



TABLE OF CONTENTS

INTRODUCTION

METHODOLOGY

4

15

Pumps for microfluidic devices Scope of the report Key features of the report Objectives of the report Related reports

Patent search, selection and analysis Search strategy Key patent identification Terminologies for patent analysis

MAIN ASSIGNEES MENTIONED 23

PATENT LANDSCAPE OVERVIEW 29

Time evolution of patent publications Countries of patent filings Time evolution by country of filing Ranking of most prolific patent applicants Mapping of main current IP holders Mapping of main current IP applicants

IP POSITION OF MAIN PATENT ASSIGNEES 36

Strength index of patent portfolios Patent citation analysis IP blocking potential of patent applicants Time evolution for main patent applicants Countries of filings for main patent applicants Summary of applicant's patent portfolio Patent applicants IP network IP leadership of patent applicants Granted patents near expiration Degree of specialization Potential future plaintiffs

50

66

TECHNICAL ISSUES

Main IPC classes: Global analysis Time evolution by IPC: Global analysis Matrix main priority countries / main IPC Main IPC classes: Main assignees Matrix main applicants / main IPC Technical segmentation Time evolution by technical issue Legal status by technical issue Countries of filings by technical issues Time evolution by country of filings Key patent analysis

IP PROFILE OF KEY PLAYERS

Agilent Technologies Baxter International Bigfoot Biomedical Robert Bosch Debiotech Seiko Epson Hitachi

REPORT SAMPLE

Honeywell Intel Konica Minolta Medtronic Panasonic Roche Seiko Instruments Waters Corporation Caltech Fraunhofer ITRI MIT Stanford University University of California

<u>For each selected player</u>: Summary of the patent portfolio Key patents

CONCLUSION	114

KNOWMADE PRESENTATION 11

INTRODUCTION Pumps for Microfluidic Devices

REPORT Microfluidic devices are designed for the precise control and manipulation of very small amounts of fluid (in the range of micro smaller). Microfluidics is suitable for many applications such as DNA chips, lab-on-a-chip technologies, drug delivery. They are also used in other domains, including flow chemistry, inkjet printing or IC cooling. Microfluidic devices are composed of reservoirs, chambers and microchannels and the fluid must be handle through those compartments in an accurate and reliable manner. Thus, the pumping system is the keystone of the microfluidic device.

Globally, the market for pumps for microfluidic devices is growing quickly. According to Market Research Future*, the global micropumps market should reach \$5.28 billion by 2027 at a CAGR of 17.2%. The biomedical and pharmaceutical industries are driving the market, it represented almost 55% of the market share in 2015. Generally, pumps for microfluidic devices are classified into 2 categories, depending on their actuation method: mechanical and non-mechanical (see next pages for further details). The most common micropumps on the market are mechanical micropumps, in particular driven by piezoelectric actuation. In 2015, mechanical micropumps hold 66.3% of the global market share for micropumps, with \$519.5 Million against \$264.4 Million for non-mechanical micropumps*.

The 1st pump for microfluidics described in patents was published in the late 1970s-early 1980s. In 1976, Thomas and Bessman developed an implantable pump with piezoelectric actuation (US3963380). Less than a decade later, Smits patented another micropump based on piezoelectric technology (EP0134614).

In this patent landscape dedicated to pumps for microfluidic devices, we analyzed the time evolution of patent publications and countries of filings, the ranking of main patent applicants and the strength of their portfolio, the technical issues developed in the patents. This analysis provides interesting data and supports analysis of the micropump market.

*Source: Market Research Future, Global Micro-pump Market Research Report - Forecast To 2027 (December 2016)



INTRODUCTION Pumps for Microfluidic Devices: Mechanical Actuation

KEPUKI , SANDIF Mechanical pumps have moving parts and need a physical actuator to perform the pumping process. The pumping effect is induce deflection of a membrane.

- **Electrostatic pumps:** The actuation mechanism involves electrostatic forces. When a biased voltage is applied between 2 plates (electrodes), it creates an electric field and induces a change of pressure inside the pump and forcing the membrane towards one direction
- **Piezoelectric pumps:** Piezoelectric materials, such as PZT, undergo shape changes when supplied with an electrical current. In piezoelectric pumps, the piezoelectric component is joined to the membrane and its deformation induces the motion of the membrane.
- **Electromagnetic pumps:** An electromagnetic micropump includes a permanent magnet and a set of drive coils. Either of the magnet or the driving coils is directly attached to the membrane. When a current is applied through the driving coils, it produces a magnetic field. The attraction/repulsion created by this magnetic field induces the deflection of the membrane.





Figures from Ashraf et al. Int. J. Mol. Sci. 2011



INTRODUCTION Pumps for Microfluidic Devices: Mechanical Actuation

- **Thermopneumatic pumps:** Thermopneumatic pumps are based on thermal expansion principle. A heater/cooler system allows the periodical expansion/compression of the gas trapped in the air chamber. This leads to a periodic change in volume of the chamber, deforming the membrane.
- Shape Memory Alloy (SMA) pumps: Certain alloys exhibit elasticity and shape memory when heated and cooled. The alloy and its associated heater is bond to the membrane. The deformation of the alloy induces the actuation of the membrane. SMA are usually TiNi alloys.
- Bimetallic pumps: two different metals with different thermal expansion coefficients are bond together. Thermal changes induce deflection of the bimetallic actuator and thus of the membrane. A bimetallic actuator can associate Aluminum and Silicon.
- **Ion conducting polymer film (ICPF) pumps:** ICPF pumps include a polymer sandwiched between thin films with high electrical conductivity. When an electric current is applied, it induces the de deformation of the polymer film.











INTRODUCTION Pumps for Microfluidic Devices: Non-Mechanical Actuation

SANDIE Non-mechanical pumps have no moving parts, they convert non-mechanical actuation into kinetic momentum. The actuation prince be electrical, chemical or magnetic for example.

- Magneto-hydrodynamic (MHD) pumps: MHD pumps are based on Lorentz force principle. An electric and a magnetic fields are generated by an electrode and a permanent magnet placed in the channels walls of the pumping system, driving the fluid. The fluid needs to be electrically conductive.
- Electro-hydrodynamic (EHD) pumps: EHD pumps are based on the interaction of an electric field and the mobile charges of the dielectric fluid. An electric field is generated by electrodes placed in the channels walls, driving the dielectric field by electrostatic forces.
- **Electroosmotic pumps:** An electric potential is applied in the channel wall by electrodes, creating surface charges. The fluid to be driven needs to be electrically conductive.







Figures from Ashraf et al. Int. J. Mol. Sci. 2011

INTRODUCTION Pumps for Microfluidic Devices: Non-Mechanical Actuation

• **Electro-chemical pumps:** Electrochemical pumps are based on electrolysis principle. An electric current is applied, inducing electrolysis and creating bubbles in the fluid.

• Electro-wetting pumps: Electro-wetting pumps are based on modification of surface tensions. An electric potential is applied between two layers of material (solid/liquid or liquid/liquid), generating electrostatic forces and modifying the surface tension. The surface tension drives the dielectric fluid.

• **Bubble-type pumps:** Bubble-type pumps are based in the expansion/collapse of bubbles, which drives the fluid. The bubbles are generated by heating process with an applied voltage.





Figures from Ashraf et al. Int. J. Mol. Sci. 2011



(C)KnowMade

- This report provides a detailed picture of the patent landscape for pumps for microfluidic devices.
- This report covers patents published worldwide up to March 2017.
- We have selected and analyzed more than **1,250 patent families** relevant to the scope of this report.

Included in the report

- ✓ Patents related to pumps for microfluidic devices: micropumps, pumps for handling small amount of fluids, etc.
- ✓ Patents related to microfluidic technologies according an important part to the pumping system (claim(s) dedicated to the pump)

X Pumps for handling large volume of fluids

X Patents related to microfluidic device in which the pump is <u>not part of the core of the invention</u> (pump only mentioned in the description of the document)

Not included in the report



INTRODUCTION Related Reports

You may also be interested in our previous reports:



• Fluidigm Patent Portfolio Analysis (2017) (<u>link</u>)





Microfluidic Technologies for Diagnostic Applications Patent Landscape (2017) (<u>link</u>)

You may also be interested in those market analysis reports of our partner Yole Développement:

-			25	22
			25	104
	_	-	/ E	20
		×	1 =	-84-14

• Status of the Microfluidics Industry (2017) (link)





 Microfluidic Applications in the Pharmaceutical, Life Sciences, In-Vitro Diagnostic, and Medical Device Markets (2015) (<u>link</u>)



Point-of-Need Testing: Application of Microfluidic Technologies (2016) (link)



METHODOLOGY Patent Search, Patent Selection, Patent Analysis (1/2)

REPORT 1 •The data were extracted from the FamPat worldwide database (Questel-ORBIT) which provides 90+ million patent document offices.

•The search for patents was performed in March 2017, hence patents published after this date will not be available in this report.

- The patents were grouped by **patent family**. A patent family is a set of patents filed in multiple countries to protect a single invention by a common inventor(s). A first application is made in one country – the priority country – and is then extended to other countries.
- The selection of the patents has been done both automatically and manually (all details in next slides).

Number of selected patent families for Pumps for Microfluidic Devices:

1,273 over a number of returned results > 4,000

- The statistical analysis was performed with **Orbit IP Business Intelligence web based patent analysis software from Questel**.
- The patents were **manually categorized in technical segments** using keyword analysis of patent title, abstract and claims, in conjunction with expert review of the subject-matter of inventions (all details in next slides).
- For legal status of European (EP) and PCT (WO) patent applications, EPO Register Plus has been used. For legal status of US patents, USPTO PAIR has been used. For legal status of other patents, information has been gotten from their respective national registers.



METHODOLOGY

Patent Search, Patent Selection, Patent Analysis (2/2)





Pumps for Microfluidic Devices – Patent Landscape Analysis | July 2017 | Ref.: KM17007 11 © 2017 All rights reserved | www.knowmade.com



	Step	Search Equation	Results
Patent Related to Pumps for Microfluidic Devices	Step 1	((+PUMP+)/TI OR F04B/IPC/CPC) AND ((MICRO_FLUID+ OR NANO_FLUID+ OR MICRO_DROP+ OR NANO_DROP+ OR MICRO_FLOW+ OR MICRO_VOLUME? OR NANO_VOLUME? OR MICRO_SCALE OR (LAB_ON_CHIP?) OR (POINT 1D OF 1D CARE) OR MICRO_TAS OR (SMALL_VOLUME_FLUID?) OR MEMS)/BI/CLMS/DESC)	>2,600
Citing and Cited Patents	Step 2	CITING AND CITED PATENTS OF SELECTED PATENTS FROM STEP 1	>19,000
Manual Selection	Step 3	SELECTED PATENT FAMILIES	1,273

• + Truncation replacing any number of characters

- ? Truncation replacing zero or one character
- # Truncation replacing one character

(C) Know Made

- _ Truncation for word that may have a space (ex: semiconductor, semi conductor)
- OR Finds references containing at least one of the words
- AND Finds references containing all words
- S Finds references containing the terms in the same sentence
- nD Finds references containing adjacent terms, regardless of the order, and may be separated by a maximum of n words

- () Parentheses are necessary to combine different operators
- /TI/OTI Search in Title
- /BI Search in Title and Abstract
- /CLMS Search in Claims
- /OBJ Search in the object of the invention
- /PA.FLD Search in Patent Assignees
- /IC Search in International Patent Classification (IPC)

PATENT LANDSCAPE OVERVIEW

Time Evolution of Patent Publications



Publications Years

The 1st patents dedicated to pumps able to manipulate very small amounts of fluids were published in the 70s and 80s. The micropumps described in these patents are based on piezoelectric actuation technology. The growth of microfluidic technologies in the 90s led to the parallel increase development of pumps adapted for microfluidic devices. In the 90s, the main patent applicants for pumps for microfluidic devices include APPLICANT XXX, APPLICANT XXX and APPLICANT XXX. After a latency period, we observe an increase of patent publications from 2002 until 2014. In the last couple of years, the number of new patent publications related to pumps for microfluidic devices. Since 2010, the number of Chinese patent applicants in the domain has increased significantly, in particular academic applicants (APPLICANT XXX, APPLICANT XXX, APPLICANT XXX, APPLICANT XXX, APPLICANT XXX, APPLICANT XXX, etc.). This coincides with the growing interest of Chinese for microfluidic technologies.

KnowMade

PATENT LANDSCAPE OVERVIEW

Time Evolution by Country of Filing

FILING COUNTRY	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	201	20	2016
AUSTRALIA																1	2	2	1	1	2	3	4	5	7	5	4	11	8	16	1	2	2	2	3	5	1	7	4	1	2	3
CANADA																2	1	2		1	3	3	2	2	6	3	3	5	4	6	2	1	1	1	9	7	5	6	7	2	4	1
CHINA														1			2					1	1	3	1	4		7	13	15	21	17	16	13	23	19	30	43	59	69	57	39
GERMANY (EP)																1	1	3	4	6	7	2	8	10	2	6	2	8	7	8	10	13	15	6	15	16	8	2	10	1		2
EUROPE											1					1	4	6	2	4	1	5	4	8	7	6	9	8	9	13	15	10	10	10	14	17	21	17	20	22	16	12
JAPAN												1			1	6	4	6	12	7	4	1	6	5	5	11	11	4	18	29	33	19	23	19	27	26	23	21	26	30	18	7
KOREA																	2	2		1			2		2	1	2	6	4	6	6	12	6	14	4	9	6	5	3	6	7	1
TAIWAN																													6	7	7	3	5	7	5	9	1	2	3	2	1	
USA		1														3		4	6	5	1	3	5	8	10	10	28	42	47	49	45	37	26	32	50	46	38	39	42	34	35	20
WO (PCT)																2	4	3	2	1	4	5	7	11	7	8	5	20	13	25	16	18	22	12	25	17	25	19	17	12	11	5

📃 1-9 patent families 🛛 📒 20-29 patent families 📒 40-49 patent families

10-19 patent families 30-39 patent families 250 patent families

Note: International (WO) and European (EP) applications may hide other countries that are not yet published.

As previously shown, China appears as the main country for 1st patent filings in the domain of pumps for microfluidic devices, but **the country experienced a burst of the patenting activity since 2010**. Before this period, the USA appeared as the main country of patent filings, with a peak of activity in 2002-2005 and 2009-2010. Since 2010, the patenting activity related to pumps for microfluidic devices is lower in the USA than in China. This is linked to the new interest of Chinese applicants for microfluidic technologies.

KnowMade

KEPORT SAMDIE

PATENT LANDSCAPE OVERVIEW Mapping of Main Current IP Holders



In China, Japan and Korea, the IP landscapes related to pumps for microfluidic devices are dominated by national applicants. Moreover, Chinese applicants focus their patenting activity on their country. In Japan, APPLICANT XXX, who owns the largest portfolio, is the main current IP holder and the company also holds granted patents in the USA and Europe. The Swiss company APPLICANT XXX holds most of its granted portfolio in the USA and Japan, but the company does not appear among the main current IP holder in Europe. In Europe, the ranking of main current IP holders include several German applicants, including APPLICANT XXX (ranked 1st) and APPLICANT XXX. Several US applicants also show a patenting activity in Europe, including APPLICANT XXX, APPLICANT XXX and APPLICANT XXX. APPLICANT XXX is the main IP holder in the USA, before APPLICANT XXX and APPLICANT XXX.

(C) KnowMade

IP POSITION OF MAIN PATENT ASSIGNEES Strength Index of Patent Portfolios (1/2)



(C)KnowMade

In an IP landscape, the number of patents assigned to a SAMPLE not necessarily reflect the strength of its portfolio. So, we analyzed strength index of the portfolio of patent applicants in the domain of pumps for microfluidic devices based on citations. This analysis reveals a totally new ranking. Here, Chinese patent applicants do not appear in the top ranking. This is probably linked to their national-centered IP strategy and their relatively recent activity. Half of the Top-20 of this ranking is composed of US applicants. Moreover, numerous patents filed by Chinese applicants only in China do not contain significantly innovative matter.

APPLICANT XXX holds by far the portfolio with the highest strength index. **APPLICANT XXX** is ranked 2nd, followed by **APPLICANT XXX**, **APPLICANT XXX and APPLICANT XXX**. The analysis of the strength index of patent portfolio shows that several academic players bring a strong contribution to the IP landscape related to the field of pumps for microfluidic devices. Indeed, 3 academic institutes appear in the Top-5 ranking: **APPLICANT XXX** (ranked 1st) and **APPLICANT XXX** and **APPLICANT XXX**. APPLICANT XXX and **APPLICANT XXX** also hold a significant number of families in their portfolio (13 and 23 families respectively). The analysis of the strength index also reveals patent applicants with a smaller portfolio with a great impact on the prior art, such as **APPLICANT XXX**, **APPLICANT XXX** or **APPLICANT XXX**.

For the next part of the IP landscape analysis, we will focus on the IP activity the 21 patent assignees shown in this strength index ranking. The next 2 slides show more details on the citation analysis.

Pumps for Microfluidic Devices – Patent Landscape Analysis | July 2017 | Ref.: KM17007 © 2017 All rights reserved | www.knowmade.com

Patent Citation Analysis



Despite the different size of their portfolio, APPLICANT XXX (13 families) and APPLICANT XXX (5 families) show similar relative impact factor. Patent portfolios of both applicants are cited by a very high number of other applicants. They also hold key patents, among the most cited patent of this study related to pumps for microfluidic devices. APPLICANT XXX hold the most cited patent of this landscape (USxxxxxx), overall. this family received over 800 forward citations. Another patent of APPLICANT XXX is also among the most cited patents: USxxxxxxx. Those patents were published in 2000-2001 and both families include several granted patents in the USA. The patents described the fabrication of pumps based on MEMS technologies. Globally, APPLICANT XXX holds by far the portfolio with the highest strength index. APPLICANT XXX also holds a very cited patent in this landscape (USxxxxxx) published in 2001 and currently granted. This patent is related to an electroosmotic pump. The ranking of those 2 US institutes shows the important contribution of academic applicants to the IP landscape related to pumps for microfluidic devices. APPLICANT XXX, 2nd largest portfolio of the main assignees selected, shows the 2nd highest strength index. Several patents of the company received numerous forward citations, including USxxxxxx, USxxxxxx and USxxxxxxx. Those patents were filed in the late 80s-early 90s, they are no longer in force. APPLICANT XXX hold the largest portfolio among the applicants selected, but the strength index of its portfolio is rather medium. Therefore the company is ranked 5th behind APPLICANT XXX, APPLICANT XXX, APPLICANT XXX and **APPLICANT XXX.**

(C)KnowMade

Pumps for Microfluidic Devices – Patent Landscape Analysis | July 2017 | Ref.: KM17007 17 © 2017 All rights reserved | www.knowmade.com

IP Blocking Potential of Patent Applicants



The more the number of forward citations from different patent applicants is high, the more the capacity to hamper the other firms' attempts to patent a related invention is important. Note: This graph is at patent family level. The identification of a "blocking patent" requires an in-depth specific analysis of each patent document composing the patent families. The IP blocking potential is an indicator of how an IP player and its patents are difficult to circumvent in a technology. The IP blocking potential is not necessarily linked to the size of the portfolio.

APPLICANT XXX shows by far the highest IP blocking potential. The portfolio of the US institute is very cited; over 180 other applicants have cited more than one time patents of APPLICANT XXX. Main citing applicants for APPLICANT XXX portfolio include APPLICANT XXX and APPLICANT XXX. Two patent families belonging to APPLICANT XXX are among the Top-10 most cited of this study: USxxxxxx and USxxxxxxx. Both families include several granted patents in the USA. The portfolio of APPLICANT XXX also shows a significant IP blocking potential. Several patens of the company received numerous forward citations, including USxxxxxxx, USxxxxxxx and USxxxxxxx. Filed in the 80s/90s, those patents are no longer in force, but APPLICANT XXX has exploited the rights of these patents until their expiration. Main citing applicants for APPLICANT XXX portfolio are APPLICANT XXX, APPLICANT XXX and APPLICANT XXX. With a portfolio of 5 families, APPLICANT XXX shows an IP blocking potential similar to APPLICANT XXX and APPLICANT XXX. Over 60 applicants have cited more than one time the portfolio of Stanford. Moreover, the American University hold the most cited patent of this landscape (USxxxxxx) filed in 2001 and currently granted.

(C)KnowMade

Summary of Applicant's Patent Portfolio (1/2)

mmary of Applic	ant's	Paten	t Port	folio (1	1/2)	LJ								R SA	EP(ORT
ASSIGNEE	No. of patent	Oldest priority date of the	No. of families filed / yr	No. of patent	No. of patents /	Patent average age	% granted	% pending	% dead (revoked	No. of alive patents / Family		No. fan	of grar nilies b	nteu p oy cour	ntry	
	families	portfolio	(average)	documents	(average)	(yr)	granteu		expired)	(granted, pending)	US	EP	JP	CN	KR	тw
APPLICANT XXX	хх	1988	хх	хх	1.9	хх	46%	xx%	xx%	0.9	7	2	18	2	-	-
APPLICANT XXX	хх	19xx	1.1	150	xx	17	xx%	xx%	73%	xx	4	1	4	3	-	-
APPLICANT XXX	хх	19xx	xx	xx	xx	xx	xx%	2%	xx%	xx	9	8	6	3	-	-
APPLICANT XXX	18	19xx	xx	47	xx	7	xx%	23%	xx%	1.8	5	3	-	3	-	1
APPLICANT XXX	хх	2002	xx	xx	2.1	хх	34%	xx%	xx%	хх	3	-	1	1	-	5
APPLICANT XXX	хх	19xx	0.7	xx	7.9	xx	xx%	xx%	xx%	5.5	9	2	-	1	1	-
APPLICANT XXX	хх	1985	xx	xx	1.2	xx	xx%	0%	88%	хх	1	-	-	-	-	-
APPLICANT XXX	хх	20xx	xx	xx	xx	xx	xx%	xx%	xx%	xx	2	-	2	-	-	-
APPLICANT XXX	10	19xx	xx	17	xx	9	xx%	xx%	xx%	xx	5	1	-	1	1	-
APPLICANT XXX	10	20xx	xx	xx	xx	xx	4%	xx%	xx%	2.0	1	-	-	-	-	-
APPLICANT XXX	хх	1993	xx	xx	1.9	13	xx%	xx%	xx%	хх	5	-	1	-	-	-
APPLICANT XXX	хх	19xx	0.4	xx	xx	xx	46%	0%	xx%	xx	2	-	4	-	-	-
APPLICANT XXX	хх	20xx	xx	xx	xx	8	xx%	47%	xx%	1.0	-	-	-	1	-	-
APPLICANT XXX	6	19xx	xx	xx	xx	XX	xx%	0%	xx%	xx	4	2	-	1	-	-
APPLICANT XXX	хх	20xx	xx	25	xx	xx	16%	8%	76%	xx	1	1	-	-	-	-
APPLICANT XXX	хх	2001	xx	xx	5.0	xx	xx%	7%	xx%	2.5	4	1	-	1	1	-
APPLICANT XXX	хх	19xx	0.3	xx	xx	xx	22%	xx%	xx%	xx	2	-	-	-	-	-
APPLICANT XXX	хх	19xx	xx	64	12.8	11	58%	xx%	xx%	9.4	4	3	3	1	-	2
APPLICANT XXX	хх	19xx	xx	хх	2.4	xx	xx%	xx%	xx%	хх	3	-	-	-	-	-
APPLICANT XXX	хх	20xx	xx	xx	xx	xx	xx%	xx%	47%	xx	3	-	1	1	1	-
APPLICANT XXX	xx	1997	xx	xx	3.3	10	92%	xx%	0%	3.3	4	-	-	-	-	-

(C) KnowMade

highest value in column Iowest value in column

Pumps for Microfluidic Devices – Patent Landscape Analysis | July 2017 | Ref.: KM17007 © 2017 All rights reserved | www.knowmade.com

19

IP POSITION OF MAIN PATENT ASSIGNEES Summary of Applicant's Patent Portfolio (2/2)

REPORT Among the main applicants highlighted in this study, APPLICANT XXX, APPLICANT XXX, APPLICANT XXX and APPLICANT XXX were file patents related to pumps for microfluidic devices in the 1980s.

APPLICANT XXX owns the largest portfolio (42 families) and shows the highest filing rate per year (1.5 family filed per year since 1988). Most of the other applicants file less than a new family per year in average. The portfolio of **APPLICANT XXX** includes 46% of granted patents, mostly in Japan. The IP activity of APPLICANT XXX in pumps for microfluidic devices is focused on 2 periods of time: 1990-1994 and 2008-2014. APPLICANT XXX develops piezoelectric pumps (see TECHNICAL ISSUES chapter).

APPLICANT XXX has the 2nd largest portfolio and is ranked 2nd in term of portfolio strength. The Swiss company also filed a significant number of patents (150 documents). APPLICANT XXX developed most of its portfolio in the 1990s and the patents of its portfolio show the oldest average age (17 years). However, the company showed a more recent filing activity between 2010 and 2014. The pumps developed by **APPLICANT XXX** are based on MEMS technology and are designed for medical applications, such as drug delivery, insulin delivery, micropump dysfunction management, etc.

APPLICANT XXX is the most active applicant in the last few years in term new family filing and it has the highest percentage of pending applications in the portfolio (47%). APPLICANT XXX has pending applications in the USA, Europe and Japan. The company is focusing on the development of pumps for HPLC systems.

APPLICANT XXX has a small portfolio, but extends significantly each of its families (12.8 patents per family). The portfolio of **APPLICANT XXX** include 73% of patents alive (58% of granted patents and 16% of pending applications), it represents an average of 9.4 alive patents per family. The American company shows a worldwide IP strategy, with granted patents in the USA, Europe and Asia.

APPLICANT XXX is a young startup (incorporated 2014), the company doesn't have any product on the market to this date. The company is specialized in insulin pumps. APPLICANT XXX hold a small portfolio of 4 families related to pumps for microfluidic devices, including 13 patents. 92% of this portfolio is currently granted and 8% is pending.



IP Leadership of Patent Applicants



The analysis of the reinforcement of patent rights combined with the current patenting activity of each applicant reveals different IP leaders in this landscape. **APPLICANT XXX** holds a very important number of granted patents in its portfolio. If this university has filed applications recently (currently pending), it has reduced significantly their patenting activity. **APPLICANT XXX** is currently the main IP holder considering the number of granted patents in its portfolio.

APPLICANT XXX has a moderate number of granted patents in its portfolio, but the Swiss company has the highest number of applications currently pending. They have been filed in various countries: USA, Europe, China, Japan and India. This shows a strong interest of **APPLICANT XXX** in the domain of pumping technologies for use in microfluidic devices.

APPLICANT XXX, APPLICANT XXX, APPLICANT XXX and APPLICANT XXX are also important IP players. They all hold a significant number of granted patents as well as a certain number of pending applications, in particular **APPLICANT XXX and APPLICANT XXX**. **APPLICANT XXX** has a limited number of patent families compare to **APPLICANT XXX** and **APPLICANT XXX**, however, **APPLICANT XXX** is filing many applications within each family.

KnowMade

REPORT SAMPLE

In order to fully understand the technological issues, we classified the patents according to the main actuation techniques described the literature (see pages 6-9):

		SEARCH EQUATION (title, abstract, claims)	SELECTED
	Bimetallic	(BI_METAL+)	XX
	Electromagnetic	(ELECTRO_MAGNET+ OR (MAGNET+ S COIL?) OR (MAGNET+ S SOLENOID?))	107
	Electrostatic	(ELECTRO_STATIC+)	XX
MECHANICAL ACTUATION	ICPF	((CONDUCT+ S POLYMER?) OR (CONDUCT+ S FILM?) OR ICPF)	XX
	Piezoelectric	(PIEZO+ OR PZT)	XX
	SMA	(SHAPE MEMORY OR SHAPE-MEMORY OR SMA OR NI_TI+ OR NICKEL_TITANIUM+ OR (MEMORY 1D FORM))	35
	Thermopneumatic	(THERMO_PNEUMATIC+)	XX
	Bubble-type	(BUBBLE+)	ХХ
	EHD	(ELECTRO_HYDRO_DYNAMIC+ OR ELECTR+ HYDRO_DYNAMIC+ OR EHD)	ХХ
NON-	Electrochemical	(ELECTRO_CHEM+)	ХХ
ACTUATION	Electroosmotic	(ELECTRO_OSMO+ OR ELECTRO_KINE+)	93
	Electrowetting	(ELECTRO_WETT+ OR (ELECTR+ S WETT+))	XX
	MHD	(MAGNETO_HYDRO_DYNAMIC+ OR MAGNET+ HYDRO_DYNAMIC+ OR MHD)	13



TECHNICAL ISSUES

Technical Seg	ment	ation (2/4)			1-4 patent familio	es 📕 5-9 patent families	10-14 patent far	SAMPLE
ASSIGNEES	Number of	Electrostatic	Electromagnetic	Piozooloctric	MECHANICAL ACTUATION	SMA	Bimotallic	ANPLE
TOTA	Families	XX	107	XX	ХХ	35	XX	XX
MAIN ASSIGNEES IN T	THE SEGMENT	Applicant XXX (DE), Applicant XXX (US), Applicant XXX (US)	Applicant XXX (US), Applicant XXX (US), Applicant XXX (CN)	Applicant XXX (CN), Applicant XXX (JP), Applicant XXX (CN), Applicant XXX (CH)	Applicant XXX (US), Applicant XXX (US), Applicant XXX(CN)	Applicant XXX (JP)	Applicant XXX (JP)	
APPLICANT XXX	xx	-	-	21	-	-	-	-
APPLICANT XXX	xx	1	1	10	-	2	-	-
APPLICANT XXX	хх	8	1	7	1	-	-	-
APPLICANT XXX	18	1	2	6	1	-	-	-
APPLICANT XXX	xx	-	-	5	-	-	-	-
APPLICANT XXX	хх	4	1	2	2	2	-	1
APPLICANT XXX	xx	-	-	6	-	-	-	-
APPLICANT XXX	хх	-	-	5	-	-	-	-
APPLICANT XXX	10	-	-	-	-	1	-	-
APPLICANT XXX	10	-	-	4	-	3	-	-
APPLICANT XXX	хх	-	1	4	-	-	-	-
APPLICANT XXX	хх	-	-	5	-	-	-	-
APPLICANT XXX	хх	-	-	1	-	-	-	-
APPLICANT XXX	6	5	3	1	-	-	-	-
APPLICANT XXX	хх	-	1	-	-	-	1	-
APPLICANT XXX	xx	-	-	-	-	-	-	-
APPLICANT XXX	хх	-	-	-	-	1	-	-
APPLICANT XXX	xx	-	1	-	-	-	-	-
APPLICANT XXX	xx	-	-	1	-	1	-	-
APPLICANT XXX	xx	-	-	-	-	-	-	-
APPLICANT XXX	xx	-	1	-	-			
KnowMade				Pum	bs for Microfluidic Dev	ices – Patent Landscap	e Analysis July 201	7 Ref.: KIVI17007 23

Pumps for Microfluidic Devices – Patent Landscape Analysis | July 2017 | Ref.: KM17007 © 2017 All rights reserved | www.knowmade.com

TECHNICAL ISSUES

Technical Seg	men	tation (3/4)		1-4	patent families 📕 5-9 patent	families 📕 10-14 patent far	SANA
				NON-MECHANI	CALACTUATION		
ASSIGNEES	Number of Families	MHD	EHD	Electroosmotic	Electrowetting	Electrochemical	Bubble-typ
τοτα	L 1,273	13	ХХ	93	ХХ	ХХ	ХХ
MAIN ASSIGNEES IN T	HE SEGMENT	Applicant XXX(US), Applicant XXX (CN)	Applicant XXX (CN)	Applicant XXX (US), Applicant XXX (US)	Applicant XXX (FR), Applicant XXX (US), Applicant XXX (US)	Applicant XXX (RO)	Applicant XXX (TW)
APPLICANT XXX	хх	-	-	-	-	2	-
APPLICANT XXX	хх	-	-	-	-	-	-
APPLICANT XXX	xx	-	-	-	-	2	-
APPLICANT XXX	18	-	-	-	-	-	-
APPLICANT XXX	хх	-	-	1	-	-	-
APPLICANT XXX	xx	-	-	2	-	-	-
APPLICANT XXX	xx	-	-	-	-	-	-
APPLICANT XXX	хх	-	-	-	-	1	1
APPLICANT XXX	10	1	-	-	1	-	-
APPLICANT XXX	10	-	-	-	-	-	2
APPLICANT XXX	хх	-	-	1	-	-	-
APPLICANT XXX	xx	-	-	-	-	-	-
APPLICANT XXX	хх	-	-	-	-	-	-
APPLICANT XXX	6	-	-	-	-	-	-
APPLICANT XXX	хх	-	-	-	-	-	-
APPLICANT XXX	хх	-	-	5	-	-	1
APPLICANT XXX	xx	-	-	3	-	1	-
APPLICANT XXX	хх	-	-	-	-	1	-
APPLICANT XXX	хх	-	-	1	-	-	-
APPLICANT XXX	хх	-	-	4	-	1	-
ΑΡΡΙΙζΑΝΤ ΧΧΧ	XX	-	-	_	-	_	-



Pumps for Microfluidic Devices – Patent Landscape Analysis | July 2017 | Ref.: KM17007 24 © 2017 All rights reserved | www.knowmade.com

TECHNICAL ISSUES Time Evolution by Technical Issue



The development of **piezoelectric pumps** for microns started in the 80s/90s. In 1990-1992, **APPLICANT XXX** and **APPLICANT XXX** were the main applicants in this technology. Since 2012, the patenting activity is mainly due to the publication of patents of **APPLICANT XXX**, in particular **Jiangsu APPLICANT XXX and APPLICANT XXX**.

KEPURT SAMPIF

The patents related to **electromagnetic actuation**, 2nd main mechanical actuation claimed, were mostly published between 2003 and 2014.

Regarding **electrostatic pumps**, **Fraunhofer** is the main applicant in this technology. The patents of the German institute related to electrostatic pumps for microfluidics were published between 1990 and 1993.

Globally the development of non-mechanical pumps for microfluidic devices started later than mechanical pumps. The main non-mechanical actuation claimed is **electroosmotic actuation**, its development started in the early 2000s. The patent of **APPLICANT XXX**, main applicant in this technology, were published in 2004 and 2005.

Since 2014, we observe a strong increase of patent publications related to **EHD** actuation technology. This sudden patenting activity is the consequence of the new interest of **APPLICANT XXX** for this actuation technology.

TECHNICAL ISSUES Key Patents Analysis

						MECH	IANICAL ACTU	ATION				N	ION-MECHANI	CALACTUATIO	ON	PLE
Key Patents	1 st Publication	Assignee	Legal Status	Electro- static	Electro- magnetic	Piezo- electric	Thermo- pneumatic	SMA	Bimetallic	ICPF	MHD	EHD	Electro- osmotic	Electro- chemical	Electro- wetting	Bubble- type
<u>USxxxxxxx</u>	1976	BESSMAN SAMUEL, THOMAS JR LYELL	Expired			1										
<u>USxxxxxx</u>	1990	DEBIOTECH	Expired			1										
<u>USxxxxxx</u>	1990	APPLICANT XXX	Expired			1										
<u>USxxxxxxx</u>	1995	APPLICANT XXX	Expired			1										
<u>USxxxxxxx</u>	1991	APPLICANT XXX	Expired	✓												
<u>USxxxxxx</u>	1991	APPLICANT XXX	Expired			✓										
<u>USxxxxxxx</u>	1992	APPLICANT XXX	Expired	✓		1										
<u>WOxxxxxx</u>	1996	APPLICANT XXX	Expired									✓	✓			
<u>EPxxxxxxx</u>	1997	APPLICANT XXX	Lapsed	✓												
<u>USxxxxxxx</u>	1998	APPLICANT XXX	Granted	1												
<u>USxxxxxxx</u>	1999	APPLICANT XXX	Lapsed			1										
<u>WOxxxxxxx</u>	1999	APPLICANT XXX	Granted										×			
<u>USxxxxxx</u>	2000	APPLICANT XXX	Granted		✓											
<u>USxxxxxx</u>	2001	APPLICANT XXX	Granted		1											
<u>USxxxxxx</u>	2003	APPLICANT XXX	Granted										1			
<u>EPxxxxxxx</u>	2004	APPLICANT XXX	Lapsed			1										
<u>USxxxxxxxxxx</u>	2006	APPLICANT XXX	Granted													
USxxxxxxxxx	2007	APPLICANT XXX	Granted					1								
WOxxxxxxxxx	2009	APPLICANT XXX	Granted/Pending											1		
WOxxxxxxxxx	2011	APPLICANT XXX	Granted/Pending			✓	✓									
<u>USxxxxxxxxx</u>	2014	APPLICANT XXX	Pending													
USxxxxxxxxx	2014	APPLICANT XXX	Pending				1									

The methodology for key patent selection is on page 39.



KEY PLAYERS APPLICANT XXX





Summary of applicant's patent portfolio





KEY PLAYERS APPLICANT XXX - Key patents

<u>USxxxxxx</u>

(C)KnowMade

Constant flow rate micro pump 1st publication: 19xx Legal status: expired

Type of pump: mechanical pump (piezoelectric pump)

<u>Content</u>: The invention relates to a micropump in which at least part of the pump mechanism is made by machining a silicon wafer using photolithographic technology. This micropump comprises a pumping chamber, an inlet channel communicating with the pumping chamber by an inlet valve and an outlet channel communicating with the pumping chamber via an outlet valve.



Improved micro-pump 1st publication: 19xx Legal status: expired

<u>Type of pump:</u> mechanical pump (piezoelectric pump)

<u>Content:</u> The invention relates to micropumps in which at least part of the pump mechanism is made by machining a silicon wafer using photolithographic technology. This invention relates to a micropump comprising two plates placed face-to-face and two valves.











EXCEL DATABASE

Containing all the patents analyzed in this report with technology segmentation



This database allows multi-criteria searches and includes patent publication number, hyperlinks to the original documents, priority date, title, abstract, patent assignees, and legal status for each member of the patent family.

- 4	Α	В	С	D	E	F	G	н	1	J	K	L	M	N	0	P	Q	R	S	Т	U	V
1												MECHA	NICAL ACTU	IATION				NO	N-MECHANI	CAL ACTUATI	ON	
2	FAMILY NUMBER (FamPat Jatabase)	PATENT NUMBER	PATENTASSIGNEE	PRIORITY DATE	тпе	ABSTRACT	PDF LINK	LEGAL STATUS	ACTUAL OK EXPECTED EXPIRATION DATE	Bimetallic	Electro- magnetic	Electro- static	ICPF	Piezo- electric	SMA	Thermo- pneumatic	Bubble- type	EHD	Electro- chemical	Electro- osmostic	Electro- wetting	MHD
3 76	13	US2012		2009-04-24	Electroosmotic	Electroosmotic (EO) d	<u>Open</u>		2014-10-01											Х		
4 76	513	EP12		2001-01-04	Implantable in	An implantable infus	<u>Open</u>		2006-04-11													
5 76	13	US2004		2001-01-04	Implantable in	An implantable infus	<u>Open</u>		2008-08-18													
6 76	13	AU200		2001-01-04	Implantable in	An implantable infus	<u>Open</u>	(S. 1997)	2021-12-18													
7 75	63	KR2017	and the later of	2015-08-27	A micro pump a	An arrow city example	<u>Open</u>	(2016-10-27													
8 75	20 -	CN2059		2016-08-15	Small -size liqu	The utility model dise	<u>Open</u>		2026-08-15									X				
9 75	20	CN2059		2016-08-15	Cylindrical elec	The utility model dis	<u>Open</u>	Contraction of the second	2026-08-15									Х				
10 75	517	JP2017	and the second second	2015-06-16	Micropump, mi	PROBLEM TO BE SOLVE	<u>Open</u>		2035-06-16													
11 75	14	CN106		2016-09-22	Aerogel electro	The present invention	<u>Open</u>		2036-09-22											Х		
12 75	602	WO20:		2015-07-02	Micropump wit	A micropump include	<u>Open</u>		2019-01-02			Х										
13 75	00	CN2058	Sector Press, America	2016-05-11	Antigravity loop	The utility model disc	<u>Open</u>	(Carried Street of the	2026-05-11									Х				
14 74	98	DE1020:	the second second second	2015-09-14	Micro-Pump	The invention relates	<u>Open</u>		2035-09-14													
15 74	96	CN106		2016-09-09	Electro-conjuga	The invention disclos	<u>Open</u>		2036-09-09													
16 74	95	CN106		2016-10-05	Bionic pump ba	The invention relates	<u>Open</u>		2036-10-05					Х								
17 74	82	CN106		2016-10-10	Valveless piezo	A valveless piezoelec	<u>Open</u>	(2036-10-10					Х								
18 74	74	CN2057		2016-05-17	Micrometeor di	The utility model disc	<u>Open</u>		2026-05-17													
19 74	69	CN2057		2016-04-23	A miniflow pun	The utility model provide and the second	<u>Open</u>		2026-04-23					Х								
20 74	61	CN106	State Press Arrest	2016-08-15	Cylindrical elec	The invention disclos	<u>Open</u>		2036-08-15									х				
21 74	55	CN106		2016-08-15	Small liquid co	The invention disclos	<u>Open</u>		2036-08-15													
22 74	52	JP2016		2015-03-30	Micropump and	PROBLEM TO BE SOLVE	<u>Open</u>		2035-03-30													
23 74	52	US2013	S 10 15.0	2011-09-13	Fluid feed pum	A fluid feed pump is c	<u>Open</u>		2016-12-09					Х								
24 74	52	EP25		2011-09-13	Fluid feed pum	A fluid feed pump is c	<u>Open</u>		2032-09-10					Х								
25 74	52	CN102		2011-09-13	Water supply p	The invention provide	<u>Open</u>		2032-09-10					X								
26 74	52	JP2013		2011-09-13	Th	PROBLEM TO BE SOLVE	<u>Open</u>		2032-03-13					Х								
27 74	51	CN106		2016-05-24	Laser shock pur	The invention disclos	<u>Open</u>		2036-05-24													
28 74	50	US2016		2015-05-02	Microfluidic pu	A microfluidic pump c	<u>Open</u>	(2035-12-14													
29 74	47	CN106	a set and and a set of	2016-06-08	High-precision	The invention disclos	<u>Open</u>		2036-06-08					Х								
30 74	42	WO201	Contraction of the local division of the loc	2015-04-20	Pump having free	A pump includes a m	<u>Open</u>		2018-10-20													
31 74	42	WO201		2015-04-20	Pump having free	A pump includes a m	<u>Open</u>		2018-10-20													
32 74	38	CN106		2016-08-03	Miniature lique	The invention relates	<u>Open</u>		2036-08-03													
33 74	36	CN105	the first set	2016-05-16	Injection pump	The invention relates	<u>Open</u>		2036-05-16													
34 74	30	IN2013	The second s	2013-09-17	Multiple inlet-	The present invention	Open		2033-09-17													
35 74	26	CN105		2016-06-17	Piezoelectric m	The invention belong	<u>Open</u>		2036-06-17					Х								
36 74	06	CN2055	Contraction in the second	2016-02-05	Exchange MHD	The utility model disc	<u>Open</u>		2026-02-05		Х											X
37 73	91	CN105	Contract of the Party of the	2016-02-03	Micro-injection	The invention disclos	<u>Open</u>		2036-04-11					Х								



ORDER FORM

Pumps for Microfluidic Devices – Patent Landscape Analysis 2017

Ref.:KM17007

SHIP TO	PAYMENT METHODS	
Name (Mr/Ms/Dr/Pr):	Check	
	To pay your invoice using a check, please mail your check to the follow	wing address:
Job Title:	KnowMade S.A.R.L.	
	2405 route des Dolines, BP 65	
Company:	06902 Valbonne Sophia Antipolis	
	FRANCE	
Address:	Money Transfer	
	To pay your invoice using a bank money wire transfer please contact	your bank to complete this process. Here is the information that you will need
City:	to submit the payment:	
	Payee: KnowMade S.A.R.L.	
State:	Bank: Banque populaire St Laurent du Var CAP 3000 - Quartier du	lac- 06700 St Laurent du Var
	IBAN: FR76 1560 7000 6360 6214 5695 126	
Postcode/Zip:	BIC/SWIFT: CCBPFRPPNCE	
	Paypal	
Country:	In order to pay your invoice via PAYPAL, you must first register at ww	w.paypal.com. Then you can send money to the KnowMade S.A.R.L. by entering
	our E-mail address contact@knowmade.fr as the recipient and enteri	ng the invoice amount.
VAT ID Number for EU members:		
	RETURN ORDER BY	
Tel:	E-mail: contact@knowmade.fr	
	Mail: KnowMade S.A.R.L. 2405 route des Dolines, 06902 Sophia Antip	polis, FRANCE
Email:		I hereby accent Knowmade's Terms and Conditions of Sale
		Signature:
Date:	E = 200 − Single user license	Signature.
	For price in dollars, please use the day's exchange rate. For French	
	customer, add 20% for VAT.	
	All reports are delivered electronically in pdf format at payment	
	reception.	
	*Single user license means only one person at the companycan use the report.	
	Please be aware that our publication will be watermarked on each page with the	
	This watermark will also mention that the report sharing is not allowed.	
	μ	

Terms and Conditions of Sales

DEEINITIONS

"Accentance". Action by which the Buyer accepts the terms and conditions of sale in their entirety. It is produce sufficient evidence of such defects done by signing the purchase order which mentions "I hereby accept Knowmade's Terms and Conditions of 2.6 No return of Products shall be accepted without prior information to the Seller, even in case of delayed Sale"

"Buver": Any business user (i.e. any person acting in the course of its business activities, for its business under article 2.5 shall remain at the Buver's risk needs) entering into the following general conditions to the exclusion of consumers acting in their personal intoracte

"Contracting Parties" or "Parties": The Seller on the one hand and the Buyer on the other hand

natents, trademarks, registered models, designs, copyrights, inventions, commercial secrets and know-how, time to time to time. The effective price is deemed to be the one applicable at the time of the order technical information. company or trading names and any other intellectual property rights or similar in any 3.2 Payments due by the Buyer shall be sent by cheque payable to Knowmade, PayPal or by electronic nart of the world. notwithstanding the fact that they have been registered or not and including any pending transfer to the following account: registration of one of the above mentioned rights.

"License": For the reports and databases, 2 different licenses are proposed. The buyer has to choose one BIC or SWIFT code: CCREERPPACE license:

1. One user license: a single individual at the company can use the report.

2. Multi user license: the report can be used by unlimited users within the company. Subsidiaries are not case, the need of down payments will be mentioned on the order. included

"Products": Reports are established in PowerPoint and delivered on a PDE format and the database may include Excel files.

"Seller": Based in Sophia Antipolis (France headquarters). Knowmade is a technology intelligence company specialized in the research and analysis of scientific and technical information. We provide patent are delivered only after reception of the payment. landscapes and scientific state of the art with high added value to businesses and research laboratories. Our 3.4 In the event of termination of the contract, or of misconduct, during the contract, the Seller will have intelligence digests play a key role to define your innovation and development strategy.

1. SCOPE

1.1 The Contracting Parties undertake to observe the following general conditions when agreed by the 4.1 The Buver or any other individual or legal person acting on its behalf, being a business user buying the consequences in their entirety. BUVER and the Seller ANY ADDITIONAL DIFFERENT OR CONFLICTING TERMS AND CONDITIONS IN ANY BF WHOLLY INAPPLICABLE TO ANY SALE MADE HEREUNDER AND SHALL NOT BE BINDING IN ANY WAY ON acts it deduces thereof. THE SELLER

1.2 This agreement becomes valid and enforceable between the Contracting Parties after clear and non- arising from a material breach of this agreement equivocal consent by any duly authorized person representing the Buyer. For these purposes, the Buyer 4.3 In no event shall the Seller be liable for: Knowmade's Terms and Conditions of Sale". This results in acceptance by the Buyer.

1.3 Orders are deemed to be accepted only upon written acceptance and confirmation by the Seller, within 17 days] from the date of order, to be sent either by email or to the Buyer's address. In the absence of any on the website, or in the Products: confirmation in writing, orders shall be deemed to have been accepted.

2. MAILING OF THE PRODUCTS

2.1 Products are sent by email to the Buyer:

- within [1] month from the order for Products already released: or

- within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall progress

2.2 Some weeks prior to the release date the Seller can propose a pre-release discount to the Buyer.

time to compute or compare the data in order to enable the Seller to deliver a high quality Products.

2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in article 3.

Buyer provided that it is informed of the defective formatting within 90 days from the date of the original download or receipt of the Product.

2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the first down payment to the exclusion of any further damages.

sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to saleability and fitness for a particular purpose, with respect to the Products. Although the Seller shall take

delivery. Any Product returned to the Seller without providing prior information to the Seller as required guarantee that any Product will be free from infection.

3. PRICE, INVOICING AND PAYMENT

"Intellectual Pronerty Rights" ("IPR") means any rights held by the Seller in its Products, including any annual subscriptions. They are expressed to be inclusive of all taxes. The prices may be reevaluated from

Banque populaire St Laurent du Var CAP 3000 - Quartier du Jac- 06700 St Laurent du Var

IBAN. · FR76 1560 7000 6360 6214 5695 126

3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a narticular written agreement. If the Buyer fails to nay within this time and fails to contact the Seller, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. Our publications (report, database, tool...)

the right to invoice at the stage in progress, and to take legal action for damages

4. LIABILITIES

Products for its business activities, shall be solely responsible for choosing the Products and for the use and

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or

arising out of the use of or inability to use the Seller's website or the Products, or any information provided may be borne by the Seller, following this decision.

thereof

The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

the liability of the Seller, provided that the Seller ensures the substituted Product is similar to the Product Buyer.

cases where a new event or access to new contradictory information would require for the analyst extra undertakes to replace the defective products as far as the supplies allow and without indemnities or The Seller may, from time to time, update these Terms and Conditions and the Buyer, is deemed to have compensation of any kind for labor costs, delays, loss caused or any other reason. The replacement is accepted the latest version of these terms and conditions, provided they have been communicated to him guaranteed for a maximum of two months starting from the delivery date. Any replacement is excluded for in due time. any event as set out in article 5 below.

2.4 The mailing is operated through electronic means either by email via the sales department. If the 4.7 The deadlines that the Seller is asked to state for the mailing of the Products are given for information 9. GOVERNING LAW AND JURISDICTION Product's electronic delivery format is defective, the Seller undertakes to replace it at no charge to the only and are not guaranteed. If such deadlines are not met, it shall not lead to any damages or cancellation 9.1 Any dispute arising out or linked to these Terms and Conditions or to any contract (orders) entered into information from the Seller. In such case only, the Buyer shall be entitled to ask for a reimbursement of its which shall have exclusive jurisdiction upon such issues.

Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be 4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of and Conditions.

reasonable steps to screen Products for infection of viruses worms. Trojan horses or other codes containing contaminating or destructive properties before making the Products available, the Seller cannot

5 FORCE MAIFURE

The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from 3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labor difficulties, equipment failure, late deliveries by suppliers or other difficulties which are beyond the control. and not the fault of the Seller

6. PROTECTION OF THE SELLER'S IPR

6.1 All the IPR attached to the Products are and remain the property of the Seller and are protected under French and international convright law and conventions

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish the Product, or any To ensure the payments the Seller reserves the right to request down payments from the Buyer. In this part of it to any other party other than employees of its company. The Buyer shall have the right to use the Products solely for its own internal information purposes. In particular, the Buyer shall therefore not use the Product for purposes such as:

- Information storage and retrieval systems:

- Recordings and re-transmittals over any network (including any local area network):

- use in any timesharing, service bureau, bulletin board or similar arrangement or public display:

- Posting any Product to any other online service (including bulletin boards or the Internet): - Licensing leasing selling offering for sale or assigning the Product

6.3 The Buyer shall be solely responsible towards the Seller of all infringements of this obligation, whether this infringement comes from its employees or any person to whom the Buyer has sent the Products and shall personally take care of any related proceedings, and the Buyer shall bear related financial

6.4 The Buyer shall define within its company point of contact for the needs of the contract. This person will OTHER DOCUMENTS ISSUED BY THE BUYER AT ANY TIME ARE HEREBY OBJECTED TO BY THE SELLER, SHALL interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and be the recipient of each new report in PDF format. This person shall also be responsible for respect of the copyrights and will guaranty that the Products are not disseminated out of the company.

7. TERMINATION

7.1 If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall accepts these conditions of sales when signing the purchase order which mentions "I hereby accept a) damages of any kind. including without limitation. incidental or consequential damages (including, but indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer not limited to, damages for loss of profits, business interruption and loss of programs or information) of such delay or cancellation. This may also apply for any other direct or indirect consequential loss that

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may b) any claim attributable to errors, omissions or other inaccuracies in the Product or interpretations send a notification to the other by recorded delivery letter upon which, after a period of thirty (30) days without solving the problem, the non-breaching Party shall be entitled to terminate all the pending orders. without being liable for any compensation.

8. MISCELLANEOUS

4.5 All the Products that the Seller sells may, upon prior notice to the Buyer from time to time be modified. All the provisions of these Terms and Conditions are for the benefit of the Seller itself, but also for its use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in by or substituted with similar Products meeting the needs of the Buyer. This modification shall not lead to licensors, employees and agents. Each of them is entitled to assert and enforce those provisions against the

Any notices under these Terms and Conditions shall be given in writing. They shall be effective upon receipt

of the orders, except for non-acceptable delays exceeding [4] months from the stated deadline, without in application of these Terms and Conditions shall be settled by the French Commercial Courts of Grasse,

9.2 French law shall govern the relation between the Buyer and the Seller, in accordance with these Terms

4.4 All the information contained in the Products has been obtained from sources believed to be reliable.

initially ordered

The Seller shall by no means be responsible for any delay in respect of article 2.2 above, and including in 4.6 In the case where. after inspection, it is acknowledged that the Products contain defects, the Seller by the other Party.