



### User guide for Laboratorio di Ateneo

# **PoliFAB**

Building 30, via G. Colombo 81, 20133 - Milano

## Gas and high pressure

#### General description ¬

,Q3RQ) \$%KJK-SUMXUHX WWP VDQG-VMHDDJDV-QQ-WZ KIFK-VHVH-QI I HU-QAFDDQJRRP +DFLQMHV-DUH-IQMDQBG -\* DV-QQ-WKDYH-EH-Q+DEUFDWG-DQG-IQMDQBG-DFFRUQQJ-VR-WKH-QDZ-DQG-WKH-EH-WWWFKQFD9SUDFWF-W -7KH-QDE-KDV-D-QDUH-QXP EH-URI -WFKQFD9JDV-QQ-HV-FRP SUMXH-G-DU-YDFXXP -DQG-QWRJHQ- -SQDFHG-RQ-WKH-FQ+DQJRRP -Z DQDV Any connection or modification to these parts have to be performed by and discussed with the cleanroom Staff. Special care has to be taken during opening and closing the gas supply. -\$Q0JDV-ERWQH-DUH-SQFH-RXWLG+RI-WKH-FQ+DQJRRP -IQ-WZ R-Q+QFDWG-EXQN-U-JDV-H[FH-SWD-&) -ERWQH-EDFNWG-HRI-6,( -DQG-RWKH-U-VP DQD-ERWQH-Z LWK-QRZ-DP RXQARI-SURGXFW-Connection and modification of the gas lines can only be performed by the Staff.

7KH-JDVHV-SUHVHQWDWBROD) \$%FDQ-EH-GLYIGHG-LQVIR-, -I-DP LOUHV-LQHUW-R[ LGDQW-VIR[ LF-DQG-H[ SORVLYH - 7KH-DDWMU-FRP SUHKHQGV-DP P RQLD-DQG-VLODQH-RQQD -Z KLFK-Z LODEH-G-MFULEHG-LQ-D-VH-SDUDWMG-VHFVLRQ-, EHORZ ---

#### Inert and oxidant gases ¬

, Q-VKIH-I ROORZ LQJ-VIZEOH-Z H-OUWWINTH-SURFHWY-J DWHV-EHORQJ LQJ-VIR-VKIH-I LUWWIZ R-I DP LOUHV-7 KIH-OUWW VSHFLI LHV-VKIH-KDJ DUGV- + -FRQQHFWIG-VIR-IHDFK-J DV -&RP P RQ-VIR-DOOJ DWHV-LV-VKIH-KDJ DUG-7 + -FRQQIDQV J DV DWKLJK SUHWXUH FDQ HJ SORGH LI KIHDWIQJ -

Inert	Hazard H		Oxidant	Hazard H		Hazard H	Hazard description
N <sub>2</sub>	Г		02	-	-		&DQFDXVHRUZRUVHQDIUUH →
He	Г		N <sub>2</sub> O	-	-		2[LGDQA4
Ar	Г	-	7	7	_		&ROMALOVJDVDWKLJK SUHWXUH
CO <sub>2</sub>	Г	-			-		&DQH[SORGHILKHDWHG-
CF₄	Г	-			-		٦
C4F <sub>8</sub>	Г	-			-	1	
CHF <sub>3</sub>	Г	-			-	1	
SF <sub>6</sub>	Г	-			-	1	

 $2[LCDQW-2] + H-12 -DUH-CDQJHURXV-EHFDXVH+FDQ+FDXVH+RU-ZRUVHQ-D+IU+H+M+Q+LQ-DEV+QFH+RI-DLU-7KH+PRW+SRSX(DU+RILLCDQW+LV-XU+O)-RI_\JHQ-EXW+RWHU-RI_\JHQ+FRPSRXQG-DU+DQR-RI_\LCDQW-QIN+112 - H2 -DQG-12 -2 WKH-U-XEWIXQFH-V-DUH-FRQWG-HU-G-RI_\LCDQW-QIN+1) -DQG-&O-DV-E\-G-FRPSRWMRQ-WKH_-FDQ-SURGXFH+RI_\LCDQW-2[\JHQ+V-4Q-SDUW-XQ-DUH-FRQWG-HU-G-RI_\LCDQW-RI_+ H2-CDQJHURXV-DV-WKH+SUREDELGW-RI_+ HU-H2-CDQJHURXV-DV-WKH-SUREDELGW-RI_+ HU-H2-CDQJHURX-H1-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H2-LU-H$ 

LQFUHDVHV-Z LVK-VKH-SHUFHQADJH-RI-R[\JHQ-LQ-VKH-DMP RVSKHUH-7KH-ULVN-EHFRP HV-YHU-KLJK-I RU-FRQFHQADMRQV KLJKHUVKDQ,,Q SUHVHQFH RI D I ODP P DEOH J DV-

- 7KHHODP P DELOWY-UDQJH-Z LCHQV-DV-VKIHHODP P DELOWY-XXSHULRU-ODP LV-LCFUHDV-HV-HJ +RU-P HKKDQH-LVLCFUHDV-HV I URP VR ¬
- ) LUH SURSDJDMRQ VSHHG LQFUHDVHV I RUP HMXDQ LVMLQFUHDVHV I URP P V VIR P V ¬
- 7KH I LUH DFWLYDMRQ HQHUJ\ GHFUHDMHV I RUP HMKDQH LV
  MLP HV ØRZ HU ¬
- 7KH FRP EXWIRQ WIP SHUDWUH IQFUHDWHV IRUP HWXDQH f & ILQR D f &  $\neg$
- 7KH VHO DEWLYDWRQ WHP SHUDWUH GHEUHDVHV ¬

1 HDUO-DOO-VXEWDOFHV-EXUQ-XQQHU-DMP RVSKHUH-RI-SXUH-R[\JHQ-WKHH RUH-LW-SUHM-QFH-LQ-WKH-DP ELHQAFDQ-GUDP DMFDOO-FKDQJH-WKH-SUREDELOW-RI-LIUH-8 VHUV-Z KR-RSHUDWH-X VWPP -Z KLFK-XWOJ H-DQ R[LQDQWIDV KDMH VR FDUH XOO) I ROORZ WKH XVHUP DQXDDDQG LQ SDUNFXODU-

- 6XEWWWWRQ-RI-SXP SV-RU-P HFKDQLFD9SDUW-LV-FRQVIDF-WZ LVK-RIJ LGDQAVZ LVK-RWKHU-RLQV-Z KLFK-DUH-QRWWJWHG I RUWKLV RSHUDWRQ LV I RUELGGHQ-
- ) ROBEZ -VMH-OLP LIVARI -SUHWIXUHDQG-LOX[ -VXJJHWM/G-LRUHDFK-SURFHW -DV-UHSRUM/G-E\ -VMH-P DQXDOX-RUUHFRP P HQQHG E\ WMH FONDQURRP 6VIXII-

\$00 RWW DQ,  $\neg$  P DWHUDO; FDQ, EXLQ,  $\Box$ Q, D, SXU+, R[\JHQ, DWP RVSKHU+, DQG, WHUH RU+, WH+, R[\JHQ, FRCFHQWDMRQ,FDQ,FKDQ]H+WH+F0DWLLFDMRQ,R| $\neg$ D,P DWHUDO; LVP  $\neg$ QRQ | 00P P DE0HVR+| 00P P DE0H  $\neg$  +XP DQ+ERQHV-EXLQ+LDS(GO)+Q-SXU+R[\JHQ -8 V+UV+WDWZ RUNZ LWK-R[\LCDQWP XWH R008Z -WH+VD) HW¬ UXOHV-R| $\rightarrow$ HM+U| $\rightarrow$ P DFKLQ++DQG+FDU+| X0O)+| R008Z  $\rightarrow$ WH+SU+WXU+DQG+| QX[ $\rightarrow$ QQ| $\rightarrow$ UV+U+SRUWG+LQ-WK+P| DFKLQ++P DQXDQ)  $\neg$  2 QQ0  $\rightarrow$ WH+6V01| $\rightarrow$ FDQ+SHU RUP  $\neg$ KDLGZ DU++P RQLLFDMRQ $\rightarrow$ WDNQJ $\rightarrow$ FDU++R| $\rightarrow$ WK++WFKQLFDO; U+TXLU+P HQW+R| $\rightarrow$ WK+X|WHP V+DQG+R| $\rightarrow$ WH+VD| HW+U+DDWHG+WK+XV+R| $\rightarrow$ R| LQDQW+H J  $\rightarrow$ YDFXXP  $\rightarrow$ SXP SV+RSHLDWHG Z LWK ) 2 0 % , 1  $\rightarrow$  $\neg$ 

#### Toxic and explosive gases -

,Q3RO) \$%-\$PPRQLD-1+ -DQG6LODQH-6L+ -DUHXVHG-DV-SUHFXUXRUJDMHARUMKH&KHPLFDG9DSRU-1HSRVMRQ-&9' -WWMP -ORFDWKG-DWWKH7KLQ) LOPV-RSHLDWRUMGH-DUHD-DQG-DWWKH\* UH, -&RULLQRU-PDFKLQH-WGH --WHQJ-WKRVH-JDWHV-H WHPHO-GDQJHURXV-DPPRQD-LV-PDLQO-WR LF-DQG-WDDQHLV-H SORVYH -WKH-ODE-LV-HTXLSSHG-Z LWK-WHQXUV-HRUHDFK-JDV-WKDWDUH-FRQWRODG-EV-D-GHQLFDWG-FRQWRO-XQLW-All users must know the access procedure and how to behave in case of emergency, even if their activity is not related to the CVD system. Each user also has to know the danger connected to those gases and the first aid measures explained in this document. In the following table we show the hazards for each of the two gases.

Gas	Hazard H	Hazard description
Ammonia	_	)ODPPDE OH JDV
$(NH_3)$	7	&RQWDLQV JDV DW KLJK SUHVV*UH
	٦	7R[LF E\ LQKDODWLRQ
	٦	&DXVHV VHYHUH EXUQV WR VNLQ
	٦	9HU\ WR[LF WR¬DTXDWLF OL
	(8+ ¬	¬&RUURVLYH WR WKH UHVSLUD
	٦	7
Silane	7	([WUHPHO\ IOD PAPDEOH JDV
(SiH <sub>4</sub> )	7	&RQWDLQV JDV DW KLJK SUHVV*UH

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: H-WWHW-WADADP P RQLD-LY-H, WHP HO-WR, LF-DQG-FDQ-FDXVH -LI-LQKDOHG -VHURXV-6XOP RQDU +HGHP D -\$P P RQLD-LY-DOR-100P P DEOH - DOWRXJK-Z LWK-D-VP DOOHOOP P DELOW-UHJLRQ -KRZ HYHU-6L00QH-LY-H, WHP HO 100P P DEOH Z KLOHUW QRWFRQWGHUHG DV WR, LF -

,Q-RUCHU-WR+IQXUH-WKH-XVHU-VDIHW -JDV-VHQVRUV- -IRU-HDFK-JDV-DUH-LQWDODG-FORVH-VR-WKH-&9' -P DFKLQH-DQG-D-JDV-FRQWDG-XQLV-WL-ORFDWG-LUK-WEHIRU-HWKH-FO-DQURRP -HQWDQFH -RXWLQH-RI-WKH-ILUW-DUU-DRFN -6HQVRUV-DQG-FRQWDG-XQLV-DUH-HTXLSSHG-ZLWK-DQ-DFRXWLF-DQG-YLXDO-DDDUP -ZKLFK-VKRZ V-WKH-WDWXV-RI-WKH-XWWP -9/HIRU-H-QWULQJ-VKH-FO-DQURRP -XV-HU-VKDYH-VR-FKH-FN-WKH-WDWXV-RI-WKH FRQWROXQLV-

OPERATIVE INSTRUCTIONS: -XVHUV-DUH-UHTXHWMG-VR-FKHFN-VKH-WMDMXV-RI-VKH-WMDIILF-QUK-WØRFDM/G-RQ-VRS RI VKH FRQWROXQUV, WFDQ-QL\SQD\ GLIHUHQWFRØRUQUKWI UHG \ HØRZ JUHHQ-

RED LIGHT: this light is on only in case of detection of one (or both) gas in ambient and the acoustic alarm is also on. ¬7KH+X WMP ¬Z LOODONR—EORFN+WKH+XSSO—RI ¬RI LODONAJ DVH-V-2 ¬1 2 The clean room access is forbidden and users have to immediately evacuate from the clean room ¬ WKURXJK-WKH+P HUJHQF\ +FI LVHRI -WKH+ODE-DQG-U+DFK-WKH+FROOFFVLRQ-SRLQAH J DWH-VRZ DLGA-MD-3 DVFRQ ¬ ,QFDVH-VKH+P HUJHQF\ +FI LVHRI -WKH+FO+DQLRRP -LV-EORFN-G-RU-VKH+DFFH-W-WKURXJK-LV+QRA-SRW-EOH-LV-WL-V-U+FRP P HQQ-HG-VR-O+DM+-WKH+FO+DQLRRP ¬MD-WKH+LW-WDLU-ORFN -O+DMQJ-LW-VXI R-GRRU-V-RS-HQ-H RU-WKH-RWKH-UX-V-U-V-KH-FROOFFVLRQ-SRLQW-FDQ-WKH-Q-EH-U+DFKH-G-MD-WKH-FRULIGRU-RX-WKL-HRI-WKH-FO+DQLRRP ¬

GREEN LIGHT: QR-LWXH-KDV-EH-IQ-G-M/FW/G-E\-WKH-FRQWROXQLV-DQG-ERWK-ERWWDW-DUHRSHQ-\$FFHW-WR WKH FODQLRRP LV SRWLEOH All gases, including the two dangerous are available.

L-VHUXUNR -USRUNDP R-XQD-VIDEHOOD-LQQFDQMHQGUQFLSLR-QL1XQ LRQDP HQMR-QHONUMMP D-QL-JHMMRQH-QHL-JDV-LQ-EDMH-DOOD-FRORUD LRQH-QH-VHP DI RUL-FRQ-QHVFUJ LRQH-QH-QUUSHMMYR-WIDMR -SRWLELIDMY-QL-DFFHWR -EORFFDJJLR-QHODHURJD LRQH-QL-JDV-H-QHFHWUM-QL-HMDFXD LRQH-QH-QH-QU-XWHQML-SUHM-QML-QDFRUDWRUR -

Light	Status	Access	Blocked gas	Evacuation
RED	* DV OHDNDJIH-	NO	1+ 6L+ 2 12¬	YES
YELLOW	0 DOXQFVIRQ-	YES	1+ 6L+ ¬	NO
GREEN	: RUNQJ-	YES	Г	NO

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#### Emergency ¬

,QFDM+RI-DFFLG+QAGXUQJ-VKI+RSHUDMRQAAKI+XVHUV-KDYH-VRE-EHKDYH-P DLQADIQQJ-VKI+KIJKHWANDIHW-IRU-VKIP VHOYHV-DQG-VKI+RIKHUV-(YHQ-IQ-FDV+RI-DFFLG+QW-Z LVKRXVAFRQAHTXHQFHV-VR-SHRSOH-RU-LQWVXP HQW-XVHUV-KDYH-VR-U+SRU-VDERXVALVANR-VKI+FODQURRP-6VIDII-8 VHUV-DOR-KDYH-VR-NH-S-VKI+6VIDII-QIRUP HG-DERXVANUXDMRQX-VKDW-FDQ-EH-SRWHQMDOO-KDUP IXOII RU-XVHUV-VDIHW-RU-VKDW-DU-HQ-

CLIDIUHHP HQAZ LIKK-KKIHLQWUXFVIRQV-SUHVHQALQVKIH-SUHVHQADQG-LQVKIH-RKKHU-LQWUXFVIRQ-DQG-VDIHW-CRFXP HQW---

,QFDMHRI-GDQJHURXV-JDV-ODDNDJH-WKIH-YUXDODQG-DFRXWIE-DDDUP V-Z LØDEH-RQ-DQG-DØDXVHUV-KDYH-VR-LP P HQDWKO-HYDFXDWH-WKIH-FODQURRP-WKURXJK-WKIH-HP HUJHQF\-H\_I LW-RI-WKIH-ØDE-DQG-UHDFK-WKIH-FRØDFWRQ-SRLQW-JDWH-WRZ DUGV-YID-3DVFRQL--,Q-FDVH-WKIH-HP HUJHQF\-H\_I LW-RI-WKIH-FODQURRP-LV-EØFFN-G-RU-WKIH-DFFH-W-WKURXJK-LW-QR-WSR-WLEOH-LW-LV-HFRPP P HQQ-HG-WR-ODYH-WKIH-FODQURRP--YID-WKIH-ILW-WDLU-ØFN--ODDYLQJ-LW-WZ R-GRRUV-RS-HQ-H RU-WKIH-RWKIH-XV-HUV--7 KIH-FRØDFWRQ-SRLQWFDQ-WKIHQ-EH-UHDFK-HG YID WKIH FRUULGRURXWIGH RI WKIH FODQURRP---

, QFDM+RI +KI-DOMK+P HUJHCF\ -GH LQHG-DV-DQ, -WUXDMRQ-Z KHUHRQHRUP RUHXVHUV-KRZ - HM+Q-VP DOD-KI-DOMK-SUREOP V -UVHLV-QHFH-WDU, -VR-HYDOXDMH-WKH-GDQJHU -2 QQ-DI WHU-D-FDUH XOHYDOXDMRQ-UVHUV-SRWLEOH-WR-SURFH-HG -KI-KOSLQJ -WKH-LQIXKUHG-SHURQ V -\$VWKH-VDP H-WLP H-XVHUV-KDYH-WR-LQI RUP -WKH-6WII -, Q-WKH-FDWHRI -SRWCMDOGCDQJHUH RUFWKH-UX-VHUV -DFWYDWH-WKH-I LUHDOUP -, II-QR-6WII I-SHURQDO-LV-DYDLODEOH-UVHUV-SRWLEOH-WR-FDOO3 RUMQ-HUD-&HQWDOH-RI -3 ROUMFQJFR- -DQG -RQQ-II-DOXR-WKH-UH-QRERQ, -UHSQL-V-FDOO3 -&RQWLCHULQJ -WKH-QDVXUH-RI -WKH-WZ R-GDQJHURXV-JDVH-V-WKH-DFFH-W-WR-WKH-DUHDV-SRWLEO-FRQWIP LQDW/G-E\ -WKHP -LV-SRWLEOH-RQQ-VR-WKH-6WIII-Z HDUIQJ-D-UHEUHDWKHU-+RZ HYHU-HWHU-XVH-U-KDV-WR-NCRZ -DERXV-WWH-HILW-WDIG-P HDVXUH-FRQWIQH-G-LQ-WKH-WKH-WDIHW-GRFXP HQWIMRQ-DWDFKH-G VR WKIV-GRFXP HQW-

,QFDM+RI-I LUH-DFWMDM+WKH-I LUH-DØUP-E\-WKH-GHGLFDWIG-EXWIRQ-DQG-LQI RUP-WKH-6VØI I ¬,I-WKH-I LUH-DØUP-LV-KKH-DUG-LP P HGLDWIQ-OPDM+WKH-Z RUNLQI-SØFH-HMDFXDWH-WKURXJK-WKH-FORV-WWH-P HUJHQF\¬ H\_ LV-HDQG-UHDFK-WKH-FROØFWRQ-SRLQW-,QFDM+WKH-P HUJHQF\-H\_ LV-HQF-WKH-FOBDQURRP-LV-EØFN-HG-RU-WKH-DFFH-W-WKURXJK-LU-WQRW-SRWLEOH-NW-UFRP-P HQQH-G-WR-OPDM+WKH-FOBDQURRP-MD-WKH-I LUW-DLU-ØFN-OPDMQJ LW-VØI R-GRRUV-RSHQI RUWKH-RWKHUXVHUV--

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