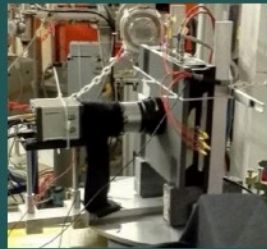


**PHASE 0:
R&D and prototypes**

2015/16
ROMA1

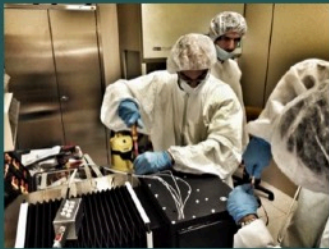
ORANGE



- 1 cm drift

2017/18
LNF

LEMON



- 3D printing
- 20 cm drift

2019/21
LNF/LNGS

LIME

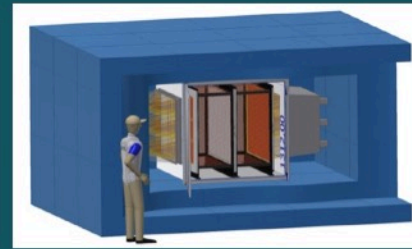


- 50 cm drift
- underground tests
- shielding

**PHASE 1:
1 m³ Demonstrator**

2022/25
LNF/LNGS

CYGNO_01

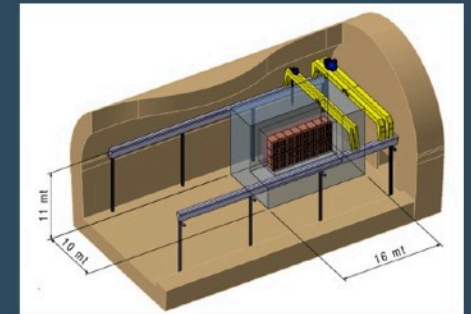


- background
- materials test, gas purification
- scalability

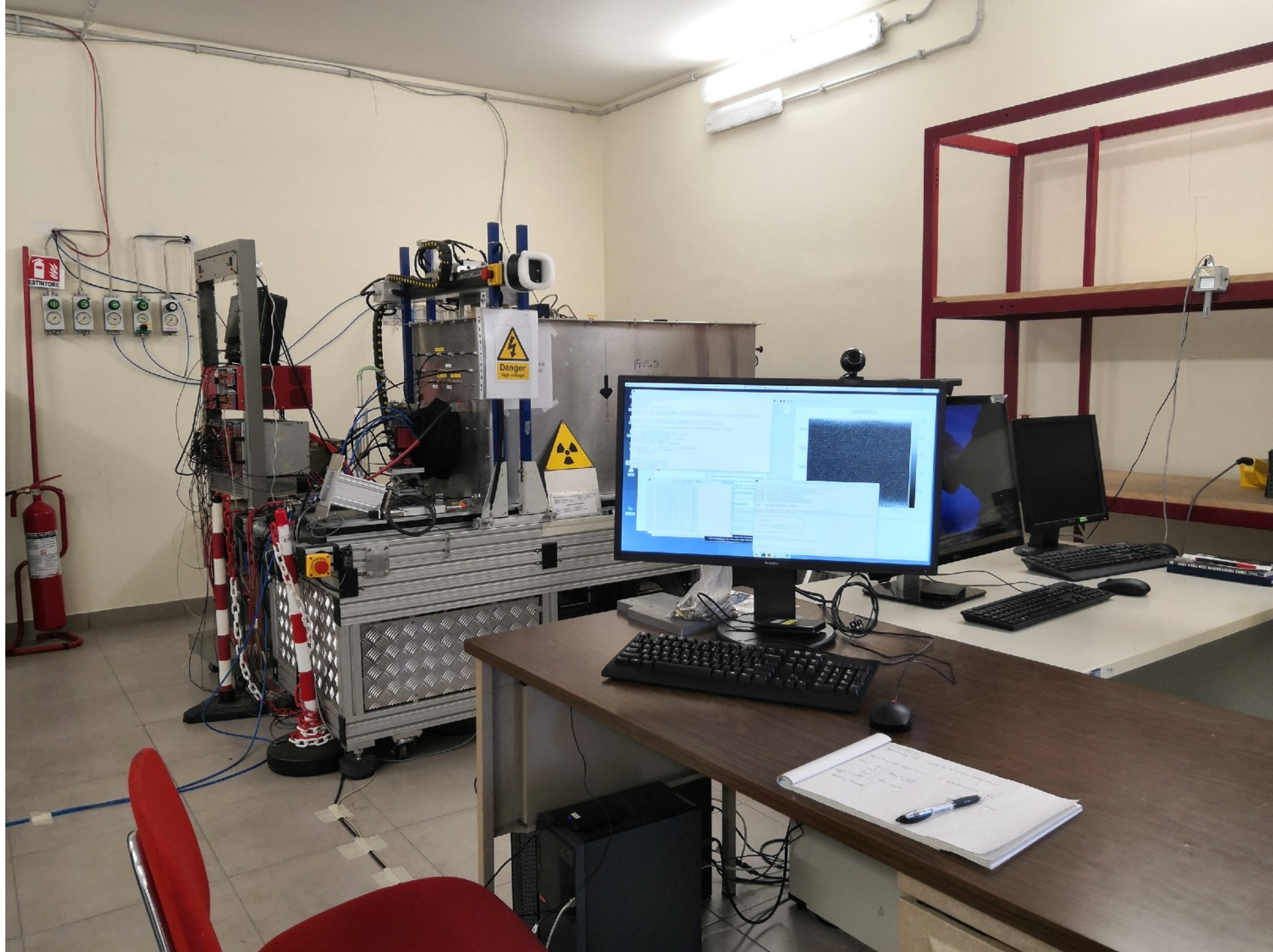
**PHASE 2:
30 m³ Experiment**

2026..
LNGS

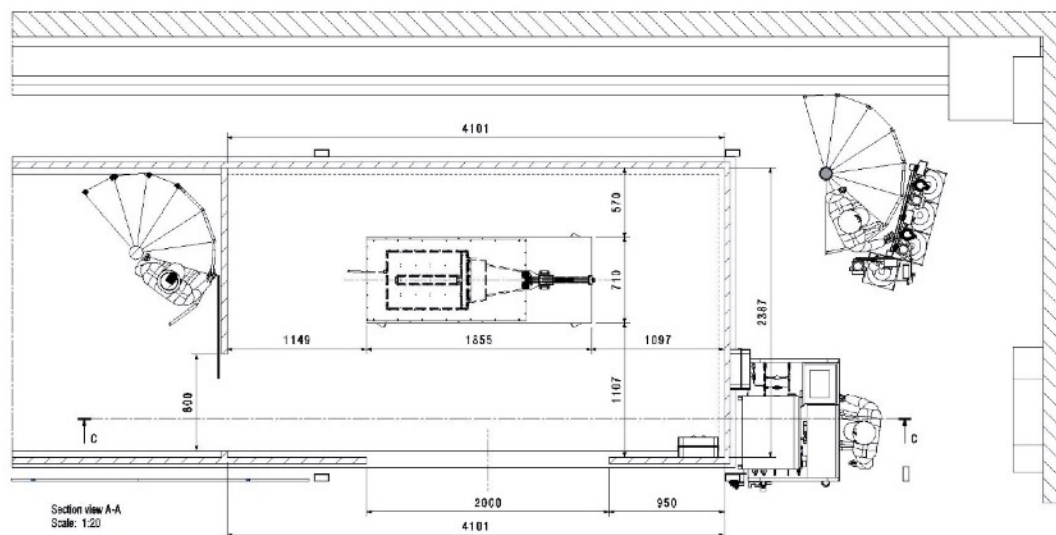
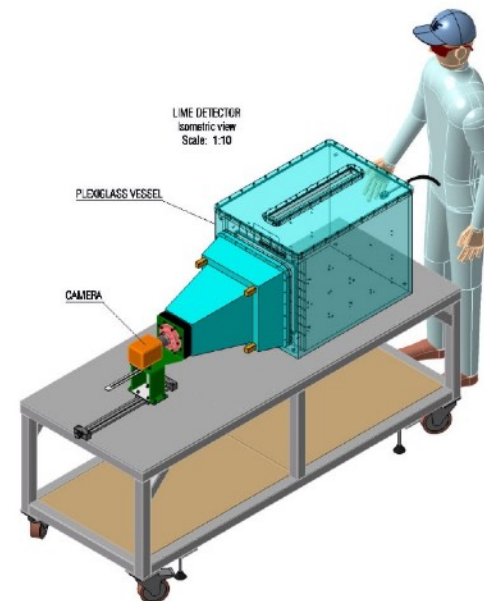
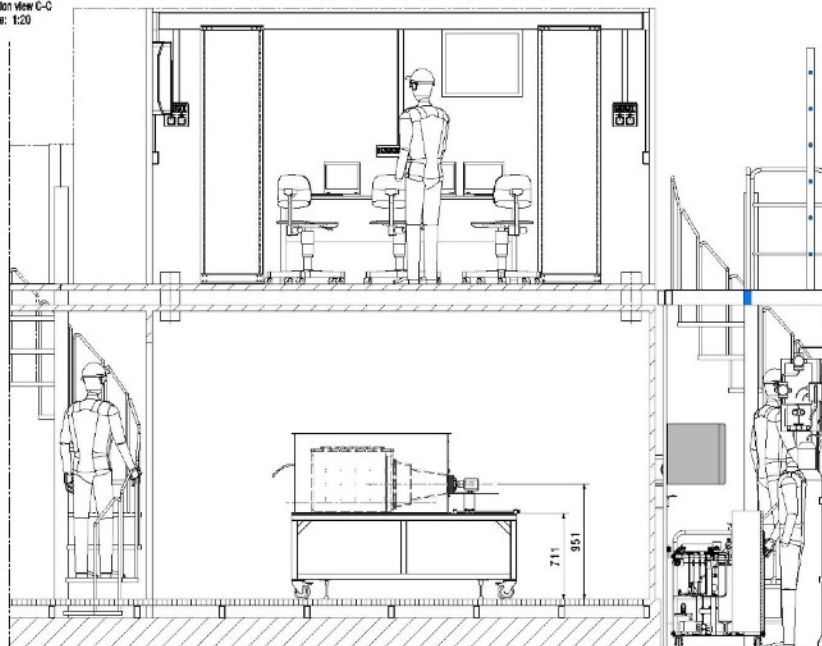
CYGNO_30



- Physics research

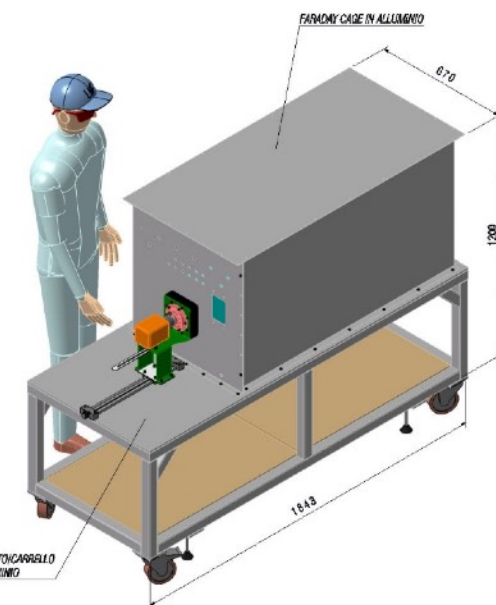


Section view C-C
Scale: 1:20



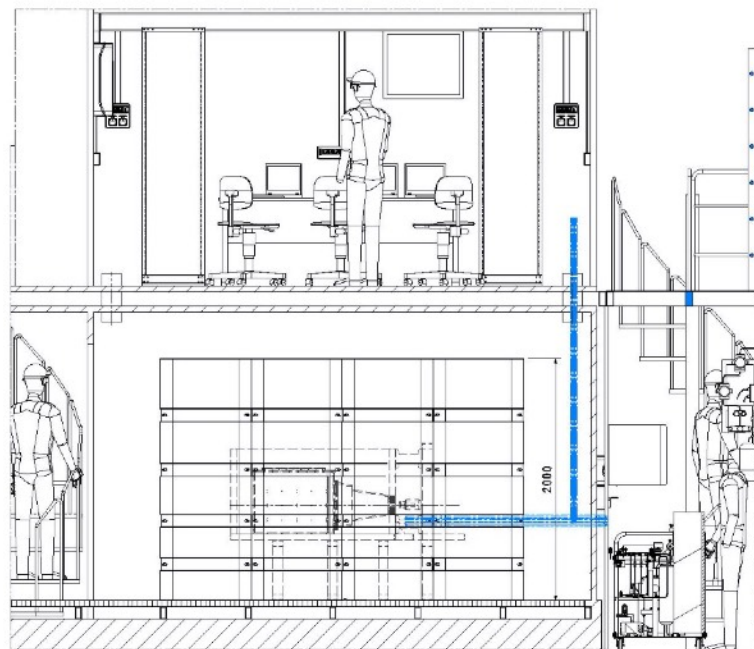
Section view A-A
Scale: 1:20

LIME DETECTOR
WITH FARADAY CAGE
PESO TOT 150 Kg (max)
Isometric view
Scale: 1:10



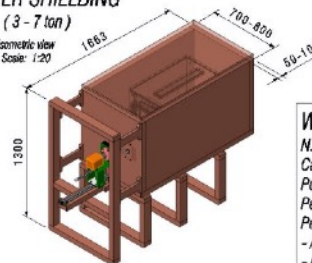
PRELIMINARY

General tolerance ISO 2768-mS-E		Geometrical tolerance ISO 1015-E		Projections ISO 1302	
 NATIONAL INSTITUTE OF NUCLEAR PHYSICS FASCIATI NATIONAL LAB RESEARCH DIVISION - SEM		SIZE A1		DATE: _____	NAME: _____
				DATE: _____	NAME: _____
				DATE: _____	NAME: _____
				DATE: _____	NAME: _____
LIME UNDERGROUND EXP. AREA LIME R&D FIRST SETUP - DETECTOR R&D				SCALE 1:20 SHEET 2/3	DATE 05/02/2021 DESIGNED C. Capocella APPROVED StudioSpazioTechnico



Isometric view
Scale: 1:20

Scale: 1:20



N.12 Serbatol

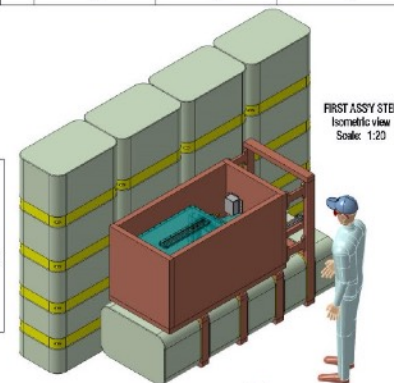
Capacità 750 lt cad
Peso serbatoi vuoti 65 Kg cad
Peso serbatoi pieni 815 Kg cad
Peso totale 10 ton di cui:
- Acqua deminer. = 9 ton
- Polietilene HD = 1.2 ton



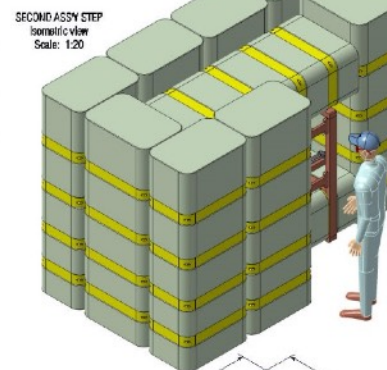
SERBATOIO IN
FOLIE TILUENE
Peso = 65 Kg
Isometric view
Scale: 1:20



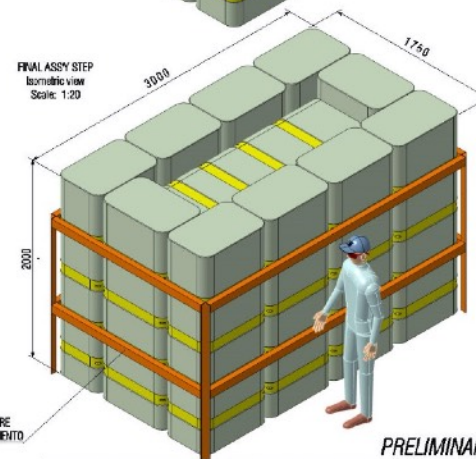
COLLETTI DI
RINFORZO (4X)
POLIETILENE
Peso tot. = 35 Kg
isometric view
Scale: 1:20



FIRST ASSY STEP
Isometric view
Scale: 1:20



SECOND ASSY STEP
Isometric view
Scale: 1:20



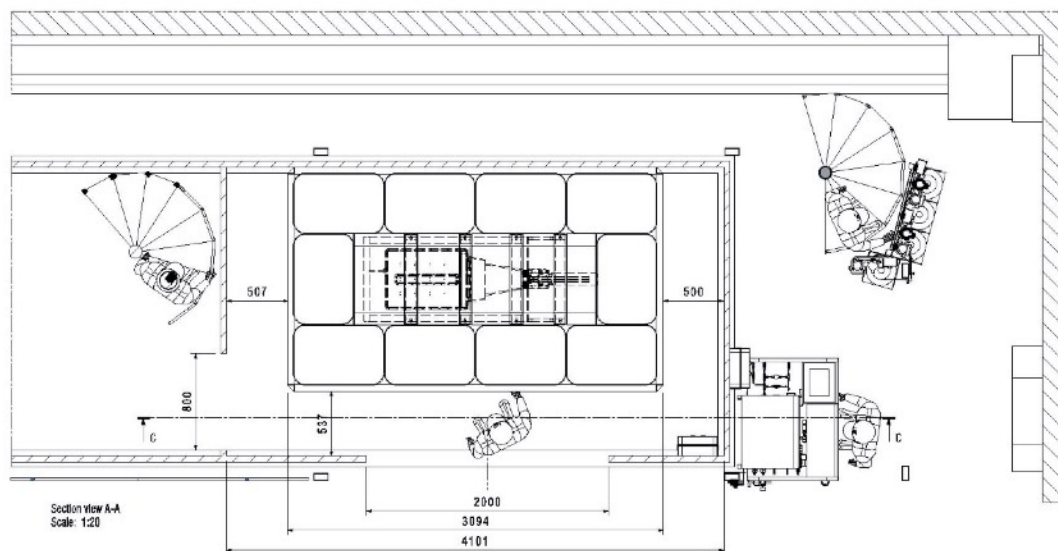
FINAL ASSY STEP
Isometric view
Scale: 1:20

FRAME/COLLARE
ANTIRIBALTAMENTO

PRELIMINARY

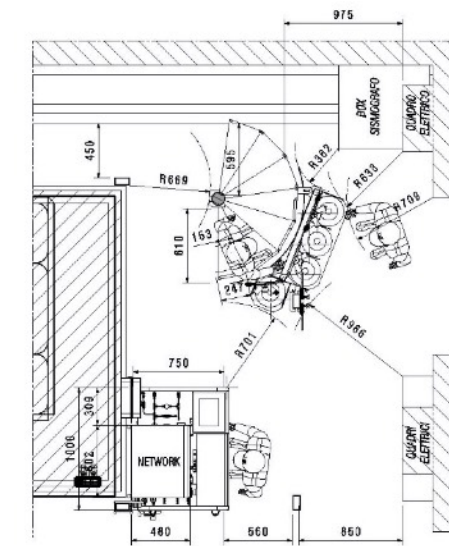
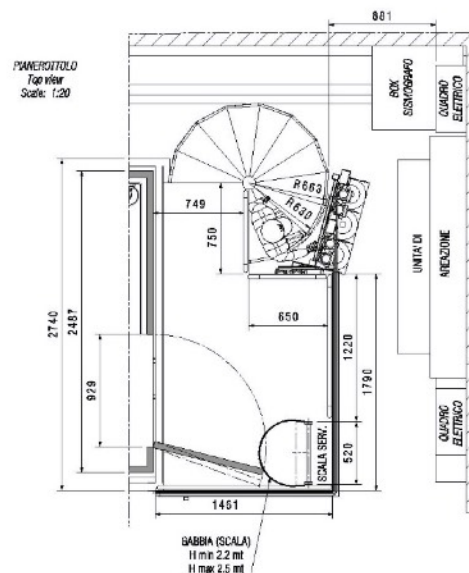
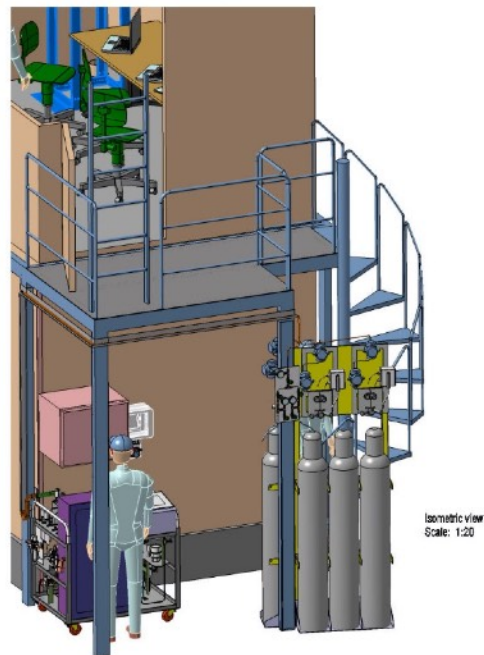
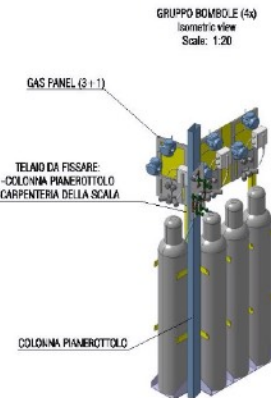
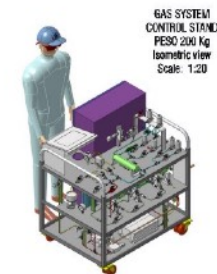
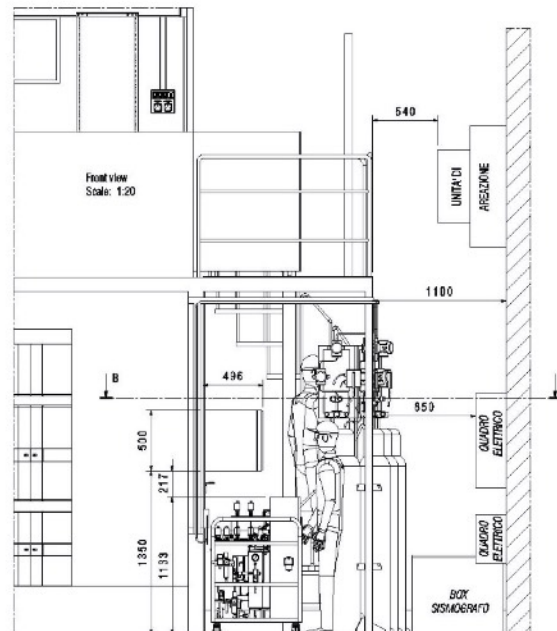
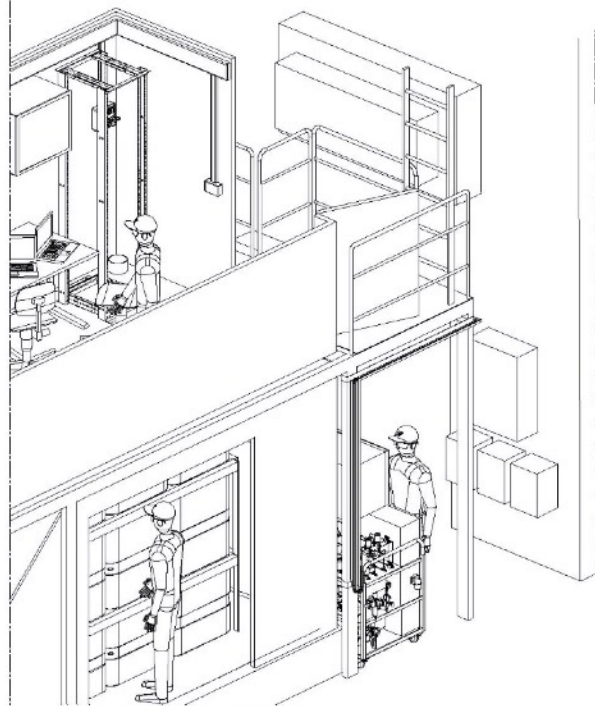
General tolerance ISO 2768-mS-K		Geometrical tolerance ISO 2015-K		Fasteners ISO 1302	
 INFN NATIONAAL INSTITUUT FÜR KERNFYSICA FUSION NATIONAAL LAB RESEARCH DIVISION - SEM		 SIZE A1 DATE: _____ DATE: _____ DATE: _____ PROJECTION		 PROJECTION DATE: 06/02/2021 DATE: _____ DATE: _____ C. Capocchia CHIEF	
LIME UNDERGROUND EXP. AREA LIME R&D SECOND SETUP - SHIELDING R&D					
				StudioSpazioTechnico	

StudioSpazioTecnico



Section view A-A
Scale: 1:20

Section view
Scale: 1:20



LIVELLO PAVIMENTO
CON BOMBOLE GAS (4x)
Section view B-B[2]
Scale: 1:20

06.05.2021 PRELIMINARY

General tolerance ISO 2768-MK-E		Geometrical tolerance ISO 1015-E		Fasteners ISO 1382		
 INFN FRASCATI NATIONAL LAB RESEARCH DIVISION - SEM		 SCALE A1  PROFESION	DATE:	NAME:		
			DATE:	NAME:		
			05/02/2021		DATE:	NAME:
			1:20		DATE:	NAME:
			1/3		DATE:	NAME:
			StudioSpazioTechnico			

GAS SYSTEM - CONTROL UNIT

GAS CONTROL STAND:

- GAS MIXING
- FLUSHING CONTROL
- PRESSURE REGULATION
- EXHAUST GAS PUMPING
-



RITORNO DETECTOR (HV 412)

MANDATA DETECTOR (HV 411)

CONNESSIONI (SEPARATE)
PULIZIA DEI FILTRI (VACUUM PUMP)

RITORNI (SEPARATI)
PER I DUE FILTRI (FV 403-404)

ALIMENTAZIONI (SEPARATE)
PER I DUE FILTRI (FV 401-402)

GAS DALLE BOMBOLE (FV 101-201-301)

CONNESSIONI (?)

GAS-MIX RITORNO DAL DETECTOR (HV 414)

GAS-MIX DAL MISCELATORE (HV 415)

GAS-MIX SCARICO (HV 413)
(BOMBOLE RECUPERO)

CONTROL UNIT
Peso = 200 Kg
Isometric view
Scale: 1:10

GAS-MIX POMPA RICIRCOLO (G 401)

GAS-MIX (SCARICO) BOOSTER (G 402)

PRELIMINARY

General tolerance ISO 2768-mK-E

Geometrical tolerance ISO 8015-E

Roughness ISO 1302



NATIONAL INSTITUTE FOR NUCLEAR PHYSICS
FRASCATI NATIONAL LAB
RESEARCH DIVISION - SEM



SIZE A3
PROJECTION

REVISION
DATE: .
DATE: .
DATE: .

NAME: .
NAME: .
NAME: .

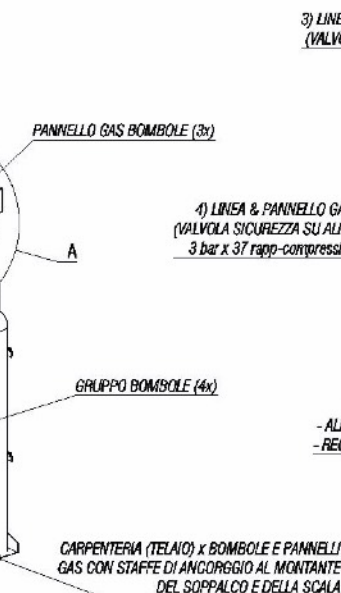
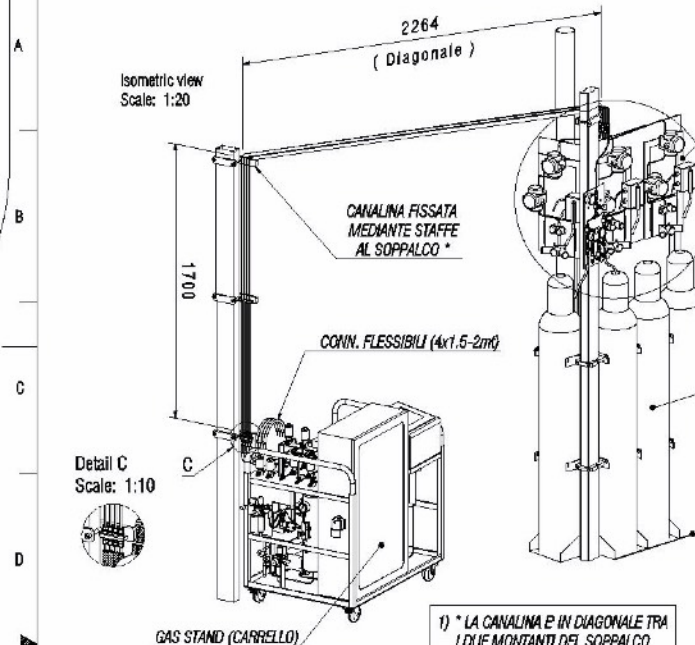
TOTAL WEIGHT (Kg)
200 Kg
SCALE
1:10
SHEET
2/2

DATE
05/02/2021

DRAWN
C.Capoccia
CHECKED
APPROVED

CYGN0 EXPERIMENT
GAS SYSTEM
GAS CONTROL UNIT

INFN GAS CYGN0 LAYOUT



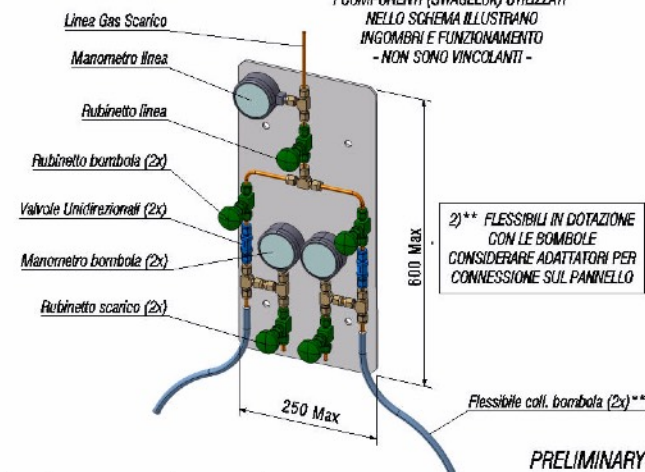
**POSIZIONAMENTO
PANNELLO GAS SCARICO**
Detail A

Note: LO SPAZIO DISPONIBILE E'
COMPLETAMENTE OCCUPATO DAI TRE
PANNELLI-GAS DELLE BOMBOLE DI
ALIMENTAZIONE, QUINDI IL PANNELLO
DEL GAS DI SCARICO DEVE AVERE
DIMENSIONI RIDOTTE.
DI CONSEGUENZA ANCHE I COMPONENTI
DELLA STRUMENTAZIONE DEVONO
ESSERE LIMITATI ALL'INDISPENSABILE E
DI DIMENSIONI CONTENUTE

N.B. TUTTE LE CONNESSIONI SUL GAS-STAND
E SUI PANNELLI-GAS DELLE BOMBOLE SONO
PER TUBI METRICI 6/4 mm CON OGNA DOPPIO
CONO (SWAGelok O COMPATIBILE)

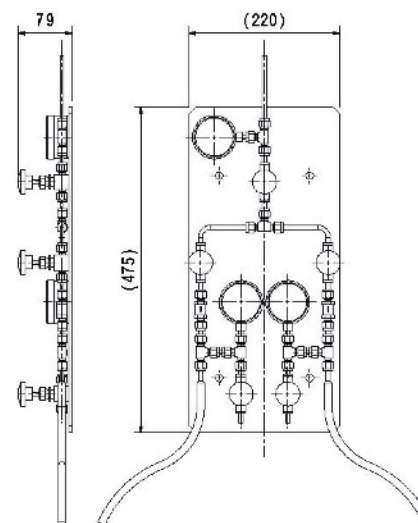
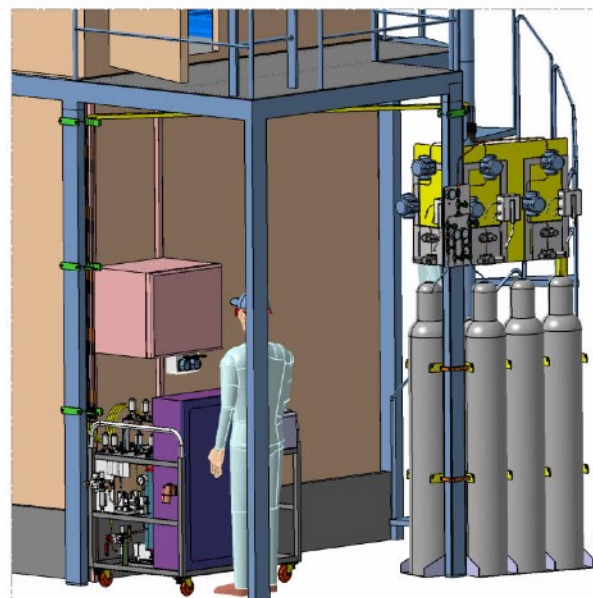
PANNELLO GAS SCARICO

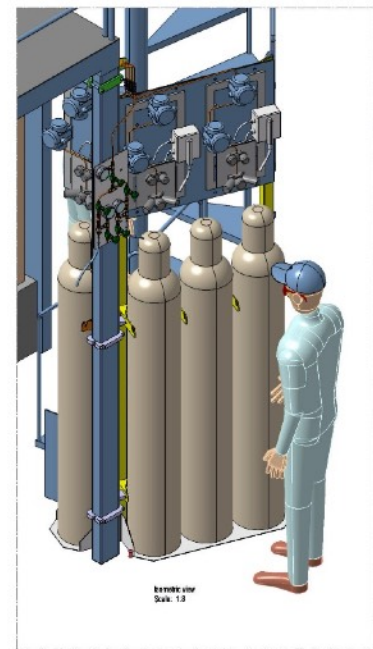
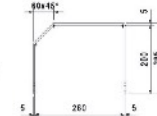
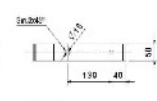
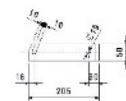
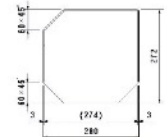
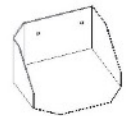
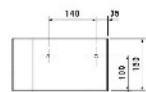
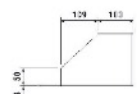
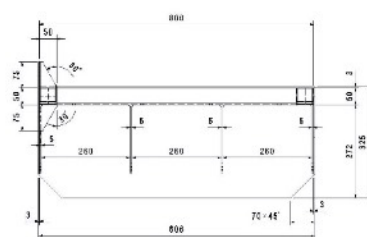
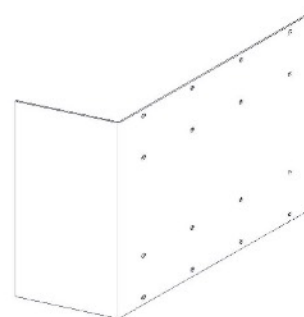
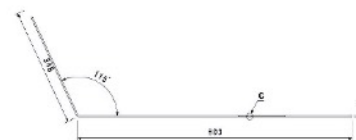
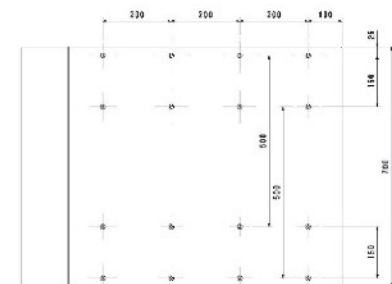
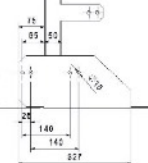
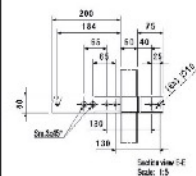
I COMPONENTI (SWAGelok) UTILIZZATI
NELLO SCHEMA ILLUSTRANO
INGOMBRI E FUNZIONAMENTO
- NON SONO VINCOLANTI -

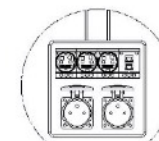
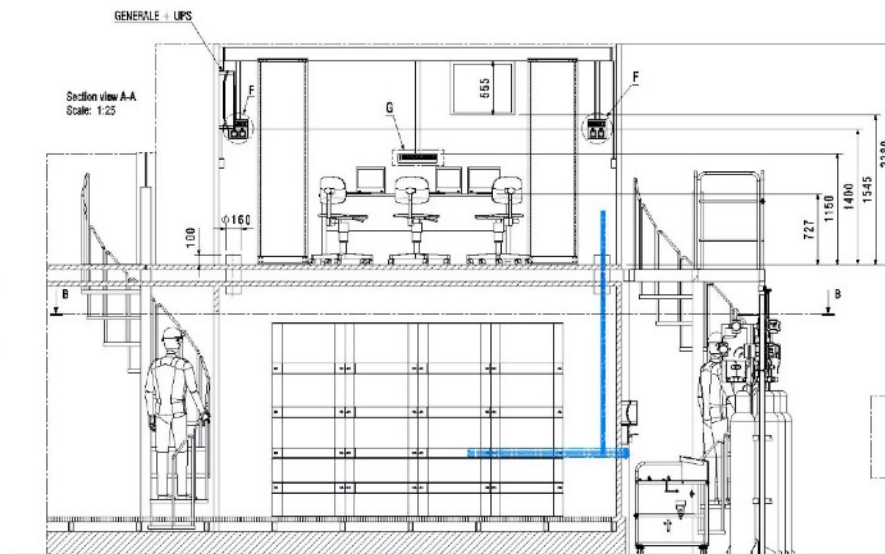


PRELIMINARY

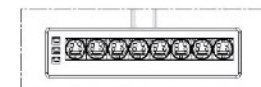
PART.N	DRAWING	MATERIAL	DENOMINATION		WEIGHT	Q.TY
General tolerance ISO 2768-mK-E			Geometrical tolerance ISO 8015-E		Roughness ISO 1302	
 NATIONAL INSTITUTE FOR NUCLEAR PHYSICS FRASCATI NATIONAL LAB RESEARCH DIVISION - SEM			SIZE A2  PROJECTION	REVISION		
				DATE: _____		NAME: _____
				DATE: _____		NAME: _____
				DATE: _____		NAME: _____
				DATE: _____		NAME: _____
CYGNO EXPERIMENT GAS SETUP COLLEGAMENTO BOMBOLE - GAS STAND			 PROJECTION	DATE: 14/05/2021		DESIGN C.Capocaccia
				SCALE 1:25		CHECKED
				SHEET 1/2		DATE: _____
				DATE: _____		APPROVED
				DATE: _____		APPROVED



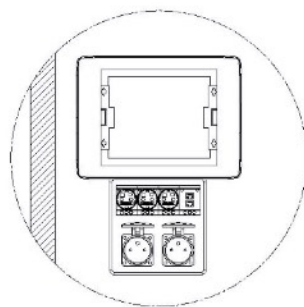
[illegible]



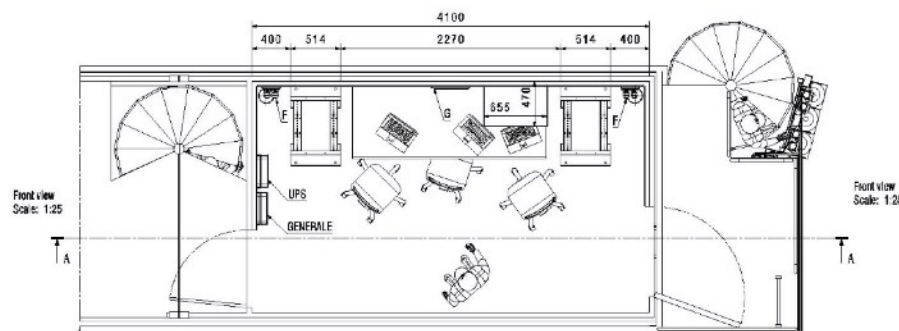
QUADRO PER RACK (2x)
Detail F
Scale: 1:5



QUADRO PER
SCRIVANIE
Detail G
Scale: 1:5

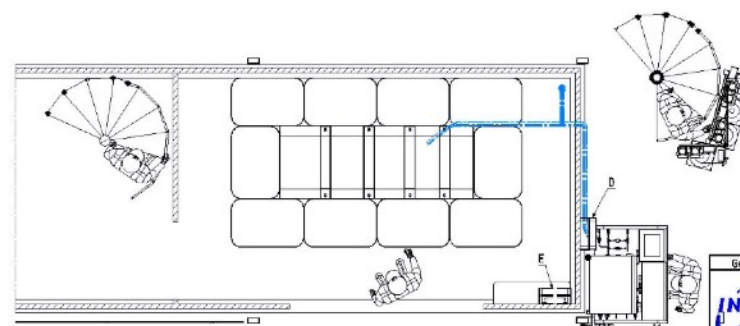


QUADRO PIANO TERRA
E SERVIZI ESTERNI
Detail E-D
Scale: 1:5



Front view
Scale: 1:25

Front view
Scale: 1:2



Section view B-B
Scale: 1:25

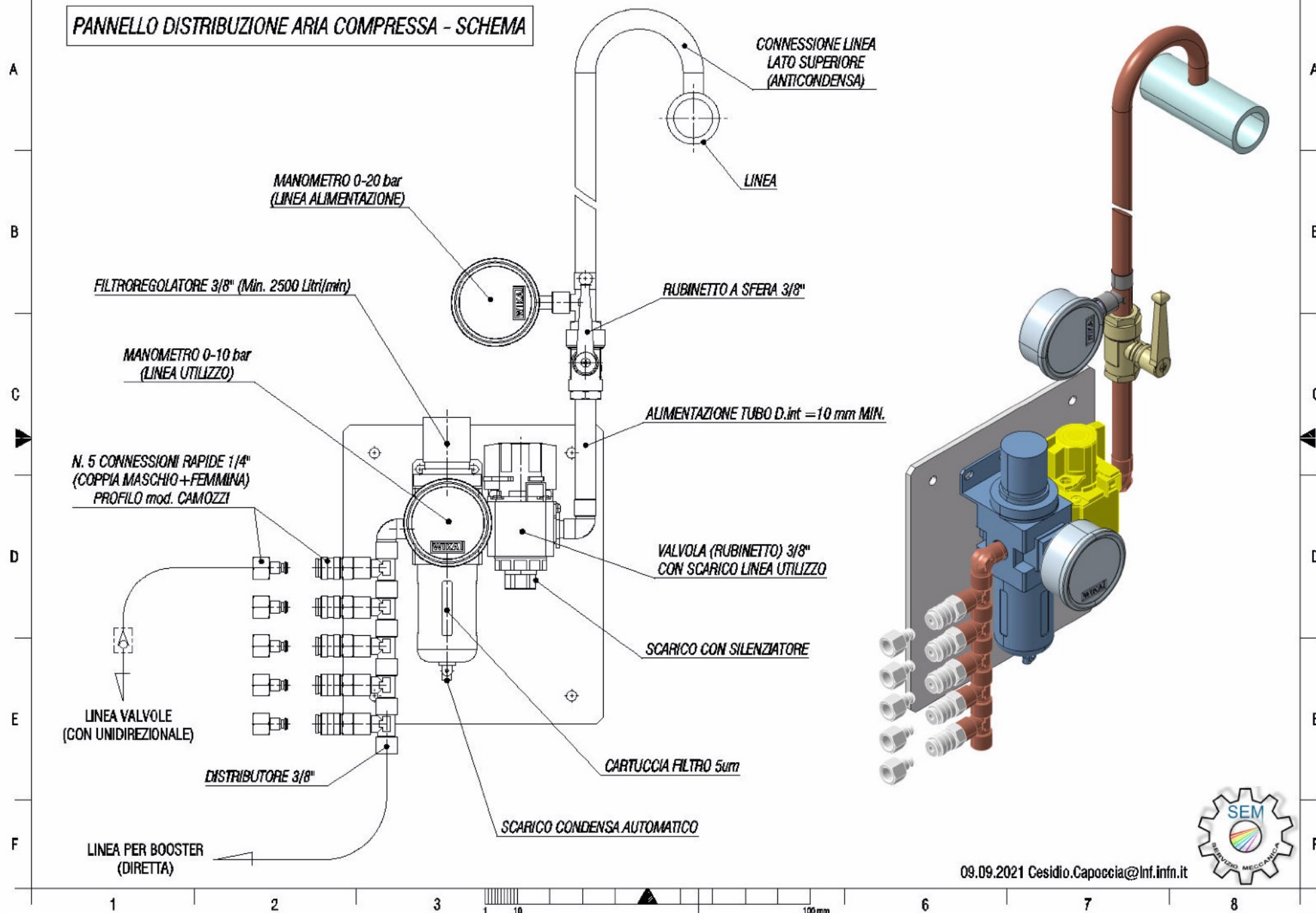


CONTROL ROOM

PRELIMINARY

General tolerance ISO 2708-mk-E		Geometrical tolerance ISO 8015-E		Finish ISO 1301	
 ITALIAN NATIONAL OVERSEAS OFFICES PRASANT NATIONAL LAB RESEARCH DIVISION - SEM	SIZE	A1	DATE	NAME	NAME
	 TOLERANCE SCALE DATE NAME	DATE	NAME	NAME	
		DATE	NAME	NAME	
		DATE	NAME	NAME	
CYGNO EXPERIMENT EXPERIMENT AREA LAY-OUT DELL'IMPIANTO ELETTRICO - SCHEMA		SCALE 1/25 DATE		C. Capocasa DATE	
		1/1		ANYWHERE	
				IMPIANTO ELETTRICO	

PANNELLO DISTRIBUZIONE ARIA COMPRESSA - SCHEMA



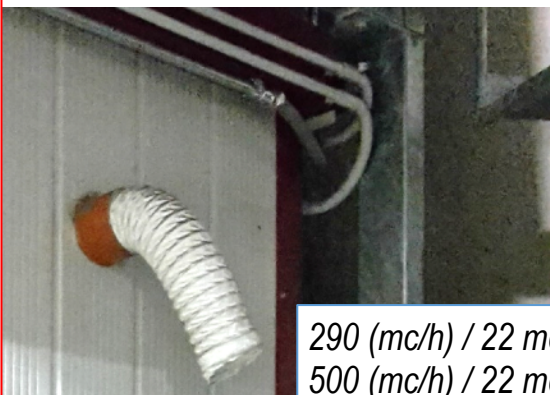
AMBIENTE PULITO NECESSARIO PER APERTURA TPC (GEM Inside)



L'ambiente dove verrà installato LIME ha un volume di 22 mc ed in precedenza era attrezzato per avere un ambiente pulito.

Abbiamo mantenuto, ed integrato, il rivestimento delle pareti e del soffitto con pannelli di polycarbonato e chiesto il ripristino dell'unità di ventilazione dall'esterno con filtro HEPA.

Questo per poter lavorare "al chiuso". Utilizzeremo poi unità di filtrazione portatili per "aggiustare" il grado di pulizia all'interno secondo necessità.



Dettagli tecnici:

- Portata d'aria max. (senza filtro): 750 m³/h
- Portata d'aria max. (Filtro G4): 680 m³/h
- Portata d'aria max. (Filtro G4 & H13): 290 m³/h
- Depressione max.: 720 Pa
- Classe di polvere (secondo DIN EN 60335-2-69): H
- Regolazione variabile della portata d'aria
- Potenza del motore: 120 Watt
- Tensione di connessione: 230 V / 50-60 Hz
- Consumo di corrente: 1,0 A
- Cavo di alimentazione / Collegamento: CEE 7/7 / H05RN-F
- Livello sonoro max. (a 1 m di distanza): 77 dB (A)
- Dimensioni (Largh x lungh x alt): 315 x 430 x 430 mm
- Peso (vuoto/pieno): 6,0 / 7,5 kg
- Mobilità: trasportabile



Purificatore d'aria TAC 750 E - Pacchetto con filtro HEPA

688,08 €

Incluso iva



Purificatore d'aria TAC 1500

1.213,90 €

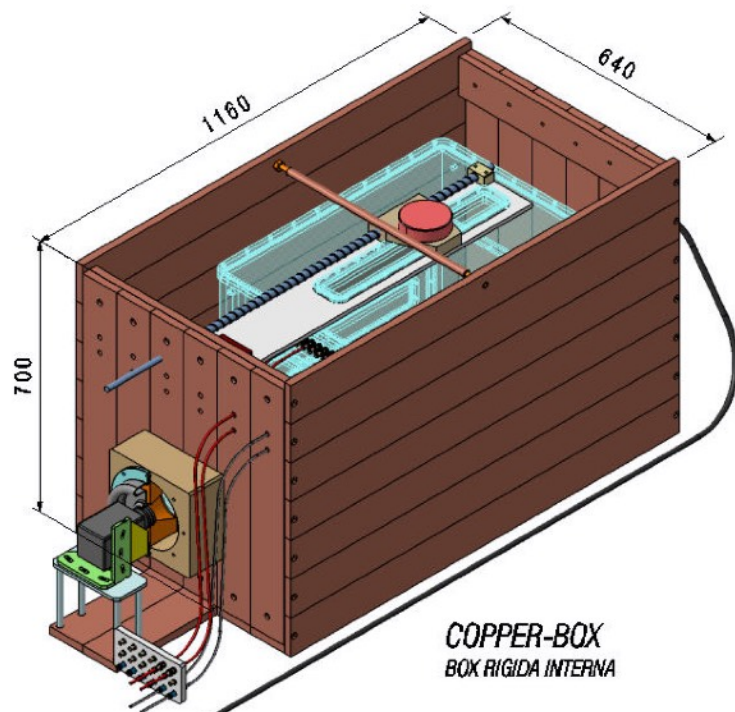
Incluso iva



$290 \text{ (mc/h)} / 22 \text{ mc} = 13 \text{ (ISO 9)}$
 $500 \text{ (mc/h)} / 22 \text{ mc} = 23 \text{ (ISO 8)}$
 ISO 9 -> 1,000,000 (fino a 15 vol/h)
 ISO 8 -> 100,000 (15 – 25 vol/h)
 ISO 7 -> 10,000 (30 – 60 vol/h)

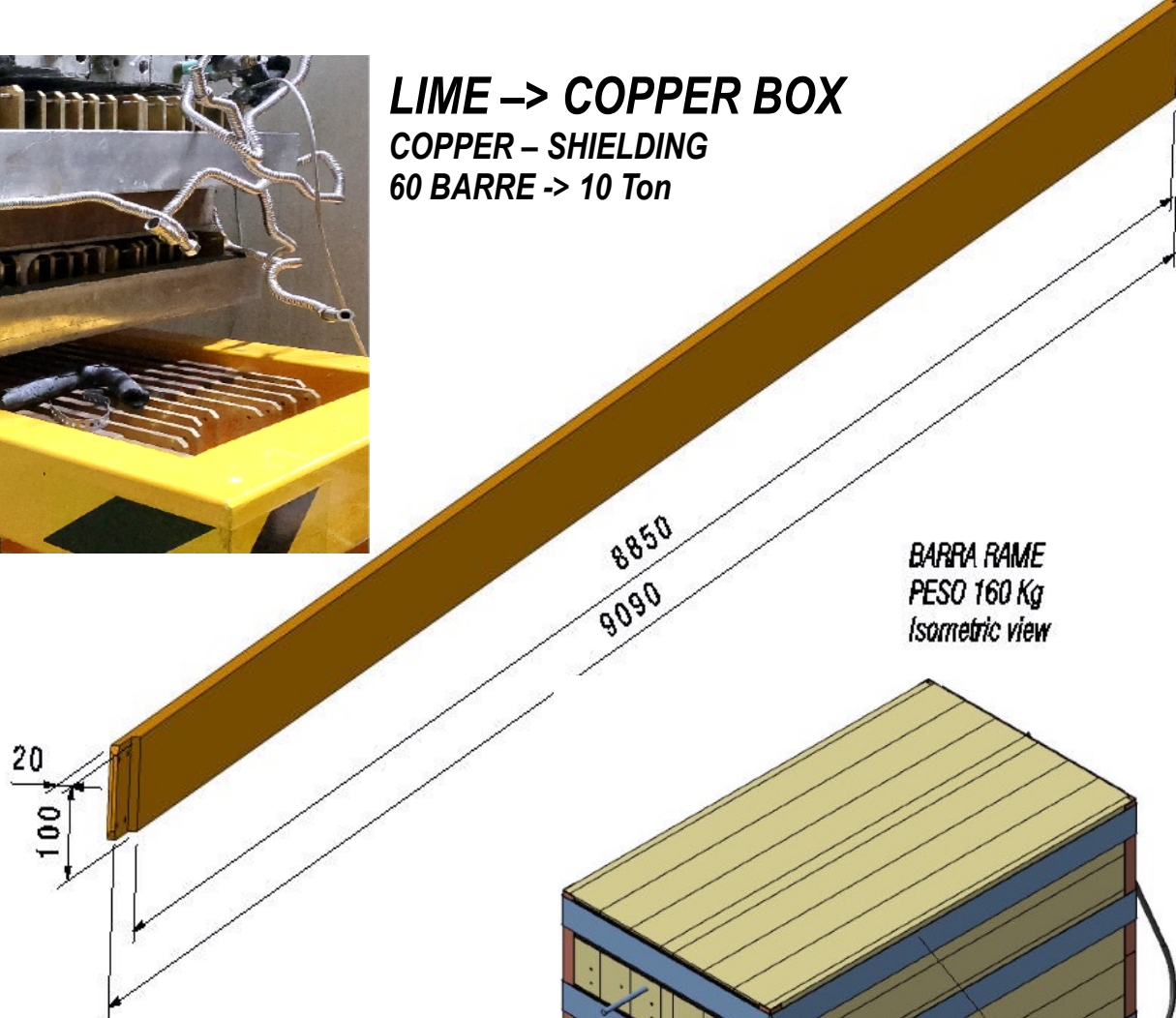


LIME → COPPER BOX
COPPER – SHIELDING
60 BARRE → 10 Ton

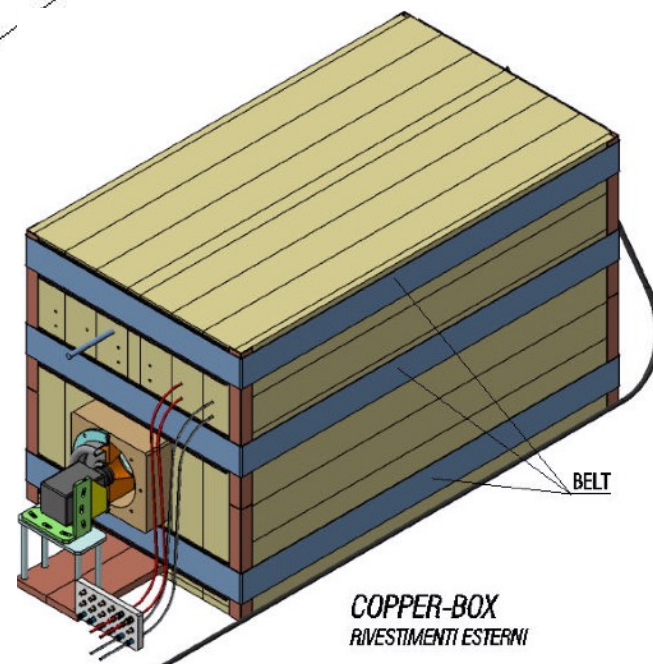


COPPER-BOX
 BOX RIGIDA INTERNA

LAVORAZIONI:
300 TAGLI
250 FORI DI CUI
100 FILETTATI
PULIZIA FINALE

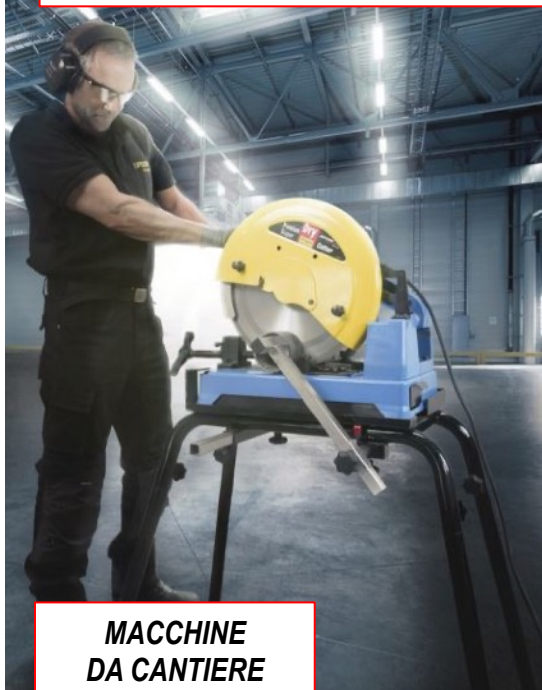


BARRA RAME
PESO 160 Kg
 Isometric view



COPPER-BOX
 RIVESTIMENTI ESTERNI

TAGLIO DELLE BARRE "DRY-CUT"



**MACCHINE
DA CANTIERE
(PORTATILI-PROF.)
DISPONIBILI DA
DIVERSE CASE:
MILWAUKEE,
JEPSON POWER,
MAKITA, etc.**

TRAPANO A COLONNA



**BANCO DI LAVORO ATTREZZATO CON
MORSA PER INTERVENTI DI FILETTATURA,
SBAVATURA, SMUSSI, PULIZIA etc.**



HANDLING E TRASPORTO



SICUREZZE: (POS, PSC, DUVRI ?)



Conclusioni

- LIME e' pronto per essere installato
- Il sistema di gas e' in test nella HdM ma non vediamo problemi per l'installazione finale in galleria, stiamo anche implementando il monitoraggio e gli allarmi.
- La carpenteria per il sistema di distribuzione del gas e' in realizzazione ai LNF e stiamo provvedendo a definire la fornitura per pannello di recupero l'impianto di distribuzione.
- I materiali di rete sono stati definiti e l'ordine e' partito.
- Stiamo cercando definire lo smaltimento del gas: abbiamo già contattato delle ditte in via informale per capire dei costi e discusso con Falcone per includerlo nell'appalto per i rifiuti LNGS
- Si sta definendo il lavoro del taglio delle sbarre di Cu, e' necessario un feedback da parte dei servizi per capire come sia meglio muoverci.
- I Trasporti verranno fatti con il furgone LNF che vorremmo inviare direttamente in galleria coordinandoci con i Servizi per l'installazione