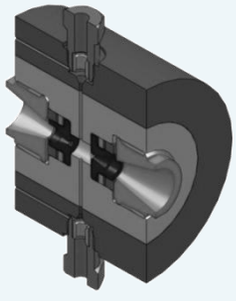
Control of internal stresses inside of a quartz window



1 axis optical cell 2500 bar
3D model



1 axis optical cell 400 bar / 1000 V
3D model



1 axis optical cell 6500 bar
3D model

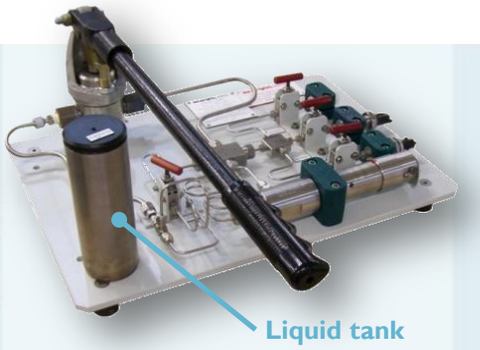
(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Hand Pump Systems

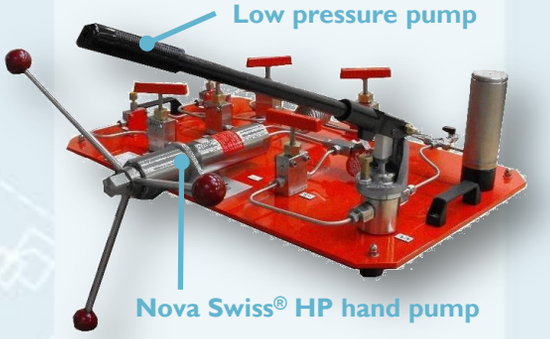
Specific products

General description :
Nova Swiss SARL designs and produces hand pump systems in order to pressurize the high pressure equipments of our customers (vessels, bottles, optical cells, etc.).

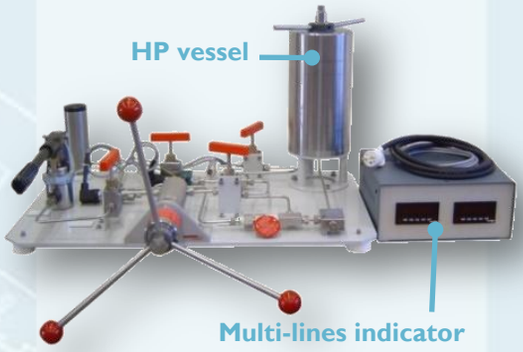
These systems are easy to operate, transportable and self sufficient, except the air supply (gas boosters) and electric power (if the system includes electric instrumentation or indicators).



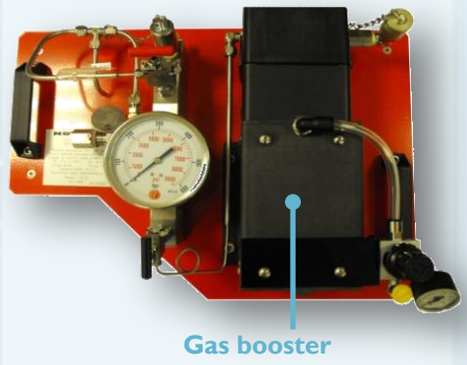
Applications :
All high pressure applications up to 7000 bar (100.000 psi).



Liquid Hand Pump Systems – Technical data (2) :
- Fluid : neutral liquids (1)
- Pressure : up to 7000 bar
- Fluid temperature : from +5°C to +40°C
- Volume of the liquid tank : 250 cc
- Low pressure pump + Nova Swiss® HP hand pump
- Connections :
  - HP standard Nova Swiss® connections (see table page 3)
  - semi-rapid Nova Swiss® connection (700 bar maximum)
  - fast connections (400 bar maximum)
  - connection of double collar type
- PED 97/23/EC agreement and marking (up to category IV)
- **Options :**
  - Other volume of the liquid tank
  - High pressure vessel included
  - Other temperatures and aggressive fluids
  - Material in contact with fluid (see table page 3)
  - Manometer or pressure sensors and digital indicators



Gas Hand Pump Systems – Technical data (2) :
- Fluid : neutral gases (1)
- Pressure : up to 1400 bar
- Fluid temperature : from +5°C to +40°C
- Gas booster (6 to 8 bar air supply)
- PED 97/23/EC agreement and marking (up to category IV)
- **Options : the same as Liquid Hand Pump Systems**



Tests and provided documentation :
- Hydraulic, leakage (liquid or gas), and functional tests
- Technical instructions and compliancy certificates (English or French)

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

High Pressure Gas Filling Benches

www.novaswiss.fr

Specific products

General description :
In order to allow our customers to fill their high pressure gas bottles or vessels, Nova Swiss SARL designs and produces a lot of filling benches, adapted to most of operating conditions (fluid, pressure, flow, etc.), and specific functional requirements (transportable benches, multi-lines filling benches, etc.).

As far as possible, Nova Swiss SARL includes high reliable standard Nova Swiss® components (tubes, valves, fittings, high pressure diaphragm compressor, etc.).

Applications :
Military industries and all high pressure gas applications.

Technical possibilities (2) :
- Fluid : pure gases (1), including O_2 and H_2 applications
- Pressure : up to 3000 bar
- Gas temperature from -32°C to +60°C
- Nova Swiss® diaphragm compressor up to 3000 bar
- 1 or 2 stages compressors (flow rate ↗ : pressure & inlet ↘)
- Possible parallel assembly in order to increase the flow
- Connections :
  - HP standard Nova Swiss® connections (see table page 3)
  - semi-rapid Nova Swiss® connection (700 bar maximum)
  - fast connections (400 bar maximum)
  - connections of double collar type
- Manual control or automatic regulation
- PED 97/23/EC agreement and marking (up to category IV)

Tests and provided documentation :
- Gas leakage (N_2 ,He, etc.) and functional tests
- Technical instructions and compliancy certificates (English or French)

Transportable filling bench
nitrogen / 430 bar / multi-lines

Automatic filling bench
nitrogen / 700 bar

Manual filling bench
helium / 400 bar

Semi-automatic filling bench - nitrogen / 400 bar

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

Cold, Warm & Hot Isostatic Presses

Specific products

Cold & Warm Isostatic Presses (CIP & WIP) applications :
- High pressure food processing
- Powdered material forming (plastic, ceramic, graphite, metallic, etc.) : this process allows the production of complex parts, with uniform mechanical resistance and density, without any raw material loss, and using simple and cheap tools (elastomer molds or pockets)

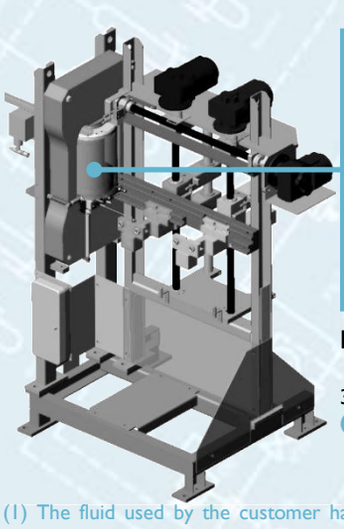
Hot Isostatic Presses (HIP) applications :
- Elimination of natural porosities in raw metallic materials
- Full densification of powders
- Post densification of sintered parts (carbides, steels, etc.)
- Regeneration of used alloys in order to eliminate defaults
- Impregnation and carbonization (ceramic, composites, etc.)
- Assembly by diffusion

Technical possibilities (2) :
- Fluid : CIP & WIP : liquids (water, soluble oil) / HIP gases (1)
- Volume : up to 100 L
- Pressure : up to 10.000 bar and more under conditions
- Fluid temperature : from -20°C to +2.200°C (HIP furnace)
- Nova Swiss® HPAP pumps
- Vessel closure : threaded or yoke frame
- Heating by electric collar, fluid, or furnace
- Manual control or automatic regulation
- Steel, stainless steel or aluminum welded or assembled frame
- PED 97/23/EC agreement and marking (up to category IV)

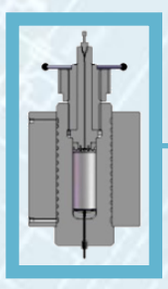
Tests and provided documentation :
- Hydraulic, leakage (liquid or gas), and functional tests
- Technical instructions and compliancy certificates (English or French)

Warm Isostatic Press
2 L / 750 bar / 800°C
(ceramic production)

Cold Isostatic Press
4.5 L / 2300 bar / 20°C
(crystal synthesis)



Hot Isostatic Press
1 L / 2000 bar / 2000°C
3D model
(material research)



Warm Isostatic Press
2 L / 6500 bar / 100°C
(high pressure food processing)

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

Other High Pressure Installations

www.novaswiss.fr

Specific products

General description :
Nova Swiss SARL designs and produces a lot of high pressure installations, adapted to the operating conditions of our customers (fluid, pressure, flow, etc.), and specific functional requirements.

Applications :
- Corrosion testing
- Mechanical parts hardening
- Crystal hydrothermal synthesis (quartz, etc.)
- Supercritical CO_2 separation and extraction
- Pressure / temperature simulations

Technical possibilities (2) :
- Fluid : liquids and gases (1)
- Volume : up to 100 L
- Pressure : up to 10.000 bar and more under conditions
- Working temperature : from -20°C to +2.200°C (HIP furnace)
- HP standard Nova Swiss® connections (see table page 3)
- Tubing and components mounting
- Heating by electric collar, fluid, or furnace
- Manual control or automatic regulation
- Steel, stainless steel or aluminum welded or assembled frame
- Designed for an easy use and maintenance
- Secure installations (safety equipments, protection panels, etc.)
- PED 97/23/EC agreement and marking (up to category IV)

Tests and provided documentation :
- Hydraulic, leakage (liquid or gas), and functional tests
- Technical instructions and compliancy certificates (English or French)

(1) The fluid used by the customer has to be communicated in order to check its compatibility with each material. (2) Compatibility between the request and the application (material, fluid, pressure, temperature, connections, etc.) is subject to validation by Nova Swiss SARL.

Cycling bench
7 L / 2500 bar / 150°C
(ceramic production)

Ergonomic control panel

CO_2 extraction bench
2x0.2 L extractors & 2x0.14 L separators
900 bar / 150°C
(supercritical CO_2)

Heat protections

Corrosion testing autoclave
H_2O and O_2 / 127 bar / 520°C
(material R&D)

Safe and ergonomic installations

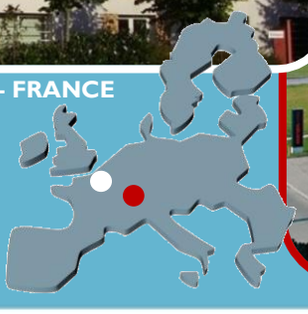
Protection panels

Food processing bench
0.5 L / 6500 bar / 80°C
(food industry)

The Company

High Pressure Technology

Nova Swiss SARL - FRANCE



Nova Werke AG - SUISSE

Military industries

Hydrogen use and production

R&D (Energetics, Biologics, etc.)

Food industries

Nova Swiss SARL is the French subsidiary of Nova Werke AG, a Swiss independent company located on Effretikon. With the quality trade mark Nova Swiss®, it develops, produces, and supplies everywhere in the world, standard and specific high pressure equipments, and complete systems, for its customers in the following main domains :

- Military industries
- Hydrogen use and production
- R&D(Energetics, Biologics, etc.)
- Food industries

Days after days, we use processes and High-tech innovative components in compliance with the most severe demands in terms of quality and reliability.

Nova Swiss® is the worldwide recognized trade mark of Nova Werke AG.

APRAGAZ QA Cert. N°: 05/FR/956 ISO 9001 : 2008

APRAGAZ QA Cert. N°: 05/FR/877 Module D & H Directive 97/23/CE

CE

The management system

Quality is a vital importance for all products, production processes and services. Nova Swiss SARL is certified ISO 9001 version 2008. Nova Swiss SARL is also accredited PED/97/23/EC module B+H. Nova Werke AG, the main factory of the group, is certified ISO 9001 version 2008 and ISO 14001 version 2004.

The continuous improvement process is one of the major components of these requirements. It is systematic for every one and practiced in all areas.

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