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22335

137p.
tables
graphs
diagrams
illus.

United Nations Industrial Development Organization

Contract 97/106

Phasing out CFC-11 and CFC-12 in the production of domestic refrigerators and replacing them by cyclopentane and HFC-134a

UZINA MECANICA SADU
BUMBESTI JIU
ROMANIA

Final Report
on activities performed
from september 1997 to december 1998
and further assistance
by
Riviera S.r.l.
Varese, Italy

- WORK PLAN AFTER
VISITING THE COUNTERPART

OCTOBER 1997

RIVIERA S.r.l. - Contract 97/106 - U.M. Sadu, Romania

Methodology and concepts for conversion of U.M. Sadu plants to usage of non-Ozone Depleting Substances

Please find herebelow some preliminary information regarding the work plan for the project :

A. Refrigeration System

Working cycle

The usage of R 134a refrigerant does not require major changes regarding working cycle, compared to the usage of R 12. However, some extra care must be applied, especially regarding:

- internal cleanless
- internal humidity/moisture
- vacuum level

It is necessary for all materials to have some protection, in their terminal part.
Also, there is a limit of time within which the components must be fixed on the units, from the moment they are open or remain un-protected :

- filter = 10 minutes
- compressor = 10 minutes
- cyrcuit and related parts = 30 minutes

The working cycle must be done respecting the following :

pre-fixing

- covers and protections must be removed only at the moment of junction or welding operations
- the return tube must be closed with a cover and the capillar must be closed with a cover or by pressing.

IMPORTANT :

- Parts and components for R 134a with 1 or more open terminal parts must be repaired, and inflated with dry air for 5 minutes at 6 bar pressure

NB- terminals to be checked :
hot tube
return tube
capillar

Quality standards

A- Internal cleanless
- dissolvable and flowing residue mg/mq 100
- no residue of : minerals
paraffin
greases
waxes
silicon
all materials non- R 134a compatible
- absence of chlorine

B- Internal humidity/moisture
- residual moisture < 250 parts per million

C- vacuum level
- non-condensable gases < 1%

BAD QUALITY OF THE CHARGE = CAPILLAR OCCLUSION

Riviera S.r.l. - Contract 97/106 - U.M. Sadu, Romania

Methodology and concepts for the conversion of two plants to usage of non-ozone depleting substances

B. Foaming system

Introduction

The use of c-pentane during the production process will require adequate procedures, in addition to some safety instructions
to control the presence of c-pentane in the working ambient.

The more potentially dangerous areas, to be kept under constant check, are :

- the c-pentane storage area
- the foam mixing area
- the injection points on the foaming jigs.

C-pentane can be used only by means of high pressure machines, with self-cleaning mixheads at impingement system.

The advantages of a high pressure system, compared to a low-pressure system are :

- better polyol-isocyanate mixing
- general better cleanliness of the working area
- general better working conditions for the operators in the foaming area

Polyol thermostating

The polyol temperature is of particular relevance to obtain a proper mixing with c-pentane, therefore the system comprises a lts 250 tank, complete with a pneumatic pump for the loading from the drum. This permits the thermostatation with electric resistances and chiller, intervening after a signal from a probe.

Dry section (jigs, moulds and plugs)*

Jigs :
A particular execution is required for foaming jigs.
The heating, both for door and cabinet jig is done by means of water circulation, therefore eliminating resistances.
Jigs are enclosed in separate exhaustion booths,complete with exhausters flow-transducers and catalytic sensors.
Both the exhaustion and monitoring systems are controlled by an electric switchboard.

Moulds and plugs :
The use of C-pentane requires that moulds and plugs are made of alluminium and the temperature must precisely controlled.
Therefore, the cabinet foaming plugs are heated by a heating unit (fan + electric resistances), located outside the exhaustion booth.
The door moulds are, instead, fixed to the jigs' plane that keeps them at proper temperature.

*modification, only

Safety

As already mentioned, this particular aspect will be monitored by TUF later stage and described in a specific way, due to its importance.
However, in the machineries' project and production, all safety standards have been considered, due to the nature of c-pentane, which is potentially dangerous. As described, high-sensitivity sensors assure a complete and accurate check on the whole system, as well as the exhausters guarantee an adequate ventilation and air circulation, in compliance with all existing International Safety Rules.

b. storage precautions and advice

no smoking
no use of free flames
compulsory use of anti-spark fittings
compulsory hearthing of all equipments
compulsory protection against atmospheric discharges
compulsory safety electric systems

store in a fresh and ventilated ambient
protect from direct insulation and heat sources
keep away from above mentioned not-compatible substances

c. leakages

In case of leakages, following instructions should be followed :

circumscribe the area
before taking any action, wear protection outfits
remove any possible source of ignition or spark
to avoid the expansion of the leakage, use proper sand or absorbing powder
spray with waporized water to avoid gas expansion

In case of fire, use :

specific chemical powders
Co2
alchool-resistant foams
spray the containers with water if exposed to the fire.

d. handling

According to situations and circumstances, following outfits must be worn :

Facial mask with filter for organic vapours
sorrounding protection glasses
rubber gloves
anti-static boots.

Riviera s.r.l.

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Partita IVA 02149680122 Capitale Sociale L. 20.000.000 Reg. Soc. 20485 Tribunale di Varese - C.C.I.A.A. 234056

LIST OF CIVIL WORKS TO BE EXECUTED
LAVORI CHE DOVRANNO ESSERE ESEGUITI DA UZINA MECANICA SADU

AREA DI SCHIUMATURA ARMADI E PORTE DEI FRIGORIFERI CON COMPRESSORE

- Rimozione completa delle macchine dosatrici esistenti, del relativo piping e delle teste di miscelazione.
- Realizzazione su indicazione O.M.S. dei vari supporti e sostegni del nuovo piping rigido e flessibile.
- Predisposizione e dimensionamento delle varie utilities (energia elettrica, acqua, azoto, ecc.) nei rispettivi punti di attacco per le varie attrezzature, in accordo al Lay Out impianto.
- Allacciamento del piping di alimentazione dei componenti (POLIISO) dai serbatoi di stoccaggio ai punti d'allacciamento sulla macchina dosatrice.
- Spostamento di tutte le cassette di derivazione elettrica e componentistica varia, dalla zona di schiumatura
- Eventuale rifacimento delle connessioni elettriche con un grado di protezione idoneo.
- Pulizia in generale ed eventuale livellamento della pavimentazione dove richiesto
- Modifica sia sulle maschere di schiumatura che sul prodotto, per adattare il foro di colata al diametro esterno delle nuove teste di miscelazione.

AREA DI STOCCAGGIO PENTANO PER ZONA FRIGORIFERI A COMPRESSORE

- Preparazione della struttura di contenimento e copertura del serbatoio di stoccaggio pentano da 3000 dm^3 secondo indicazione da parte O.M.S.
- Realizzazione e montaggio dei vari supporti di sostegno del piping di trasferimento pentano.
- Montaggio, su indicazione O.M.S., dei piping di trasferimento pentano.
- Predisposizione e dimensionamento delle varie utilities (energia elettrica, azoto, ecc.) nei rispettivi punti di attacco per le varie attrezzature, in accordo al Lay Out impianto.

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AREA DI SCHIUMATURA ARMADI E PORTE DEI FRIGORIFERI AD ASSORBIMENTO

- Rimozione completa della macchina dosatrice esistente, del relativo piping e della testa di miscelazione.
- Realizzazione su indicazione O.M.S. dei vari supporti e sostegni del nuovo piping rigido e flessibile.
- Predisposizione e dimensionamento delle varie utilities (energia elettrica, acqua, azoto, ecc.) nei rispettivi punti di attacco per le varie attrezzature, in accordo al Lay Out impianto.
- Spostamento di tutte le cassette di derivazione elettrica e componentistica varia, dalla zona di schiumatura
- Eventuale rifacimento delle connessioni elettriche con un grado di protezione idoneo.
- Pulizia in generale ed eventuale livellamento della pavimentazione dove richiesto.
- Modifica sia sulle maschere di schiumatura che sul prodotto, per adattare il foro di colata al diametro esterno delle nuove teste di miscelazione.

AREA DI STOCCAGGIO PENTANO PER ZONA FRIGORIFERI AD ASSORBIMENTO

- Preparazione delle fondazioni di contenimento e copertura del serbatoio di stoccaggio pentano da 10.000 dm^3 secondo indicazione da parte O.M.S.
- Realizzazione e montaggio dei vari supporti di sostegno del piping di trasferimento pentano.
- Montaggio, su indicazione O.M.S., del piping di trasferimento pentano.
- Predisposizione e dimensionamento delle varie utilities (energia elettrica, azoto, ecc.) nei rispettivi punti di attacco per le varie attrezzature, in accordo al Lay Out impianto.

- RE-DESIGN AND PROTOTYPING OF REFRIGERATORS AND THERMOSTATS

DEC 1997 TO MAY 1998

- DESIGN AND DRAWINGS OF THE FOAMING LINES

SPRING 1998

Riviera S.r.l.

Contract 97/106
Conversion of Bumbesti Jiu
factory of Uzina Mecanica Sadu
to phase-out the use of CFC-11 and 12
in the production of domestic appliances.

The prototype program for the above-mentioned project has been done a.f. :

1- The first step was the execution of tests and the provision of technical data-sheets on Sadu's models at our premises in Italy.

Advice was given on various points :

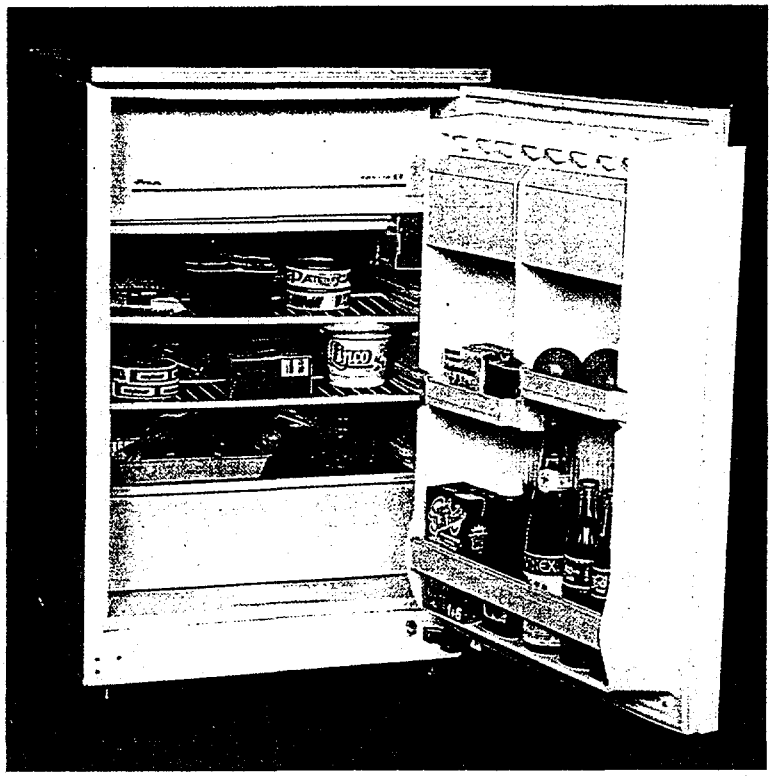
- determination of the charging quantities of fron R 134a, compared to the previous quantities of R 12. Such quantities increased, in their models, in order to achieve good performances.
- advice on the handling of the capillar tubes, due to the high sensitivity of R 134a to moisture. The use of caps and protections was stressed as an essential operation.
- Advice was given on the proper execution and on on the proper assembling, fixing and welding of their units, which was, also, one of the causes of the previous bad performances.
- determination of the injected foam quantities when passing from R 11 to CP as foam blowing agent. The required density of the foam increased from R11 to CP, therefore the quantities of blowing agent had to be increased, in accordance.
- We gave them a list of suppliers of new components (filters, compressors etc...) that had to be changed, and, also, we contacted various suppliers of CP, in order to follow-up the future supplies.

2- The studies and re-design of their thermostats has been done as per enclosed summary reports, for Your files. Please note none of their staff speaks english, therefore we decided to use italian for comunication, which is widly accepted and spoken in Romania.

3- Part of their staff attended the tests and studies as per above points (1) and (2) during their visit to our premises in Italy.

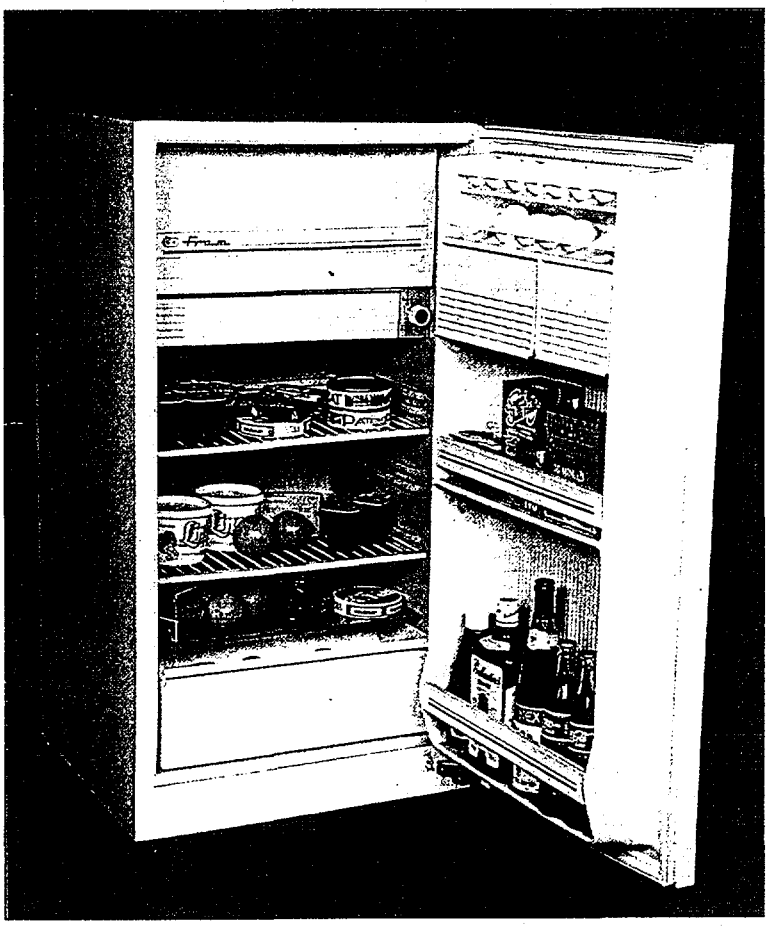
4- All machineries and equipments included in the Project have not only been purchased but are, currently, under shipment.

5- The Project site has been inspected before and after the execution of all civil works carried out by Sadu, following our advice on the implementation of the safety procedures and strategy. All old machineries will be removed and disassembled before the installation and commissioning activities.



CARACTERISTICI TEHNICE
TECHNICAL STANDARD
CARACTÉRISTIQUES TECHNIQUES

Tip Type Type	FRAM 140 L	FRAM 180 L	FRAM 240 L
Capacitate Capacity Capacite	140 l	180 l	240 l
Compartiment congelator Ice box Compartiment congelator	14 l	19 l	19 l
Dimensiuni Dimensions Dimensions	85x55x60 cm	104,3x55x60 cm	132x55x60 cm
Greutate Gross weight Poids totale	41 kg	47 kg	55 kg
Alimentare Voltage Voltage	220 V/50 Hz	220 V/50 Hz	220 V/50 Hz



Observatii

- clasa de temperatura: N (temperat normal)
- termostat de inalta precizie, reglabil, cu dezghet semiautomat

Observations

- temperature class: N (normal temperate)
- adjustable high precision thermostat with semi-automatic defrost

Observations

- la classe de temeperature: N (normal tempéré)
- thermostat réglable de grande precision avec un degivrage semi-automatique

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Institutul de Cercetare şi Proiectare pentru Electrotehnică
Research and Design Institute for Electrical Engineering

LABORATORUL DE ÎNCERCĂRI PENTRU CERTIFICAREA PRODUSELOR ELECTRICE
Testing Department for Electrical Products Certification

AVIZ NR. 545 / 09.08.1996
APPROVAL NO.

PRODUSUL : PRODUCT :	RACITOR ELECTRIC CU MOTOCOMPRESOR FRAM 18o l ood 2118
ÎNCERCAT LA SOLICITAREA : TESTED ON REQUEST OF :	UZINA MECANICA SADU.-
FABRICAT DE : MANUFACTURED BY :	UZINA MECANICA SADU.-
VALORI NOMINALE ŞI CARACTERISTICI PRINCIPALE : RATED VALUES AND MAIN CHARACTERISTICS :	22oV; 12o W; V brut= 18o l clasa N V comp xx = 19 l Clasa de protecţie : I Agent frigorific : R 134 a(85g)
MARCA DE FABRICĂ : TRADE MARK :	F R A M.-
CONCLUZII : CONCLUSIONS :	Produsul este considerat conform STAS 2614/24-88 şi STAS 2614/1-86, în baza rezultatelor din BI 7o5/09.08.96
AVIZUL ESTE VALABIL : APPROVAL IS VALID :	până la 09.08.1997

MANAGER GENERAL
Dr.ing.Nicolae Vasile

ŞEF LABORATOR
DEPARTMENT CHEF
ing.Nicolae Rogoveanu

ÎNTOCMIT DE
DRAWN UP BY
ing. Elena Pleşcan

COMERCIALIZAREA PRODUSELOR CARE NU SUNT IDENTICE CU CEL PENTRU CARE S-A EMIS PREZENTUL AVIZ, SE FACE PE PROPRIA RĂSPUNDERE A BENEFICIARULUI AVIZULUI.

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Institutul de Cercetare şi Proiectare pentru Electrotehnică
Research and Design Institute for Electrical Engineering

LABORATORUL DE ÎNCERCĂRI PENTRU CERTIFICAREA PRODUSELOR ELECTRICE
Testing Department for Electrical Products Certification

AVIZ NR. 546 / 09.08.1996
APPROVAL NO.

PRODUSUL : PRODUCT :	RACITOR ELECTRIC CU MOTOCOMPRESOR FRAM 240 l cod 2124 .-
ÎNCERCAT LA SOLICITAREA : TESTED ON REQUEST OF :	UZINA MECANICA SADU.-
FABRICAT DE : MANUFACTURED BY :	UZINA MECANICA SADU.-
VALORI NOMINALE ŞI CARACTERISTICI PRINCIPALE : RATED VALUES AND MAIN CHARACTERISTICS :	220 V; 150 W; V brut= 240 l clasa N V comp xx = 19 l Clasa de protecţie : I Agent frigorific : R 134a(100g)
MARCA DE FABRICĂ : TRADE MARK :	F R A-M.-
CONCLUZII : CONCLUSIONS :	Produsul este considerat conform STAS 2614/24-88 şi STAS 2614/1-86 în baza rezultatelor din BI 706/09.08 1996 .-
AVIZUL ESTE VALABIL : APPROVAL IS VALID :	până la 09.08.1997 .-

MANAGER GENERAL
Ing. Nicolae Vasile

ŞEF LABORATOR
DEPARTMENT CHEF
ing. Nicolae Rogoveanu

ÎNTOCMIT DE
DRAWN UP BY
ing. Elena Pleşcan

COMERCIALIZAREA PRODUSELOR CARE NU SUNT IDENTICE CU CEL PENTRU CARE S-A EMIS PREZENTUL AVIZ SE FACE PE PROPRIA RĂSPUNDERE A BENEFICIARULUI AVIZULUI.

SPLAIUL UNIRII Nr.313, SECTOR 3, BUCUREŞTI, 74204, ROMÂNIA
TELEX : 10486, FAX : 3213769/3222748, TEL : 3236016

Riviera...

PERFORMANCE TESTS ("EMPTY" Conditions)

NAME OF UNIT FRAM 240 L.

REF. RULES FILE

COMPRESSOR	CONDENSER	CAPILLAR	CHARGE	THERMOSTAT	EVAPORATOR
		8 LT/MIN			

AMBIENT TEMP. °C		+ 32°C ①			+32°C ②		+32°C ③	
THERMOSTAT		10/10	5/10		10/10	5/10		
POSITION		ON / OFF	ON / OFF		ON / OFF	ON / OFF	ON / OFF	ON / OFF
High temp. Refr. °C		- 1.8	+6.1 / +5.9		- 2.3	+4.4 / +4.3	-2.5	
Medium temp. Refr. °C		-1.6	+5.7 / +5.4		- 2.6	+4.5 / +4.5	-1.9	
Low temp. Refr. °C		-1.4	+5.5 / +5.3		-3.1	+4 / +4	-2.9	
Refr. average °C		-1.6	+5.6		-2.6	+4.2	-2.4	
High temp. Freezer °C			-6.4			-8		
Medium temp. Freezer °C								
Low temp. Freezer °C			-7.2			-8.4		
Freezer average °C		-15.5	-6.8		-16.2	-8.2	-15.8	
therm. bumb temp.°C		-24	-9.6 / -10		-24.5	-9.9 / -19.2	-23.0	
Functioning %		100 %	56.5 %		100 %	43.4 %	100 %	
Consumption kwh/24								
Power W								
CURRENT A								

NOTES : NEL PUNTO 3 LE PROVE SI RITENGONO CON CAPILLARE DI CIRCA 4.5 LT/MINUTO

DATE 10 MAG. 1990	REPORT No.	Page	Signature
Request Ref.			

Riviera

PERFORMANCE TESTS ("EMPTY" Conditions)

NAME OF UNIT FRAM 180L.

REF. RULES FILE

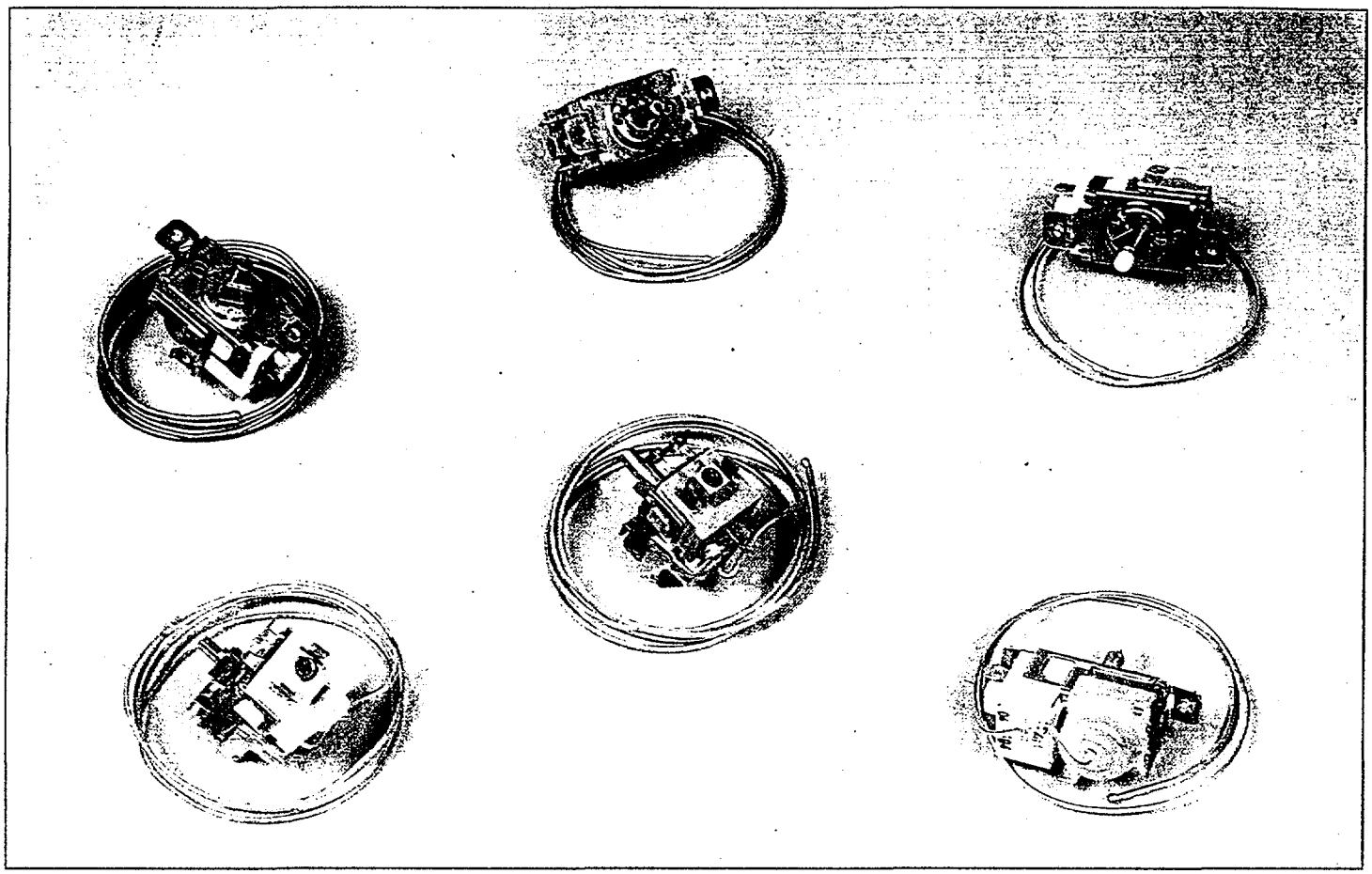
COMPRESSOR	CONDENSER	CAPILLAR	CHARGE	THERMOSTAT	EVAPORATOR
-	-	8LT' / 4.5LT'	GR. 85 R134a	-	19L

AMBIENT TEMP. °C	32°C CAP. 8LT (1)		32°C (2)		32°C (3)	
THERMOSTAT	10/10		10/10		10/10	8/10
POSITION	ON OFF	ON OFF	ON OFF	ON OFF	ON OFF	ON OFF
High temp. Refr. °C	+ 8.4		+ 4.6		+ 1.6	+ 4.2 / + 4
Medium temp. Refr. °C	+ 8.3		+ 4		+ 1.2	+ 3.8 / + 3.8
Low temp. Refr. °C	+ 8		+ 3.7		+ 0.7	+ 3.4 / + 3.2
Refr. average °C	+ 8.2		+ 4.1		+ 1.1	+ 3.7
High temp. Freezer °C						- 15
Medium temp. Freezer °C						
Low temp. Freezer °C						- 12.8
Freezer average °C	- 12.5		- 14.8		17.8	- 13.9
therm. bumb temp.°C	- 20.6		- 20		- 21.9	- 10.9 / - 21.3
Functioning %	100%		100%			75.2
Consumption kwh/24						
Power W						
CURRENT A						

NOTES :

DATE 20 MAGGIO 1998	REPORT No.	Page	Signature
Request Ref.			

Riviera srl	PERFORMANCE TEST ON EMPTY UNIT (I.S.O. 8187)					
	UNIT : Framm 240 liters					
	Ref. rules					
Capillar			Charge			
8 liters/min						
ambient temp.	32	32	32			32
Freezer therm. pos.	as received	continuous	max/max			med/med
Refr. therm. pos.	max	short circuit	max			med
Refr. high temp.	+10.6 +10	+1.9	+6.9 +2.5			+10.7 +10.2
Refr. med. temp.	+9.2 +9	-0.5	+5.3 -0.4			+9.2 +8.8
Refr. low temp.	+8 +7	-4.1	+4.3 -3.5			+7.1 +5.3
Refr. average	**+8.9**	**-0.9**	**+2.5**			**+8.5**
Freezer high temp						
Freezer med temp	-10.7 -13.9	-25.2	-9.3 -24.7			-10.5 -13.4
Freezer low temp						
Freezer average	**-12.3**	**-25.2**	**-17**			**-11.9**
Condensation temperature	+32	+38.8	+38.8			+38
Feedback tube temperature	+30	+32.4	+32.6			+32
Functioning percentage	40.7	100	78			40.4
Suction pressure (kg/sq.cm)	+4.2 -21.2	-24	+4 -23.5			+4.4 -13.5
Notes : Date : 20.05.98						



DOMENIU DE UTILIZARE
USING FIELD
DOMAINE D'UTILISATION

Termoregulatoarele sunt aparate care se utilizeaza la racitoarele electrice, congelatoare orizontale, verticale si instalatii frigorifice, avand rolul de a comanda anclansarea si declansarea automata in limitele temperaturilor de regim stabilite prin caracteristicile tehnice ale produsului.

The thermostat is an apparatus used for electric coolers, refrigerating plants, horizontal and vertical deep freezers, for automatic switching in and releasing at the touch of the temperature established by the technical standard of the product.

Le thermostat est un appareil utilisé pour les réfrigérateurs électriques aux installations frigorifiques, aux congélateurs horizontaux et verticaux, pour l'enclanchement et le déclanchement automatique, a l'atteint des températures établies par les caractéristiques techniques du produit.

CARACTERISTICI TEHNICE
TECHNICAL STANDARD
CARACTÉRISTIQUES TECHNIQUES

Tipul termostatului Type of thermostat Type de thermostat	T3H		T4H			T5H		
Dimensiuni Dimensions Dimensions	66X29,4X54,3 mm		66X29,4X62,8 mm			66X29,4X54,3 mm		
Greutate Net weight Poids net	0,110 kg		0,097 kg			0,095 kg		
Distanta intre gaurile de prindere Distance between catch holes Distance entr les trous d'accrocement	55 mm		55 mm			55 mm		
Lungimea sondei Well length Longueur de la sonde	la cerere on demand sur l'ordre		la cerere on demand sur l'ordre			la cerere on demand sur l'ordre		
Tensiunea de alimentare Nominal voltage Voltage	220 V	250 V	220 V	250 V	127 V	220 V	250 V	127 V
	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
		60 Hz		60 Hz	60 Hz		60 Hz	60 Hz
Curentul nominal Nominal current Courant nominal	2 A	2 A	2 A	2 A	3 A	2 A	2 A	3 A
		4 A		4 A	6 A		4 A	6 A
Mod de dezghetare Mode of thaw Mode de dégelement	manual manual manuel		semiautomat halfautomatic semiautomatique			manual manual manuel		
Domeniu de reglare Adjustable range Domaine réglable	-32^0C - 0^0C		-25^0C - $+5^0$C			-25^0C - 0^0C		
Domeniu de utilizare Useful range Domaine utile	225^0		180^0 sau 225^0 180^0 or 225^0 180^0 ou 225^0			180^0 sau 270^0 180^0 or 270^0 180^0 ou 270^0		

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Institutul de Cercetare şi Proiectare pentru Electrotehnica
Research and Design Institute for Electrical Engineering

LABORATORUL DE ÎNCERCĂRI PENTRU CERTIFICAREA PRODUSELOR ELECTRICE
Testing Department for Electrical Products Certification

AVIZ NR. 539 / 31.07.1996
APPROVAL NO.

PRODUSUL : PRODUCT :	Termoregulator tip T5H2
ÎNCERCAT LA SOLICITAREA : TESTED ON REQUEST OF :	Uzina Mecanică Sadu
FABRICAT DE : MANUFACTURED BY :	Uzina MecanicăSadu
VALORI NOMINALE ŞI CARACTERISTICI PRINCIPALE : RATED VALUES AND MAIN CHARACTERISTICS :	220 Vca, 2 A, clasa I de protecţie împotriva electrocutării
MARCA DE FABRICĂ : TRADE MARK :	FRAM
CONCLUZII : CONCLUSIONS :	Produsul este considerat conform cu STAS 2614/1-86 în baza rezultatelor din BI nr. 691/31.07.96.
AVIZUL ESTE VALABIL : APPROVAL IS VALID :	de la 31.07.96 până la 31.07.97

MANAGER GENERAL
Dr.ing.Nicolae Vasile

ŞEF LABORATOR
DEPARTMENT CHEF
ing.Nicolae Bogoveanu

ÎNTOCMIT DE
DRAWN UP BY
ing. Hahui Cornelia

COMERCIALIZAREA PRODUSELOR CARE NU SUNT IDENTICE CU CEL PENTRU CARE S-A EMIS PREZENTUL AVIZ. SE FACE PE PROPRIA RĂSPUNDERE A BENEFICIARULUI AVIZULUI.

SPLAIUL UNIRII Nr.313, SECTOR 3, BUCUREŞTI, 74204, ROMÂNIA
TELEX : 10486, FAX : 3213769/3222748, TEL : 3236016

Institutul de Cercetare şi Proiectare pentru Electrotehnică
Research and Design Institute for Electrical Engineering

LABORATORUL DE ÎNCERCĂRI PENTRU CERTIFICAREA PRODUSELOR ELECTRICE
Testing Department for Electrical Products Certification

AVIZ NR. 540 / 31.07.1996
APPROVAL NO.

PRODUSUL : PRODUCT :	Termoregulator tip T4H
ÎNCERCAT LA SOLICITAREA : TESTED ON REQUEST OF :	Uzina Mecanică Sadu
FABRICAT DE : MANUFACTURED BY :	Uzina MecanicăSadu
VALORI NOMINALE ŞI CARACTERISTICI PRINCIPALE : RATED VALUES AND MAIN CHARACTERISTICS :	220V.c.a, 2 A clasa de protecţie împotriva electrocutării : I
MARCA DE FABRICĂ : TRADE MARK :	FRAM -
CONCLUZII : CONCLUSIONS :	Produsul este considerat conform cu STAS 2614/1-86 în baza rezultatelor din BI nr. 692/31.07.1996.
AVIZUL ESTE VALABIL : APPROVAL IS VALID :	31.07.1996 până la 31.07.1997

MANAGER GENERAL
Ing. Nicolae Vasile

ŞEF LABORATOR
DEPARTMENT CHEF
ing. Nicolae Rogoveanu

ÎNTOCMIT DE
DRAWN UP BY
ing. Hahui Cornelia

COMERCIALIZAREA PRODUSELOR CARE NU SUNT IDENTICE CU CEL PENTRU CARE S-A EMIS PREZENTUL AVIZ SE FACE PE PROPRIA RĂSPUNDERE A BENEFICIARULUI AVIZULUI.

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20 dicembre 1997

RELAZIONE DI VISITA ALLA UZINA MECANICA SADU ROMANIA

Nei giorni 17 - 18 dicembre 1997 abbiamo incontrato i tecnici della UZINA MECANICA SADU e abbiamo visitato la fabbrica di termostati di Bumbesti Jiu.

Ai tecnici è stato illustrato il programma di lavoro studiato e la relativa procedura che intendiamo seguire per sostituire gli attuali gas di carica dei termostati (Freon 12 e Freon 22) con altri gas Non CFC.

Dopo la discussione tecnica, abbiamo consegnato il seguente materiale informativo:

1. Relazione Riviera datata 14.12.97 (pagine 9), con lo studio per l'eliminazione dei fluidi refrigeranti Freon, scelta dei nuovi gas di carica, modalità per determinare la pressione di carica dei nuovi gas per i loro modelli di termostato.
2. Tabelle di conversione Temperatura/Pressione dei vari gas in esame R12, R22, R134A, Propano C3H8

3. Relazione Riviera datata 15.12.97 (pagine 11), relativa alla analisi eseguita in Italia sui campioni di termostato ricevuti da SADU, T3H - T4H - T5H e sui soffietti caricati da SADU con Freon 22 e Freon 134A.

   La relazione comprende:

   - valori di temperatura riscontrati in Italia letti su banchi di controllo
   - analisi gascromatografiche della qualità del gas di carica dei termostati e degli altri soffietti, con singoli cromatogrammi allegati
   - esame della tenuta delle punte del capillare pinzato (sotto la goccia di stagno)

4. Tabella con la purezza dei gas di carica Propano grado 99.9%

5. Relazione Riviera sulla metodologia di depurazione del gas e dell'impianto di carica

6. Fascicoli Bibliografici sulle caratteristiche chimico - fisiche dei 4 gas in esame (freon 12 - freon 22 - R134A - propano C3H8)

7. Campioni di termostati e soffietti SADU caricati in Italia con propano C3H8 a 7 Atm e a 4 Atm per le prove di comparazione sui valori di temperatura.

Durante la visita agli impianti produttivi, abbiamo esaminato il loro impianto di carica.

Questo impianto, a nostro avviso, presenta i seguenti aspetti positivi e negativi, visti anche in relazione all'utilizzo del nuovo gas propano C3H8.

ASPETTI POSITIVI

- L'impianto è funzionante in locale a temperatura non inferiore a + 20°C, quando fuori la temperatura era di -15°C
- La bombola del gas è riscaldata
- Il gas prima della carica è ulteriormente riscaldato a +40°C

ASPETTI NEGATIVI

- La bombola del gas non può essere posizionata nel reparto di carica dei soffietti, ma deve essere posizionata all'esterno e sistemata secondo le normative di sicurezza vigenti in Romania. La bombola deve essere collegata all'impainto di carica mediante tubo in rame saldato e collaudato ad alta pressione - min 20 bar - (vedere schema di collegamento delle bombole di gas allegato A).

- Il manometro di regolazione della pressione di carica non deve essere del tipo a contatti elettrici per evitare esplosioni.

- L'impianto di carica è a comando manuale, quindi senza la possibilità di eseguire cicli di "lavaggio" dei soffietti in carica. Il vuoto a volte non è sufficiente a togliere completamente gli incondensabili dall'interno dei soffietti da caricare; lo conferma il fatto che su 5 soffietti caricati in SADU ed esaminati in Italia, nr 2 avevano dal 20 al 40% di gas estraneo al gas di carica, quando i limiti di incondensabili ammessi sono nell'ordine max di 100 PPM.

- Tutti i residui di gas di carica, specialmente con propano, devono essere portati all'esterno del locale di carica. Il tubo collegato alla pompa del vuoto deve sfogare all'esterno specialmente se vengono eseguiti cicli di lavaggio sia nel ciclo di carica che durante la fase di spurgo dell'impianto.

- Sopra la zona di carica dei soffietti deve essere sistemato un aspiratore che aspiri e convogli all'esterno tutti i residui o fughe di gas durante le operazioni di carica dei soffietti.

- Verificare che il riscaldatore del gas di carica a +40°C non abbia interferenze con contatti elettrici ma che il gas sia incanalato in apposita serpentina posta all'interno del

riscaldatore. Il meglio sarebbe se la serpentina attravversasse un bagno d'olio riscaldato.

- Le pinze di tenuta sono inaffidabili, le guarnizioni sono incerte ed il bloccaggio delle pinze avviene manualmente. Questo fatto può procurare difficoltà di vuoto e relative cariche inquinate, inoltre pressioni di carica diverse da quelle prescritte dalle specifiche.

- La pinza tronca-capillare è una semplice cesoia tronca fili. Lascia i capillari troncati a forma di coda di pesce, poi ricoperti dalla goccie di stagno. Questo sistema è inaffidabile e può dar luogo a perdite di gas subito dopo la troncatura. Se la perdita è grossa si vede quando il mazzo di capillari viene introdotto nel bagno contenente disossidante liquido e viene eliminata; se la perdita è piccola non si vede e si stagna ugualmente la punta. Nel tempo poi l'effetto ghiaccio, che si manifesta sulla punta del capillare a contatto con l'evaporatore del frigorifero, può degenerare lo stagno fino a mettere in evidenza la microperdita della punta del capillare di rame pinzato.

Durante la visita all'impianto di carica, l'Ing. Panoiu ha fatto le seguenti richieste:

1. Tipo di elettrovalvola Danfoss per impianto carica da sostituire alla loro attuale

2. Tipo di manometro per indicare la esatta pressione di carica

3. Pinze tronca-capillare diverse dalle attuali

4. Guarnizioni in gomma adatte ai loro raccordi per la tenuta capillare

5. Gascromatografo: modello e offerta

6. Proposta di licenza per la produzione di termostati Ministat ATEA Modelli N2-S2 / C2-C3 per frigoriferi a 1 e 2 porte.

CONCLUSIONE:

- ***Per quanto riguarda il gas di carica dei tre modelli di termostato SADU si definisce quanto segue:***

  ⇒ ***Mod. T3H passa da R22 a PROPANO C3H8***

  ⇒ ***Mod. T4H passa da R12 a PROPANO C3H8***

  ⇒ ***Mod. T5H passa da R12 a PROPANO C3H8***

  Si può quindi unificare l'utilizzo di 1 solo tipo di gas variando solo le pressioni di carica in funzione delle temperature di taratura dei vari modelli.

- ***Per caricare con Gas Propano non è consigliabile l'impiego dell'impianto di carica nelle attuali condizioni, in quanto non ha le sicurezze antideflagranti. Si consiglia di modificare l'impianto attuale oppure di sostituirlo con altro impianto più razionale.***

STUDIO PER L'ELIMINAZIONE DEI FLUIDI REFRIGERANTI (FREON)

CFC CLOROFLUOROCARBURI R12

HCFC IDROCLOROFLUOROCARBURI R22

NEL SETTORE DELLA CLIMATIZZAZIONE DOMESTICA (TERMOSTATI PER FRIGORIFERI E CONGELATORI) E SOSTITUZIONE CON NUOVI PRODOTTI CHE NON CONTENGONO CLORO.

QUESTI NUOVI FLUIDI REFRIGERANTI PURI SONO DENOMINATI:

HFC IDROFLUOROCARBURI 134A e C3H8.

QUESTI PRODOTTI COSTITUISCONO SOLUZIONI DEFINITIVE IN QUANTO, IN ASSENZA DI CLORO, HANNO UN POTENZIALE DI IMPOVERIMENTO DELL'OZONO UGUALE A ZERO.

14 dicembre 1997

SCELTA DEL GAS DI CARICA PER OGNUNO DEI TRE MODELLI DI TERMOSTATO.

MODELLO T3H - PER FREEZER

Attualmente viene caricato con Freon 22 HCFC. Il modello T3h viene normalmente impiegato nella produzione dei Freezer.

Questi apparecchi possono raggiungere temperature di distacco sull'evaporatore, luogo dove viene posizionato il capillare del termostato, che raggiungono i -32°C.

Il gas con caratteristiche che si avvicinano di più al Freon 22 è il C3H8 PROPANO. Verificando i valori temperatura/pressione risulta:

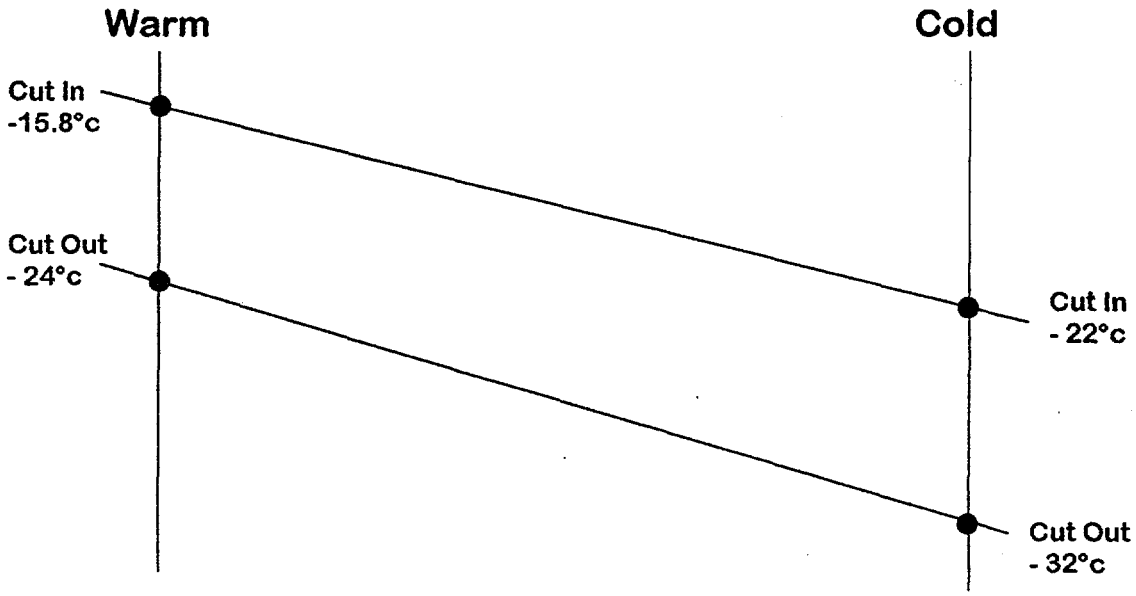
	FREON *R22*	*C3H8* PROPANO
a 0°C	= 3.9759 bar	= 3.7414 bar
a - 32°C	= 0.5011 bar	= 0.5420 bar

GRADO DI PUREZZA RICHIESTO = 99.9 %

Le tabelle di conversione temperatura/pressione forniscono i dati delle forze in gioco da considerare nella procedura di calcolo dei termostati.

COME SI DETERMINA LA PRESSIONE DI CARICA DEL GAS PER IL TERMOSTATO T3H CON GAS DI CARICA C3H8 PROPANO

Per avere un corretto funzionamento del termostato nel congelatore, la pressione di carica del gas deve corrispondere a circa 9-10°C di valore in pressione, superiore alla temperatura di attacco più calda:



In questo caso la temperatura da considerare è -15,8°C in posizione WARM.

Aggiungendo 10°C si arriva a -5°C circa che, dalla tabella di conversione temperatura/pressione, corrisponde ad una pressione di 3 bar.

- **Aggiungendo un ulteriore limite di sicurezza nei casi di valori di temperatura fino a 0°C, si può definire che la pressione di carica venga fissata a 4 bar.**

  Verificare praticamente, montando 4 soffietti caricati in Italia con propano a 4 bar.

MODELLO T4H - PUSH BOTTON PER FRIGO A 1 PORTA

Attualmente viene caricato con Freon 12 HCFC.

Il modello T4H viene normalmente impiegato nella produzione di frigoriferi ad 1 porta con sbrinamento semiautomatico.

Questi termostati hanno un campo di regolazione che va da +10°C a -20°C.

L'utilizzo del Freon 12 come gas di carica era compatibile, come rapporto temperatura/pressione.

Per il termostato T4H, visto che la temperatura di distacco arriva a -24°C $^{\pm 1}$ = -25°C, abbiamo:

	R12	R134A	C3H8
a -25°C	0.2368 bar	0.0650 bar	1.0246 bar

Secondo la nostra esperienza, questo termostato caricato con Freon 12 non dà molte garanzie di ripetibilità e precisione del valore di taratura -24°C $^{\pm 1}$.

Caricato con R134A ancora meno, in quanto la spinta del gas a -25 °C è praticamente zero.

Pertanto si deve utilizzare come gas di carica per i termostati T4H con temperature di distacco freddo, il propano C3H8 dove le spinte a - 25°C sono decisamente favorevoli.

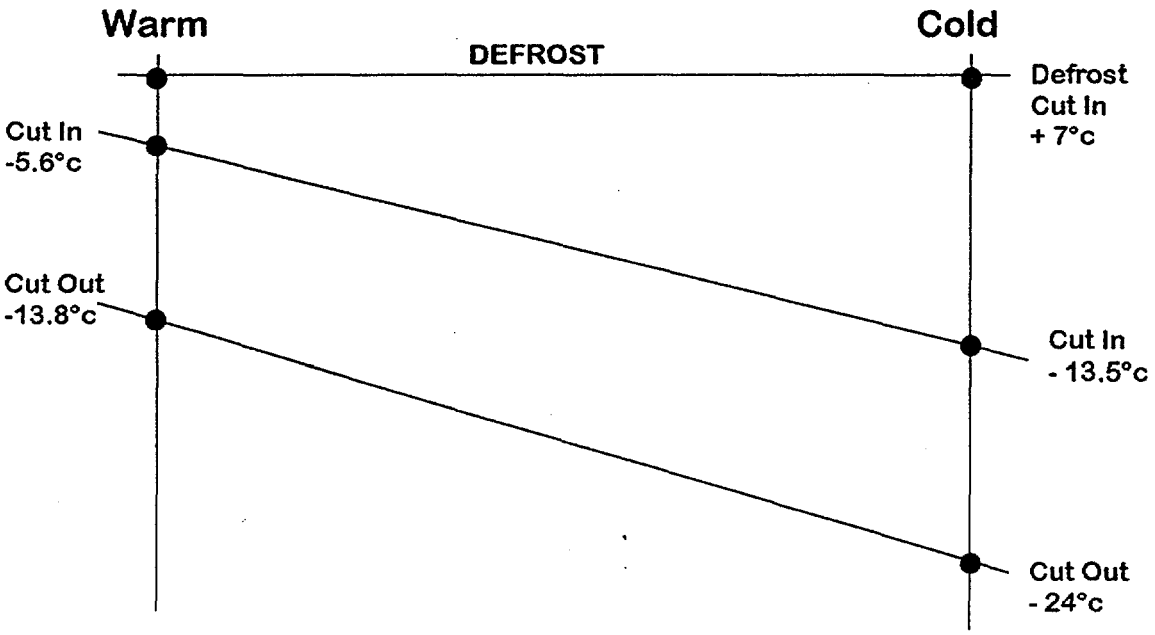
- E' buona regola quindi usare come gas di carica

R134A: ***FINO A TEMPERATURE DI DISTACCO DI -20/-21°C***

C3H8: ***CON TEMPERATURE DI DISTACCO PIU' FREDDE DI -20/-21°C***

COME SI DETERMINA LA PRESSIONE DI CARICA DEL GAS PER IL TERMOSTATO T4H CON GAS DI CARICA C3H8 PROPANO (ex R22)

Per avere un corretto funzionamento del termostato nel frigorifero, la pressione di carica del gas deve corrispondere a circa 9-10°C di valore in pressione, superiore alla temperatura di attacco (cut in) più calda:



+7°C (attacco defrost).

Aggiungendo 10°C, arriva ad una temperatura di +17/+18°C che corrisponde ad una pressione di carica di 6.7 bar.

Pertanto la pressione di carica con C3H8 per questo modello sarà di 7 bar.

Verificare preticamente il risultato, montando termostati T4H con soffietti caricati in Italia con C3H8 a 7 bar.

MODELLO T5H - PER FRIGO A 1 STELLA

Attualmente viene caricato con Freon 12 HCFC.

Il modello T5H viene normalmente impiegato su piccoli frigoriferi senza sbrinamento.

Questi termostati hanno un campo di regolazione abbastanza limitato.

Il distacco a freddo non va oltre i -21°C.

L'utilizzo del Freon 12 come gas di carica era il più adatto, come rapporto temperatura/pressione.

In questo tipo di termostato, la temperatura di distacco in posizione Cold raggiunge i -21°C; il gas che si avvicina di più al Freon 12 come rapporto temperatura/pressione è il 134A:

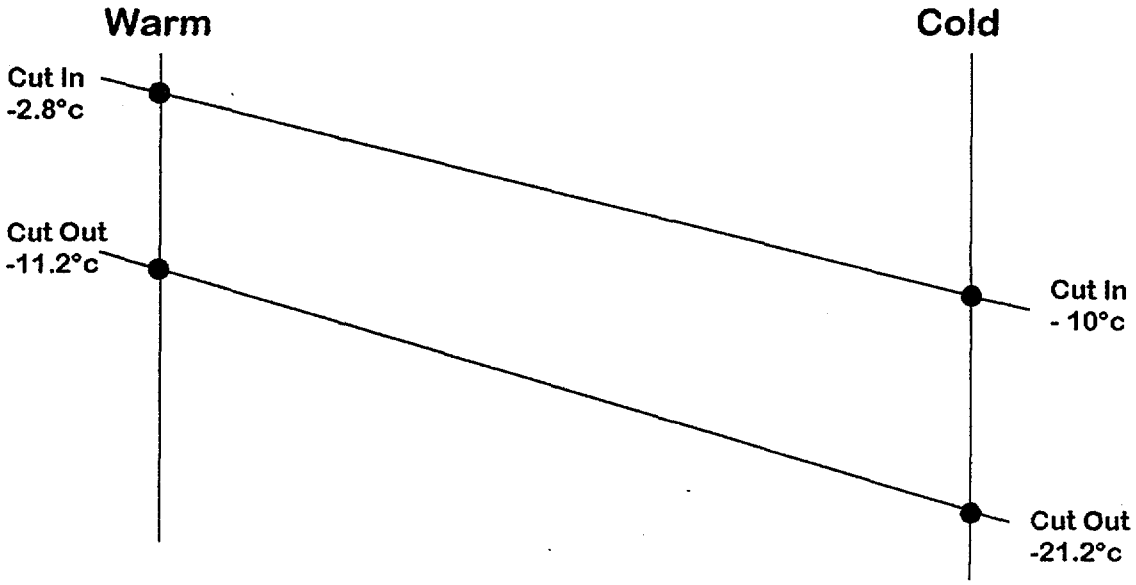
	FREON *R12*	*R134A*
a -21°C	= 0.2750 bar	= 0.4515 bar

E' comunque un limite di temperatura fredda da non superare con questo gas.

Le tabelle di conversione temperatura/pressione forniscono i dati delle forze in gioco da considerare nella procedura di calcolo dei termostati.

COME SI DETERMINA LA PRESSIONE DI CARICA DEL GAS PER IL TERMOSTATO T5H CON GAS DI CARICA HFC 134A

Per avere un corretto funzionamento del termostato nel frigorifero, la pressione di carica del gas deve corrispondere a circa 9-10°C di valore in pressione, superiore alla temperatura di attacco (cut in) più calda:



In questo caso la temperatura di attacco da considerare è -2.8°C (attacco WARM pos.).

Aggiungendo 10°C, arriva ad una temperatura di +8°C che, dalla tabella di conversione temperature/pressione, corrisponde ad una pressione di carica di circa 3 bar.

Aggiungendo un ulteriore limite di sicurezza, si può fissare una pressione di carica a 4 bar.

Verificare praticamente il risultato, montando termostati T5H con soffietti caricati in Italia con 134A a 4 bar.

ANALISI ESEGUITA SUI CAMPIONI DI TERMOSTATI T3H - T4H - T5H

- Lettura valori di temperatura
- Analisi gascromatografica dei soffietti (5) caricati in R22 e R134A
- Analisi gascromatografica dei gas di carica dei soffietti montati sui termostati campioni ricevuti T3H - T4H - T5H
- Esame della tenuta delle punte sotto goccia di stagno
- Ricarica di:
  - * 2 soffietti con C3H8 4 bar per T3H
  - * 3 soffietti con C3H8 7 bar per T4H
  - * 2 termostati completi T4H 7 bar C3H8 (ex R12)
  - * 2 termostati completi T5H 4 bar R134A (ex R12)
  - * 3 termostati completi T3H 4 bar C3H8 (ex R22)

Tutti questi campioni sono da esaminare in Romania con i loro mezzi per quanto riguarda:

- valori di temperatura dopo la ricarica (IT)
- montaggio dei soffietti caricati in Italia e controllo risultati in temperatura

I VALORI NOMINALI possono variare. Per i VALORI DI TARATURA occorre aggiornarli durante l'operazione di taratura. Per i valori di CAMPO occorre variare gli elementi di calcolo molla/incremento camma in funzione delle pressioni di spinta dei nuovi gas (vedi tabelle di conversione temperatura/pressione).

T3H

Customer

Customer Therm. Code No.

Measured individual values

Sample No.	Ts min C°	Ta min C°	Ts max C°	Ta max C°	Lungh. capill. mm.
1	-15,9	-11,8	-29,5	-24,1	1000
2	-13,9	-10,4	-28,5	-23,9	1040
3	-18,1	-12,6	-33,8	-25,3	1000

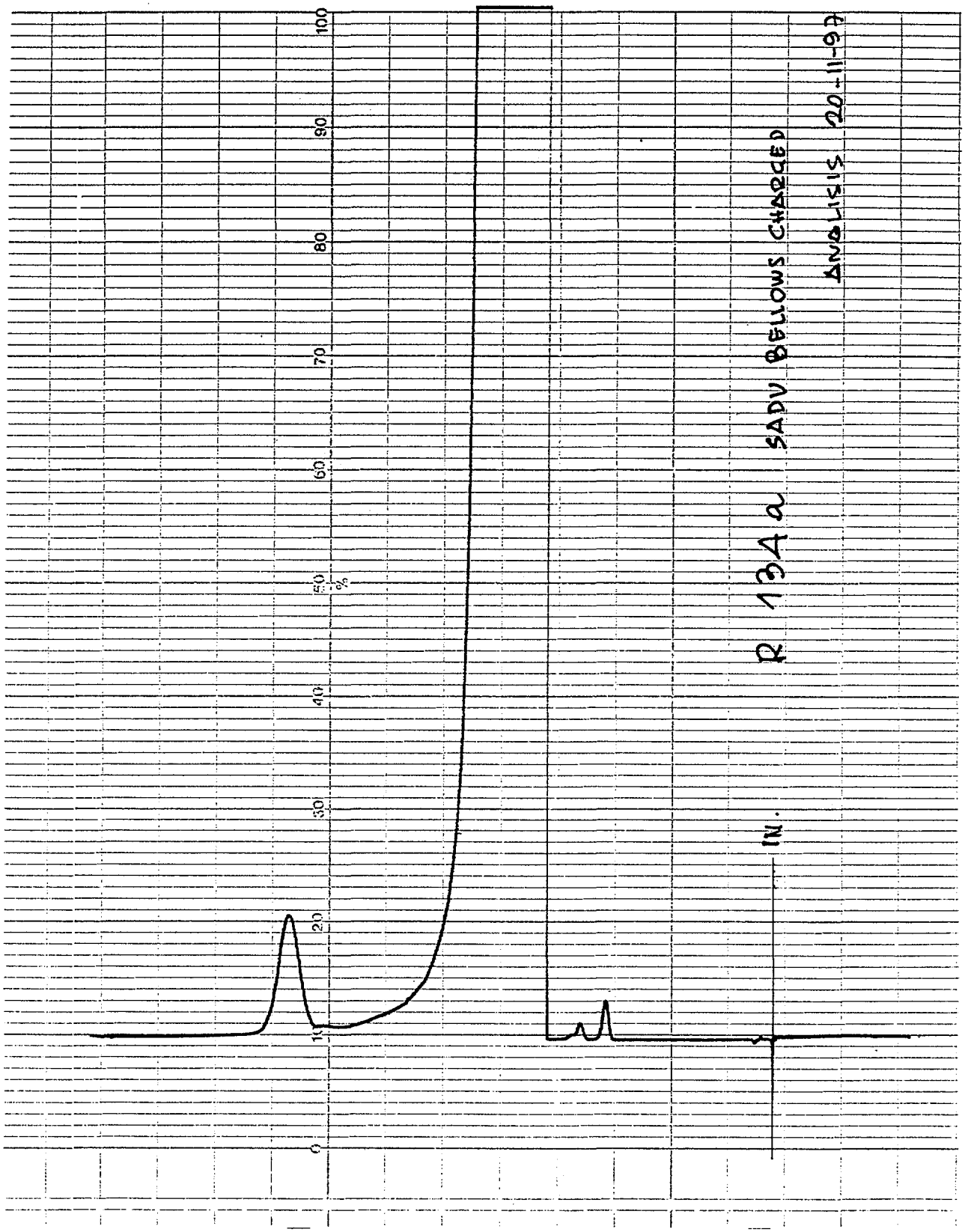
T4H

Sample No.	Ts min C°	Ta min C°	Sbr. min. C°	Ts max C°	Ta max C°	Sbr. max C°	Lungh. capill. mm.
1	-14,2	-5,3	10,6	-24,9	-13,7	7,7	480
2	-15,6	-6	9,2	-27,1	-14,9	7,5	470
3	-16,4	-6,7	9,7	-27,4	-14,1	8,3	500

T5H

Sample No.	Ts min C°	Ta min C°	Ts max C°	Ta max C°	Lungh. capill. mm.
1	-3	-0,3	-14,1	-8,8	950
2	-0,7	2,1	-15,2	-8,6	910
3	-0,4	1,2	-13,9	-8,7	940

1° CAMPIONE



ANALISI OK (AL LIMITE)

1 QUADRETTO = 20 ppm.

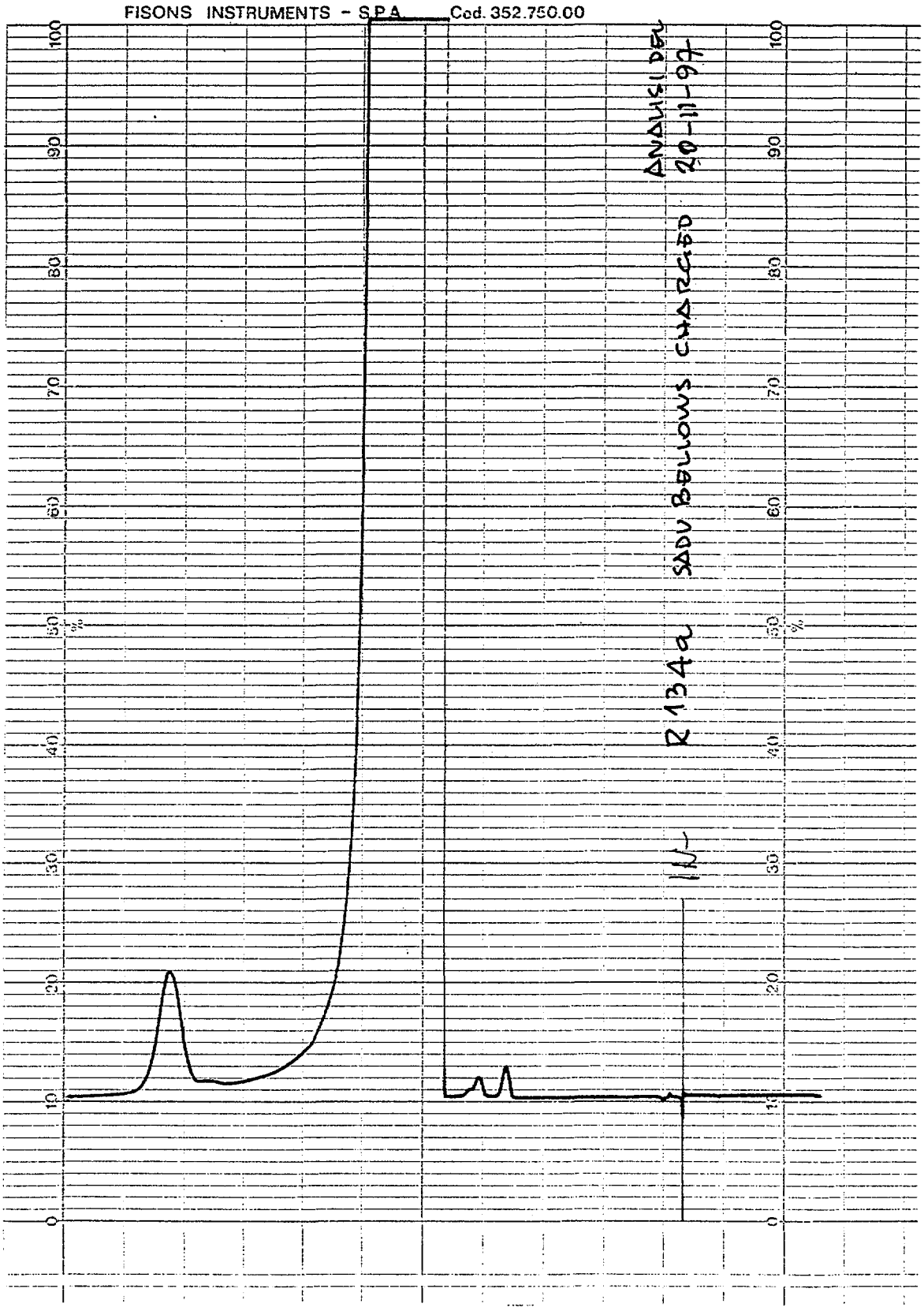
RISULTATO: ~ 70 ppm.

LIMITE AMMESSO 100 ppm.

Riviera

ANALISI GASCROMATOGRAFICA ESEGUITA SU SOFFIETTO SADU CARICATO CON R 134a

2° CAMPIONE



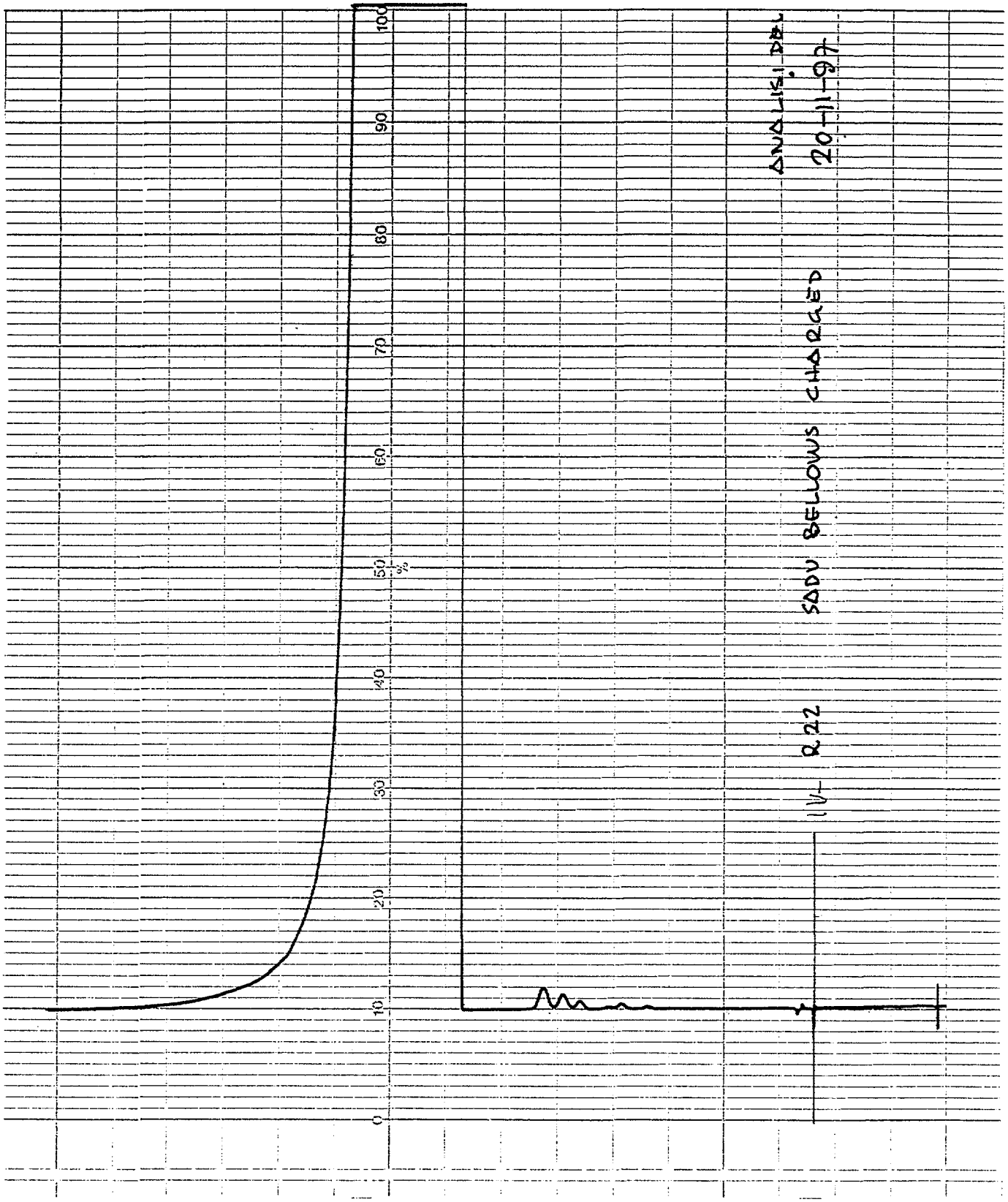
RISULTATO: ANALISI OK 50 ppm

(LIMITE AMMESSO 100 ppm)

Riviera

ANALISI GASCROMATOGRAFICA ESEGUITA SU SOFFIETTO SADU CARICATO CON R 22

1° CAMPIONE



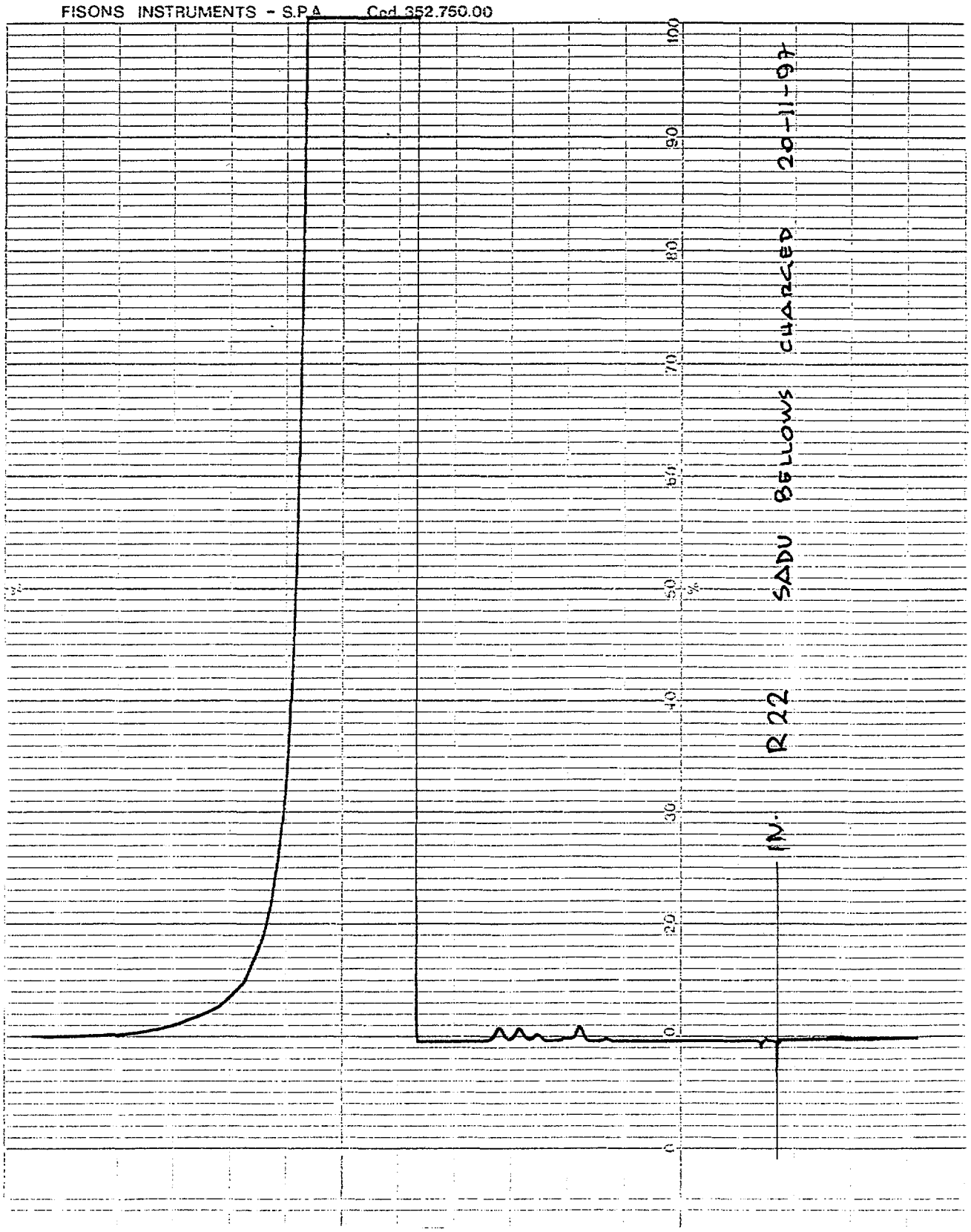
RISULTATO: ANALISI OK 40 ppm.

1 QUADRETTO = 20 ppm LIMITE AMMESSO 100 ppm.

Riviera s.r.l.

ANALISI GASCROMATOGRAFICA ESEGUITA SU SOFFIETTO SADU CARICATO CON R 22

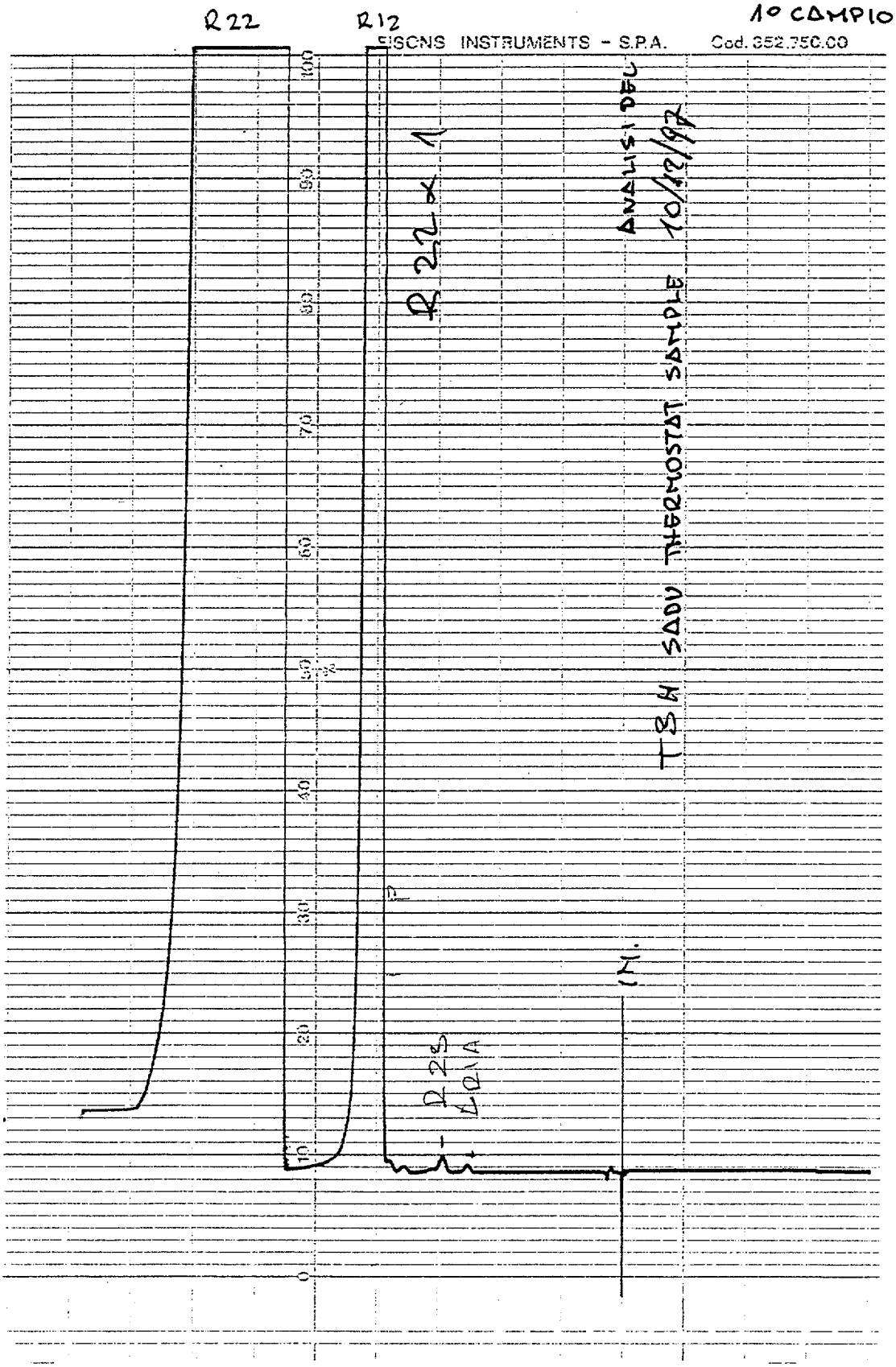
2° CAMPIONE



RISULTATO: ANALISI ok 15 ppm. ~

1 QUADRETTO = 20 ppm. LIMITE AMMESSO 100 ppm.

1° CAMPIONE



RISULTATO : NEGATIVO

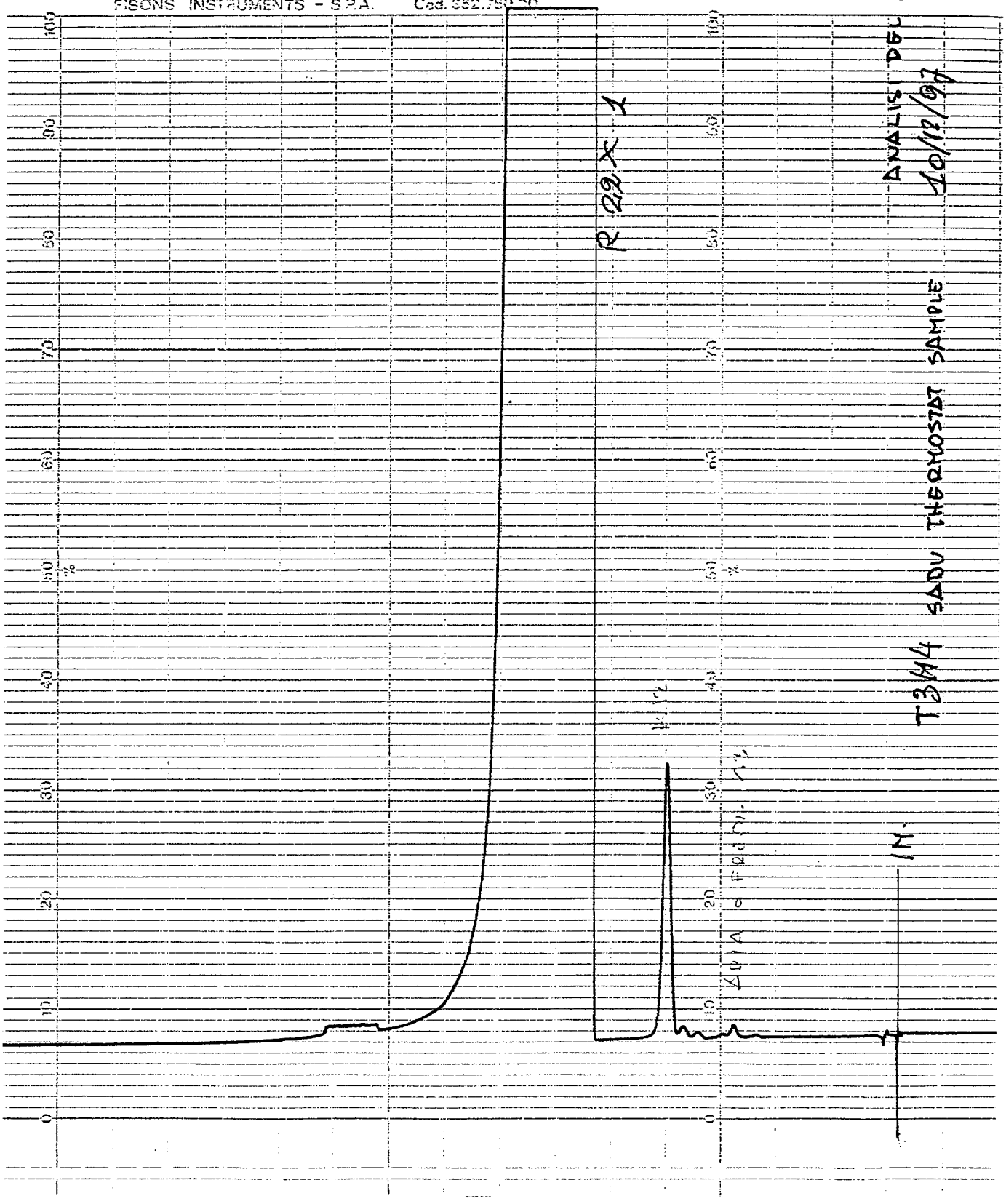
QUESTO SOFFIETTO PRESENTA UNA ENORME QUANTITÀ DI GAS DI CARICA CHE NON È FREON 22. (CARICA INQUINATA) ARIA - FREON 23 FREON 12

DOVUTO AL CAMBIO DEL GAS ? CAMBIO BOMBOLA?

Riviera S.r.l.

ANALISI GASCROMATOGRAFICA ESEGUITA SU SOFFIETTO SADU MONTATO SU TERMOSTATO T3H CARICATO CON FREON 22

2° CAMPIONE

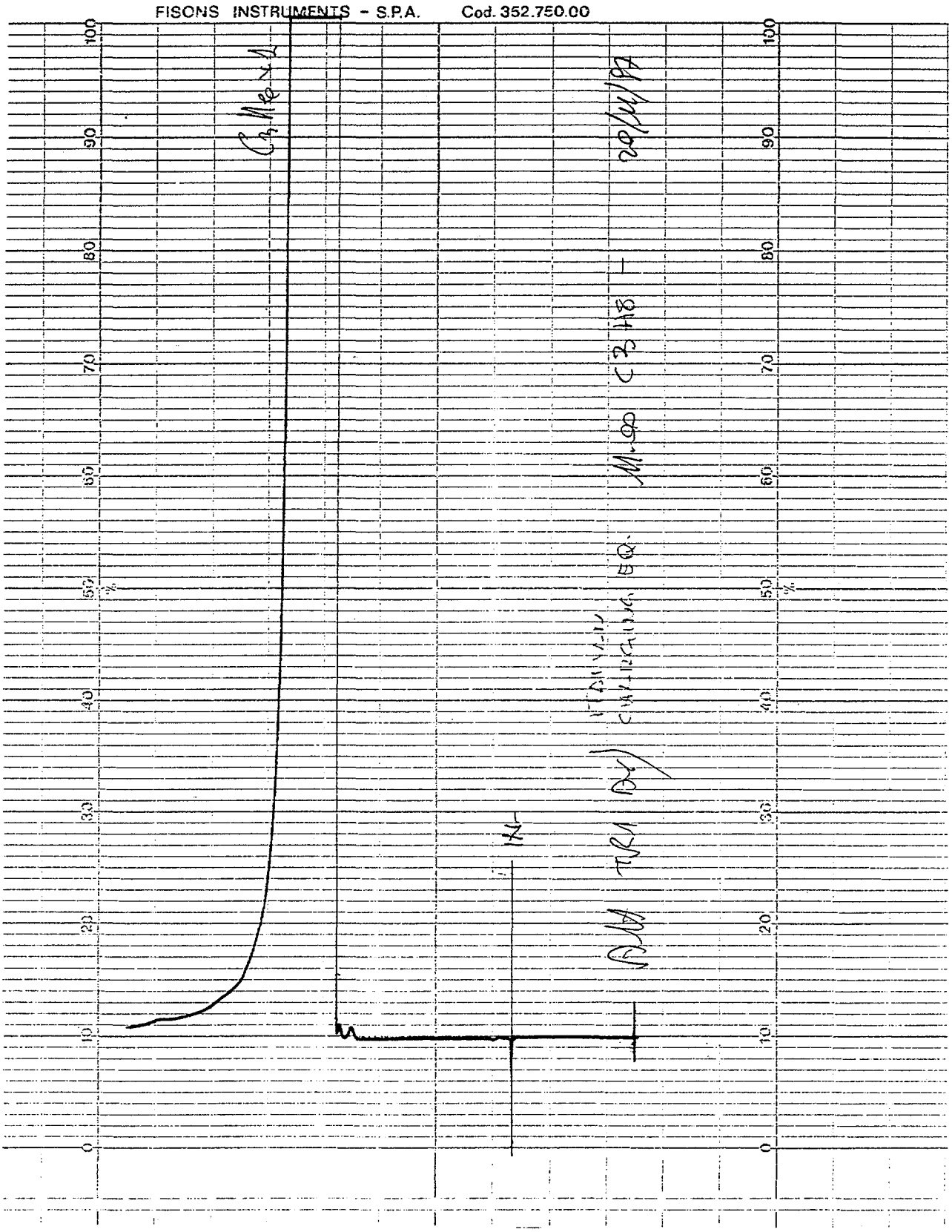


RISULTATO : NEGATIVO

QUESTO SOFFIETTO PRESENTA UNA QUANTITÀ ECCESSIVA (500 ppm) ~ DI GAS DI CARICA CHE NON E' FREON 22 (CARICA INQUINATA)

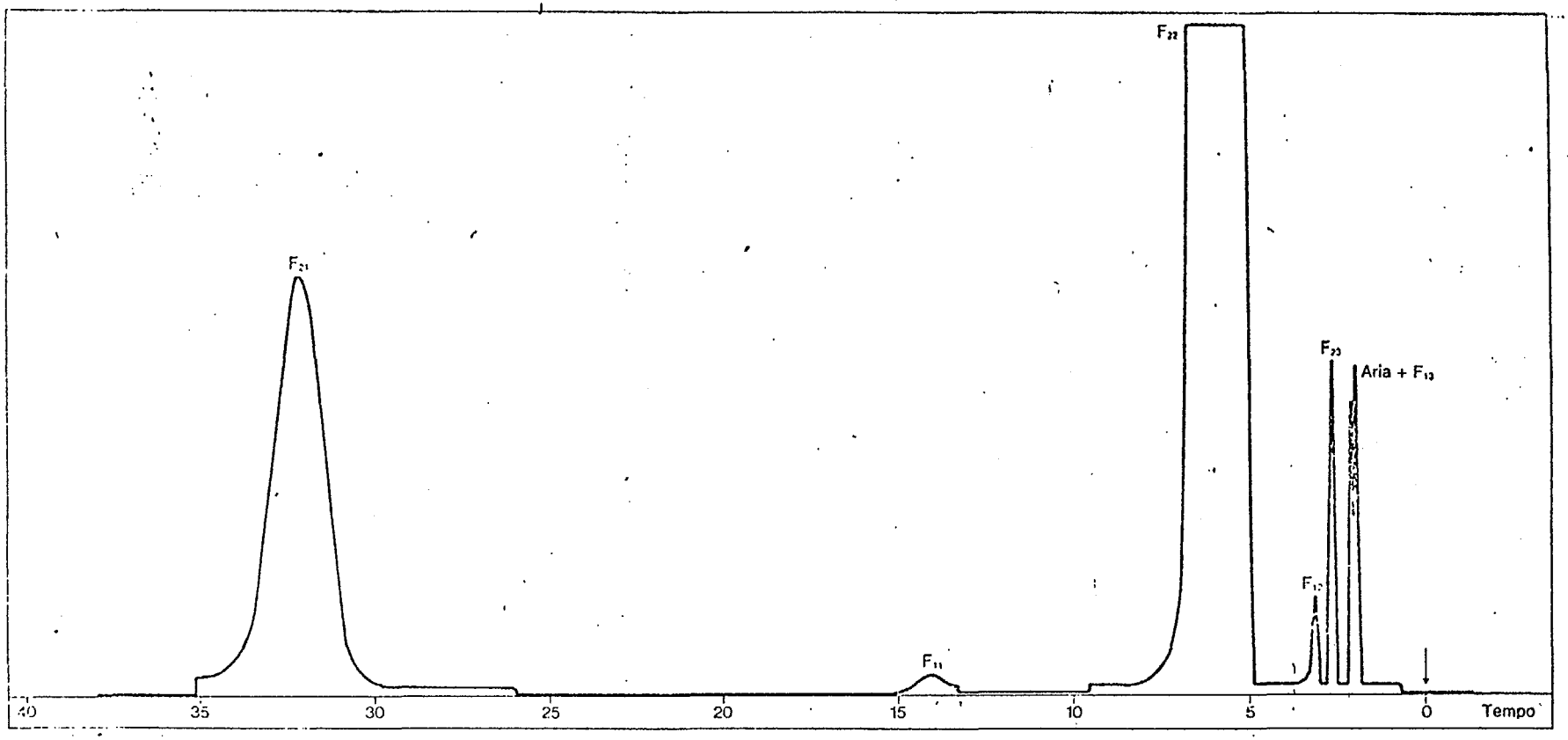
Riviera s.r.l.

ANALISI GASCROMATOGRAFICA ESEGUITA SU SOFFIETTO CARICATO IN ITALIA CON C_3H_8 PUREZZA 99.9%



RISULTATO : ANALISI OK 20 ppm.

LIMITE AMMESSO 100 ppm.



Analisi di FREON

Condizioni sperimentali

Campione: Clorodimetilfluorometano (Freon 22)
Fractovap tipo: ATC/f con rivelatore a filamenti
Colonna tipo: In acciaio 5 m Ø 6 x 5 con 20 % di Tergitol NPX su Chromosorb P 30-60 mesh
Temperatura colonna: 95°C
Temperatura evaporatore: 180°C
Temperatura rivelatore: 95 °C
Carrier: Elio 60 cc/min.

Dati tecnici sulla fase stazionaria

Denominazione: Tergitol NPX
Polarità: alta (+++)
Temperatura max. di esercizio: 100°C
Temperatura min. di esercizio: temperatura ambiente
Solubilità: Cloroformio

Note

Le colonne preparate con Tergitol NPX trovano un impiego specifico per l'analisi del Freon. Per una ricerca di impurezze del prodotto industriale è necessario usare colonne lunghe da 4 a 6 metri.

L'analisi esposta mostra l'analisi del Freon 22 e le sue impurezze costituite da altri Freon.

Rivieta

DIAGRAMMA DI CONFRONTO PER ANALISI DEL FREON 22

pag. 10/11

- Sono state esaminate le punte dei capillari pinzate meccanicamente e ricoperte dalla goccia di stagno.
  Su un totale di 12 pezzi controllati (tolto lo stagno immergendo la punta stagnata in un crogiolo con stagno fuso) nr 2 pezzi presentavano perdite di tipo grossolano: i termostati si sono scaricati in pochi minuti.
  Vedere operazione di pinzatura, metodo di controllo delle perdite prima e dopo la stagnatura della punta (stagionatura?); vedere difettosità attuale in produzione e i ritorni dal Service.

ANNEXE 1

THE RESULTS OF THE TESTS FOR THE THERMOSTATS CHARGED WITH PROPANE AT RIVIERA

THERMOSTAT T4H
REFRIGERANT C_3H_8 (7 BAR)

Tabel 1

Sample no.	Ta max [°C]	Td max [°C]
1.	-31	doesn't work
2.	-32	doesn't work

REMARK:When the temperature in the test bath is -40 °C the two samples don't work.

THERMOSTAT T5H
REFRIGERANT R 134 a (4 BAR)

Tabel 2

Sample no.	Ta max [°C]	Td max [°C]
1.	-8.1	-11.9
2.	-8.0	-12

THERMOSTAT T4H
REFRIGERANT C_3H_8 (7 BAR)

Tabel 3

Sample no.	Ta max [°C]	Td max [°C]	T s [°C]
1.	-27.5	-32.6	-20.6
2.	-26.8	-31.4	-20.4
3.	-26.8	-33.4	-19

1.	-17.5	-26.9
2.	-17.6	-27.6
3.	-15.9	-27.6

THERMOSTAT T3H
REFRIGERANT C_3H_8 (4 BAR)

Tabel 5

Sample no.	Ta max [°C]	Td max [°C]	T s [°C]
1.	-24.2	-29.3	-14.8
2.	-26.6	-31	-15

WHERE: T a -coupling temperature
T d -decoupling temperature
T s -signalisation temperature

Riviera s.r.l.

PROPANO C_3H_8
GRADO DI PUREZZA 99.9%

Settala hydrocarbon pure gases

Propane - N. Butane - Isobutane

Combining experience and modern technology, we have for several years devoted a great deal of time and effort to obtain pure gases. Sulphur is removed by absorption on molecular sieves and unsaturated hydrocarbons are removed by acid polymerisation followed by distillation.
With the installation of a 35 - meter high fractionated distillation column, besides the normal production purities of 99 (2.0) - 99.5 (2.5) - 99.9 (3.0) - 99.95 (3.5), we have now obtained an experimental gas with overall impurities of less than 100 ppm, that is a gas which is more than 99.99 (4.0) pure.
Obviously monitoring is done with process gas chromatographic equipment and laboratory gas chromatographic apparatus, connected to a sophisticated recorder - integrator which supplies analysis results without any operator intervention.
We are also able to detect traces of organic sulphur down to few p.p. billion using a special gas chromatograph equipped with a flame photometric detector.
Our laboratory is also equipped with an electrolitic cell moisture - monitor which reveals traces of water in the gas to within a few ppm.

PROPANE

PURE GRADE	99%	99.5%	99.9%	99.95% RESEARCH GRADE
Max content of impurities	vol. %	vol. %	ppm	ppm
Ethane	0.02	0.01	100	50
Propylene	0.02	0.02	150	100
Isobutane	0.85	0.4	800	400
N. Butane	0.2	0.1	200	100
Total unsaturated C_4	0.01	0.01	100	50
Sulphur	0.0002	0.0002	1	1
H_2O max	0.0012	0.0012	10	10
O_2 max	0.0015	0.0015	10	10
CO_2	0.001	0.001	10	10

Of course in our pure gases the total sum of impurities meets the specifications.

Riviera

PROPANO C3H8
CORREZIONE BAROMETRICA

CORREZIONE BAROMETRICA A 740 mmHg per C3 H8

(Barometric Correction at 740 mmHg for C3 H8)

	710	714	720	724	730	734	740	744	750	754	760
+ 5°	+ 0,30	+ 0,20	+ 0,20	+ 0,10	+ 0,10	=	0,0	=	- 0,10	- 0,10	- 0,20
+ 0°	+ 0,30	+ 0,30	+ 0,20	+ 0,20	+ 0,10	=	0,0	=	- 0,10	- 0,10	- 0,20
- 5°	+ 0,30	+ 0,30	+ 0,20	+ 0,20	+ 0,10	=	0,0	=	- 0,10	- 0,10	- 0,20
- 10°	+ 0,30	+ 0,30	+ 0,30	+ 0,20	+ 0,10	+ 0,10	0,0	- 0,10	- 0,10	- 0,20	- 0,20
- 15°	+ 0,40	+ 0,30	+ 0,30	+ 0,20	+ 0,10	+ 0,10	0,0	- 0,10	- 0,10	- 0,20	- 0,30
- 20°	+ 0,40	+ 0,40	+ 0,30	+ 0,20	+ 0,10	+ 0,10	0,0	- 0,10	- 0,10	- 0,20	- 0,30
- 25°	+ 0,50	+ 0,50	+ 0,40	+ 0,30	+ 0,20	+ 0,10	0,0	- 0,10	- 0,10	- 0,20	- 0,30
- 30°	+ 0,60	+ 0,50	+ 0,40	+ 0,30	+ 0,20	+ 0,10	0,0	- 0,10	- 0,20	- 0,30	- 0,40

ESEMPIO

pressione 710 Temperatura ST -30°
lo stacco risulta -30,6°
in realtà è -30° perchè c'è + 0,6° di correzione

Example

pressure 710 cut out temperature - 30°
Cut out results - 30,6°
really it is - 30° because there is + 0,6° for correction

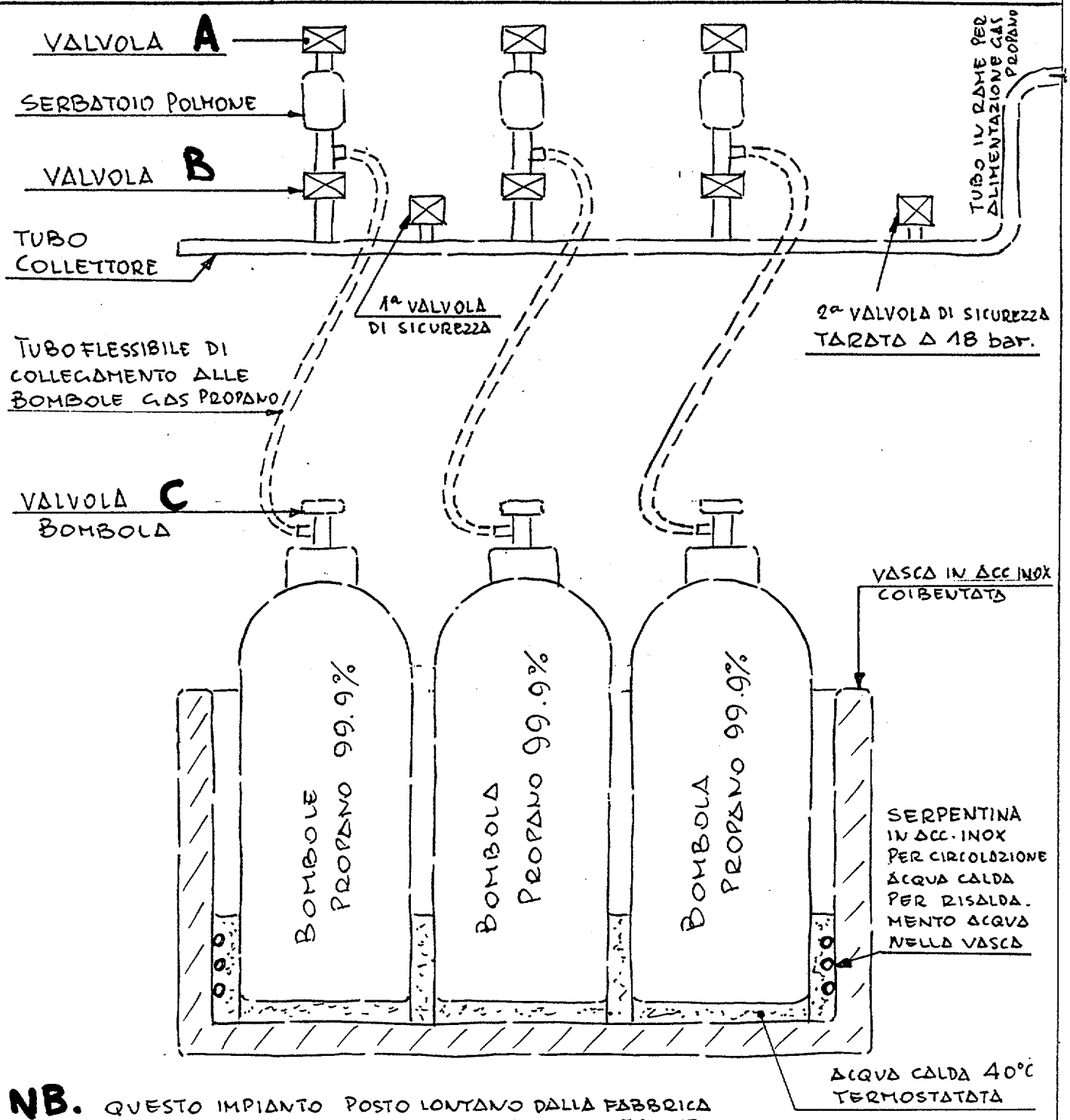
ESEMPIO

pressione 760 Temperatura ST -30°
lo stacco risulta -29,6°
in realtà è -30° perchè c'è - 0,4° di correzione

Example

pressure 760 cut out temperature - 30°
Cut out results - 29,6°
really it is - 30° because there is - 0,4° for correction

Riviera	SCHEMA DI COLLEGAMENTO DELLE BOMBOLE DI GAS PROPANO	ALLEGATO A



NB. QUESTO IMPIANTO POSTO LONTANO DALLA FABBRICA IN BOX DI CEMENTO ARMATO SERVE COME DEPOSITO PER LE BOMBOLE DI PROPANO CHE ALIMENTANO LA MACCHINA DI CARICA IN REPARTO. TUTTO QUESTO IMPIANTO DEVE FUNZIONARE SENZA ALCUNA APPARECCHIATURA ELETTRICA.

OPERAZIONI DI MANOVRA PER CAMBIO BOMBOLA GAS PROPANO

1 VALVOLE **A-B-C** CHIUSE
2 APRIRE VALVOLA **C**. IL TUBO FLESSIBILE SI RIEMPIE DI GAS, L'ARIA SI CONCENTRA NEL POLMONE.
3 APRIRE VALVOLA **A** PARZIALMENTE E SCARICARE GAS E ARIA IN ATMOSFERA PER 30"
4 PARZIALIZZARE VALVOLA **C** CON VALVOLA **A** APERTA
5 CHIUDERE VALVOLA **A**
6 APRIRE VALVOLA **B**

1 1

1 : 10

PLÄNE

- VISIT AND TRAINING OF THE COUNTERPARTS' STAFF IN ITALY

13 - 20.09.98

Riviera

VISIT AND TRAINING OF COUNTERPART'S

RELAZIONE SULLA VISITA DEI RAPPRESENTANTI SADU A RIVIERA ITALIA DAL 13 AL 20.09.98

STAFF FROM 13 TO 20.09.98, IN ITALY.

In conformità agli accordi bilaterali tra Riviera Italia e U.M.Sadu, con riferimento al contratto Unido 97/106/VK, riguardante l' eliminazione dei gas CFC dalla produzione della suddetta U.M.Sadu, i rappresentanti

Sig. Lazarescu Valentin	Ingegnere
Sig. Panisoara Cornel	Ingegnere
Sig.ra Hoara Iuliana	Interprete

hanno preso parte, durante la settimana sopracitata ad una serie di attività relative al contratto in oggetto e riguardanti l' addestramento e aggiornamento tecnico, sopralluogo e controllo dello stato di costruzione dei macchinari facenti parte dello "scope of supply" del contratto stesso, nonchè la visita ad alcuni produttori di elettrodomestici, macchinari e componenti dell' area nord-Italia.

In particolare, si sono svolte le seguenti attività e si sono stabiliti i seguenti punti :

1- E' stata fornita ai Sigg. Rappresentanti U.M.Sadu la lista completa e definitiva delle attezzature e macchinari facenti parte del contratto.

2- Sono state fornite indicazioni di massima per la ottimizzazione del processo produttivo attraverso dei suggerimenti di Riviera Italia che la U.M.Sadu si riserva di porre in atto.

3- Si sono stabiliti i modi e i tempi della spedizione dei sopracitati macchinari da Riviera Italia a U.M.Sadu. Tale spedizione comprenderà anche i campioni di frigoriferi della U.M.Sadu (180 e 240 litri) che sono stati oggetto delle prove e delle modifiche e che sono attualmente presso i magazzini Riviera.

4- Sono stati visitati i laboratori Riviera e si sono discussi ed approfonditi i risultati delle prove di cui al punto (3).

5- Sono stati visionati tutti i macchinari (macchine di schumatura, serbatoi da 3000 e 10000 litri con relativi piping ed accessori) di produzione del sub-fornitore Impianti OMS di Milano, quasi completamente pronti per essere spediti a U.M.Sadu.

6- Impianti OMS ha consegnato ed illustrato ai rappresentanti U.M.Sadu una serie di disegni costruttivi degli impianti ed anche riguardanti indicazioni sulla parte elettrica degli stessi, nonchè suggerimenti per la preparazione finale delle aree interessate all' installazione.

Riviera

7- Il funzionamento di impianti analoghi a quello in fase di consegna è stato visionato dai rappresentanti U.M.Sadu durante la visita agli stabilimenti IAR-Siltal di Casale Monferrato (Alessandria)

8- Le attrezzature che Riviera fornirà direttamente a U.M.Sadu sono già imballate e pronte per la spedizione e, pertanto, non è stato possibile visionarle direttamente.

9- Una delegazione mista Riviera-Impianti OMS visiterà U.M.Sadu entro le prossime 3 settimane per un sopralluogo alla fabbrica ed ai lavori di preparazione delle aree interessate all' installazione dei nuovi macchinari.

10- Sono state effettuate visite di approfondimento tecnico anche alla Direzione Commerciale Whirlpool Europe di Comerio, alla fabbrica di termostati Atea di Bardello, all' industria di stampaggio componenti in plastica Roverplastic di Groppello di Gavirate ed alla salderia meccanica SimMeccanica di Ternate.

11- Eventuali ed ulteriori informazioni e documentazioni tecniche, che non fossero state raccolte direttamente dai rappresentanti U.M.Sadu verranno consegnate durante l' imminente visita dei rappresentanti Riviera-Impianti OMS

12- Riviera Italia potrà fornire collaborazione e consulenza diretta alla U.M.Sadu per l' acquisto di nuovi macchinari, componenti e tecnologie dall' Italia.

13- Riviera Italia potrà fare, su richiesta della U.M.Sadu, una proposta tecnica e commerciale per lo spostamento delle operazioni di vuoto e carica direttamente sulla linea di produzione frigoriferi della U.M.Sadu.

14- Riviera Italia potrà fornire collaborazione per lo studio e la realizzazione di nuovi modelli di frigoriferi che la U.M.Sadu volesse proporre sul mercato.

15- Riviera Italia potrà fonire assistenza per l' eventuale commercializzazione in Italia di frigoriferi ad assorbimento di produzione della U.M.Sadu.

Milano, 20.09.98

U.M.Sadu

Ing. Valentin Lazarescu

Riviera Italia S.r.l.

Antonio Forni - Projects' coordinator

- RE-VIEW OF SITE CONDITIONS AND CIVIL WORKS

JUNE 1998

Riviera s.r.l.

21100 Varese (Italy) - Via Silvestro Sanvito, 60 - tel. 0332 / 282984 - telefax 0332 / 240309 - telex 325126
Partita IVA 02149680122 Capitale Sociale L. 20.000.000 Reg. Soc. 20485 Tribunale di Varese - C.C.I.A.A. 234056

Varese. li 22.05.98

vs. rif.

ns. rif.

Fax no. 781

Messrs.
Arsenalul Armatei - Bucuresti
Uzina Mecanica Sadu

Ref. Contract 97/106/VK - visit of our officers

Dear Sirs,

Please find herebelow details of our two delegates :

Mr **Antonio Forni** - Projects' coordinator - **Riviera** - Pass. no. **746488L**

Mr **Paolo Caldarini** - Technician - **Impianti OMS** (sub-supplier for the foaming section) - Pass. no. will be informed at a later date.
resident of Albiate Brianza (Milano), via Giovanni XXIII
Born in Carate Brianza (Milano) on 25.03.1960

Subject to Your approval, our provisional travelling schedule would be as follows :

Monday, **01.06.98** - Milano dep. 10.00. - **Bucuresti** arr. **13.15** - Flight **AZ 504**

Thursday, **04.06.98** - **Bucuresti** dep. **14.05** - Milano arr. 15.30 - Flight **AZ 505**

Awaiting Your reply, we thank You and pass our best regards.

WE CONFIRM OUR VISIT
AS PROGRAMMED ABOVE
LOOKING FORWARD TO
SEEING YOU, SOON
BEST REGARDS. 28/05/98

Yours faithfully,
Riviera S.r.l.
Antonio Forni
Projects' coordinator

Contract 97/106
Conversion of U.M. Sadu
factories of Bumbesti Jiu, Romania
to phase-out the use of CFC-11 and 12
in the production of domestic appliances.

The specifications and list of all civil and preparatory works, to be done by the Counterpart before the installation of the equipments in the factory, were given to the Responsible staff, leaving them a more than reasonable period of time to complete them.

After receiving a written confirmation on the execution of these works, we visited the Project Site in june '98 to approve all above. We found all works had been carefully executed, therefore we agreed to proceed with the shipment of all machineries.

In particular, all previously used machineries had been removed from the installation areas, although still in use in different areas until the completion of the installation works.

Supports for the external piping (some 300 meters) had been manufactured.

All utilities were available (electricity, water, air etc..)

All electrical terminal boards had been removed from the foaming areas.

All electrical connections had been re-done with a higher safety level.

The concrete structure for the 3000 liters tank basin had been constructed.

A general higher level of cleanless, dust removing etc.. was be kept until the installation started.

- SHIPMENT, INSTALLATION OF ALL EQUIPMENTS, TRAINING

- CERTIFICATE ~~OF~~ ACCEPTANCE OF WORKS

OCT/NOV 1998

Riviera...

WEIGHT CERTIFICATE AND PACKING LIST PER CONTAINER

THE HI LIFE PRODUCTS

THE UNIDED NATIONS
DEVELOPMENT PROGRAMME
RESIDENT REPRESENTATIVE (UNDP)
16,AUREL VLAICU STR.
79362 BUCHAREST R O M A N I A

) CONTRACT 97/106

MESSRS. SADU.

FICATE OF ORIGIN NO. C/00677117

ING MARKS: RIVIERA/OMS 1-4+8/KLIMAX 7/GALILEO 10+20 MADE IN ITALY CONTRACT UNIDO 97/106
MECANICA SADU ROMANIA

CK FROM VARESE ITALY TO BUCHAREST ROMANIA

BUMBESTI JIU

(ORIGINALS WILL FOLLOW BY DHL.)

PMENT FOR DOMESTIC APPLIANCES PRODUCTION
UNIDO CONTRACT 97/106

TOTAL AMOUNT USD. 435.640.-

INVOICE NO. 23/EX

K NO. MM05BTJ/MM85BTJ | **TOTAL PACKAGES NO.** 9 | **TOTAL GROSS WEIGHT KGS.** 9.180.-

CKAGE MBERS	QUANTITY PACKAGES	QUANTITY PCS	TOTAL PCS	DESCRIPTION OF THE GOODS	DIMENSIONS MM	TOTAL NET WEIGHT KGS	TOTAL GROSS WEIGHT KGS
EO 10	1 CASE	1	1	REFRIGERANT CHARGING MACHINE FOR134a	720X1070X1750	170	250
EO 20	1 CASE	1	1	CHARGING STATION WITH VACCUM PUMP AND CYLINDER	470X1720X750	120	170
X 7	1 CARTON	2	2	LEAK DETECTOR FOR HFC-134a	690X470X700	50	60
		2	2	SETS OF MAINTENANCE AND SPARE PARTS			
		1	1	MANIFOLD SET			
	1 CRATE	1	1	ELECTRIC BOARD FOR PENTAFOAM HP40/20	3300X2100X2430	2.000	2.470
		1	1	ELECTRIC BOARD FOR PENTAFOAM HP100/50			
		1	1	ELECTRIC BOARD FOR SENSORS + ALARMS FOAMING AREA			
		1	1	ELECTRIC BOARD FOR SENSORS + ALARMS DOOR/CABINET JIGS			
		1	1	CHILLER TYPE 5 - 15000 Fr/H			
		1	1	ELECTRIC BOARD FOR 3000 LTS TANK			
		1	1	CYLINDER DE-COMPRESSION GROUP			
		1	1	FITTING FOR CP TRUCK-TANK EARTHING			
		1		+ BASE			

.../...

RIVIERA s. r.l.

						INVOICE NO. 23/EX	
TRUCK NO. MM05BTJ/MM85BTJ		**TOTAL PACKAGES NO.** 9			**TOTAL GROSS WEIGHT KGS.** 9.180.-		
PACKAGE NUMBERS	**QUANTITY**		**TOTAL**	**DESCRIPTION OF THE GOODS**	**DIMENSIONS**	**TOTAL NET**	**TOTAL GROSS**
	PACKAGES	**PCS**	**PCS**		**MM**	**WEIGHT KGS**	**WEIGHT KGS**
OMS 2	1 CRATE	1	1	PENTAFOAM HP100/50 HIGH PRESSURE SYSTEM	3300X2100X2440	2200	2.690
OMS 3	1 CRATE	1	1	PENTAFOAM HP40/20 HIGH PRESSURE SYSTEM	3300X2100X2440	2200	2690
OMS 8	1 CASE	12	12	SFERICAL STAINLESS VALVES DN 20	1100X600X570	295	310
		800	800	LOCK BANDS FOR CABLES			
		2	2	ANTI-EXPLOSION CERAMIC FIBER PACK.			
		2	2	ANTI-EXPLOSION MATERIAL PACKAGES			
		40	40	ANTI-EXPLOSION CONNECTIONS			
		16	16	STAINLESS FLANGES DN65			
		16	16	ALLUMINIUM BY-PASS SOCKETS			
		6	6	SFERICAL STAINLESS VALVES 1/2"			
		1	1	SET FOR VARIOUS MECHANICAL CONNECTIONS			
		4	4	STAINLESS FLANGES DN20			
		1	1	PRESSURE METER			
	2 PALLETS	MT.210	MT.210	50X50RUN-CHANNEL FOR FOAMING AREA PENTANISATION	2400X800X500	520	540
	3 CRATES 3 CASES 1 CARTON 2 PALLETS					7.555	9.180

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RIVIERA s.r.l.

Riviera

WEIGHT CERTIFICATE AND PACKING LIST PER CONTAINER

THE HI LIFE PRODUCTS

THE UNIDED NATIONS
DEVELOPMENT PROGRAMME
RESIDENT REPRESENTATIVE (UNDP)
16,AUREL VLAICU STR.
79362 BUCHAREST R O M A N I A

UNIDO CONTRACT 97/106
CERTIFICATE OF ORIGIN NO. C/00677117
SHIPPING MARKS: RIVIERA/OMS 1-4+8/KLIMAX 7/GALILEO 10+20 MADE IN ITALY CONTRACT UNIDO 97/106
UZINA MECANICA SADU ROMANIA
1 TRUCK FROM VARESE ITALY TO BUCHAREST ROMANIA
C & F BUMBESTI JIU

EQUIPMENT FOR DOMESTIC APPLIANCES PRODUCTION
REF. UNIDO CONTRACT 97/106

TOTAL AMOUNT USD. 193.000.-

INVOICE NO. 23/EX

TRUCK NO. MM10GXE/MM08DDU

TOTAL PACKAGES NO. 21

TOTAL GROSS WEIGHT KGS. 7.333.-

PACKAGE NUMBERS	QUANTITY PACKAGES	QUANTITY PCS	TOTAL PCS	DESCRIPTION OF THE GOODS	DIMENSIONS MM	TOTAL NET WEIGHT KGS	TOTAL GROSS WEIGHT KGS
OMS 4	1 CRATE	2	2	EXHAUST AND VENTILATION SYSTEMS	5720X2220X2300	3500	4360
		2	2	SAFETY PACKAGE WITH GAS DETECTION SYSTEM			
		MT.20	MT.20	CONNECTION PIPING (FOAM.SYST.TO MIX HEADS)			
		MT.20	MT.20	CONNECTION PIPING (FOAM.SYST.TO MIX HEADS)			
	1 TANK	1	1	STORAGE TANK FOR C-PENTANE 3000LTS		858	858
	1 LOOSE	1	1	TRANSFER PUMP GROUP FROM CP TANK PENTAFOAM 40/20		60	60
	1 BUNDLE	MT. 24	MT. 24	RIGID PIPING CP TANK-PENTAFOAM40/20		100	100
	8 CARTONS	MT. 25	MT. 25	ROCK WOOL INSULATING MATERIAL	1200X600X600	144	160
		MT. 360	MT. 360	ROCK WOOL INSULATING MATERIAL			
	2 CARTONS	MT. 360	MT. 360	PROTECTION TUBE FOR ROCK WOOL	1060X640X1180	96	100
		MT.25	MT. 25	PROTECTION TUBE FOR ROCK WOOL			
	1 BUNDLE	MT.500	MT. 500	DISTRIBUTION PIPING (CP TANK TO PREMIX) .../...		670	670

			INVOICE NO. 23/EX
TRUCK NO. MM10GXE/MM08DDU	TOTAL PACKAGES NO. 21	TOTAL GROSS WEIGHT KGS. 7.333.-	

PACKAGE NUMBERS	QUANTITY PACKAGES	QUANTITY PCS	TOTAL PCS	DESCRIPTION OF THE GOODS	DIMENSIONS MM	TOTAL NET WEIGHT KGS	TOTAL GROSS WEIGHT KGS
	1 BUNDLE	MT.20	MT.20	STAINLESS TUBE DIA. 22		60	60
	1 BUNDLE	MT.30	MT.30	STAINLESS TUBE DIA. 35		130	130
	1 ROLL	MT.1500	MT.1500	CABLE 5X5.1		425	425
	1 ROLL	MT.500	MT.500	CABLE 4X2.5		54	54
	1 PALLET	1	1	SET OF RUN-CHANNEL	2400X800X500	140	150
	1 PALLET	MT.300	MT.300	CABLE 3X1	1200X800X500	196	206
		1	1	SET OF ELECTRIC CONNECTION CABLES ELECTRIC BOARDS-MACHINES			
		1	1	SET BOLDS			
		1	1	SET PF CABLE			
		1	1	SET OF PIPE HANGER			
	10 CARTONS 1 CRATES 2 PALLETS 4 BUNDLES 2 ROLLS 1 TANK 1 LOOSE					6.433	7.333

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RIVIERA s.r.l.

Riviera S.r.l.

Unido Contract 97/106 - Uzina Mecanica SADU - Romania

General Packing list (please refer to our offer 557/97 and further amendment)

2. Conversion of the assembly line for the refrigeration cycle

Galileo	no. 2 cases	Quantity
	Digifill B 150 F1 charging machine for R134a	1
	vacuum valve	1
	refrigerant valve	1
	quick coupler 1/4" for filler	1
	temperature sensor	1
	pirani head OG915	1
	inox start button for filler	1
	valve maintenance kit	1
	metering device maintenance kit	1
	transfer pump RP1	1
	gasket kit for refrigerant gas cylinder	1
	maintenance kit for refrigerant gas cylinder	1
	gasket for air cylinder	1
	Rotoil oil (can of 5 liters)	1

Klimax	no. 1 pallett	Quantity
	H10N leak detector for R134a	1
	set of maintenance and spare parts	1

3/4. Conversion of foaming for compression and absorption lines

OMS	no. 1 cage cms 330x212x245	Quantity
	Pentafoam HP 100/50 two-speed high pressure system complete with polyol/pentane line + Isocyanate line + tanks of 250 liters and cabin for polyol/pentane line + no. 2 catalytic sensors	1

	no. 1 cage cms 330x212x245	Quantity
	Pentafoam HP 40/20 two speed high pressure system same features as above	1

	no. 1 cage cms 330x192x237	Quantity
	electric board for Pentafoam HP 40/20	1
	electric board for Pentafoam HP 100/50	1
	elecric board for sensors and alarms - foaming area	1
	elecric board for sensors and alarms - door/cabinet jigs	1
	chillers - type 5 - 15000 Fr/h	2
	electric board for 3000 liters tank	1
	cylinders de-compression group	1
	fitting for CP truck-tank earthing + base	1

no. 1 cage cms 570x212x223	Quantity
boomer for injection heads - HP 40/20	1
boomer for injection heads - HP 100/50	1
aspiration groups for foaming machine cabins	2
aspiration group for foaming area cabin w/base and devices	1
aspiration group for cabinet area cabin w/base and devices	1
aspiration group for jigs area cabin w/base and devices	1
250 liters service tank for pure polyol	1
transfer pumps groups from tanks to foaming machines	2
electric run-channels set	1
pneumatic charging pumps	2
catalytic sensors	11
injection heads w/8 meters pipings and nitrogen injectors	4
balance lead cables and weights for boomers/heads	7

various materials to be loaded on trucks	Quantity
3000 liters tank with anti-corrosion external coating and double jacket, with capacity meter, probe, pressure meter and safety valve.	1
transfer pump group from cp tank to Pentafoam 40/20	1
rigid piping cp tank - Pentafoam 40/20	meters 24
rock wool insulating material	meters 25
alluminium by-pass sockets	4
sferical stainless valves 1/2"	6
rigid piping cp tank - Pentafoam HP 100/50	meters 360
rock wool insulating material	meters 300
protection tube for rock wool	meters 300
4" sleeves for tubes mounting	100
alluminium by-pass sockets	12
sferical stainless valves DN 20	12
stainless tube diam 22	meters 20
stainless tube diam 35	meters 30
stainless flanges DN 65	6
bolts set for flanges coupling	1
set for various mechanical connections	1
connection piping Penta HP 100/50 - injection heads	meters 10
connection piping Penta HP 40/20 - injection heads	meters 10
50x50 run-channel for foaming area pentanization	meters 210
cable 5x1,5	mts 1500
cable 4x2,5	mts 500
cable 3x1	mts 300
set of electric connection cables electric boards-machines	1
anti-explosion conncetions	40
anti-explosion ceramic fiber packages	2
anti-explosion material packages	2
lock bands for cables	800

6. Development of the servicing and repair technology

Klimax	Quantity
Tif 5650 leak detector for service	1
set of repair and maintenance parts	1
manifold set	1

ARSENALUL ARMATEI
REGIE AUTONOMA

R.A. ARSENALUL ARMATEI - UZINA MECANICA SADU
Str. PARANGULUI Nr. 1 , BUMBESTI - JIU, Jud. GORJ, ROMANIA
Tel: 040 - 53 - 463859 ,463201 fax: 040 - 53 - 463873, 463863

Messrs.
RIVIERA S.R.L.
VIA SANVITO SILVESTRO , 60
21100, VARESE - ITALY

During the visit of your technicians - Mrs. Perego, Pedroni, Cavalleri and Forni - at our plant the following activities have been performed:

- Installation of Digifill B150 F1 charging machine for R 134a.
  Relevant working tests with positive outcomes.

- Installation of Pentafoam HP 100/50 two-speed high pressure system complete with polyol/pentane line + Isocyanate line + tanks of 250 liters and cabin for poiyol / pentane line + no. 2 catalytic sensors.
  Relevant working tests with positive outcomes.

- Installation of Pentafoam HP 40/20 two-speed high pressure system same feature as above.
  Relevant working tests with positive outcomes.

WE DECLARE THAT OUR FACTORY IS PROPERLY WORKING AND IS IN POSITION TO PERFORM ALL OUR PRODUCTION ACTIVITIES BY EMPLOYING CFC-FREE TECHNOLOGY.

The present statement will be considered as CERTIFICATE OF ACCEPTANCE for the plant subject of Contract no. 97/106.

In faith ,

Manager
Eng.
PANOIU POMPILIU

- TÜF REPORT

AND ACCORDING MEASURES

19/20.11.98

TÜV
SÜDDEUTSCHLAND

REPORT

on Technical Plant Inspection

Plant:	1. Pentane-Tank, above ground. 2. Pentan-Tank, underground 3. Pentafoam 100/50 4. Pentafoam 40/20
Dates of inspection:	19. / 20. November 1998
Kind of inspection:	Safety inspection
plant location:	Ratmil / Romania
Experts:	Dipl.-Ing. Richardt TÜV Süddeutschland, NL-Ulm/BB Dipl.-Ing. (FH) Mack TÜV Süddeutschland, NL-Ulm/BB
Participant on location:	Mr. Carlo Candiani - OMS
Date:	20 January 1999

Bau und Betrieb

Niederlassung Ulm
Dampf und Druck

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Ulm, 1999-02-02
BB-ULM-RI/Ma
File-No.: OMS/Rat-RUM/01/99

1. Preliminary remark

The OMS company builds and delivers PU-foaming plants for both factories of the Project of UZINA Mecanica Sadu in Romania.

These plants are going to use Cyclopentane as foaming agent.

The main contractor and OMS have agreed to build these plants in accordance with the TÜV-safety requirements. The aim of the TÜV inspection is to prove the measures against fire and explosion hazard.

Following parts belong to the 2 Factories related to the PU Plant:

- Machine 1 Factory 1

  1 x Underground tank 10.000 l
  1 x Mixing unit with machine tank and HP Pump (100 kg machine)
  1 x Cabinet Carousel with 1 Mixing head
  1 x Door Plant with 1 Mixing head Pipes will be above ground approx. 300m
  1 x Inertisation for cabinet and doors via mixing head.

- Machine 2 Factory 2

  1 x Storage tank aboveground tank 3.000 l
  1 x Mixing unit with machine tank (250l)and HP Pump (40 kg machine)
  1 x Cabinet Carousel with 1 Mixing head
  1 x Door Plant with 1 Mixing head
  1 x Inertisation for cabinet and doors via mixing head.

2 DOCUMENTS USED AS A BASIS FOR THIS PLANT EVALUATION

2.1 Technical regulations

This plant evaluation is based on international, European and national regulations - in that order - as far as these are available and applicable.

These include the following essential regulations:

- international standards (ISO, IEC)
- Ordinance Regulating Facilities for Storing, Racking and Transporting combustible Liquids - Germany: VbF
- Decree for electrical plants in explosion dangerous areas, Germany: ElexV
- Decree for pressure vessels, Germany DruckbehV (pressure vessels)
- Law for immission protection: Germany BImSchG
- Law for water protection: Germany WHG (protection against water-polution)
- Electrotechnical regulations: International: IEC / European: EN / National: DIN VDE e.g. IEC 60073, IEC 439-1/A2, IEC 204-1, IEC 1310-2, EN 50054, EN 50013, EN 50020, EN 50081, EN 60529, pr. EN 1050, DIN VDE 0165, EN 349, EN 418, EN 294
- Fundamental safety aspects to be considered for measurement and control equipment: Germany DINV 19250
- Safety requirements for automated manufacturing systems: Germany VDI 2854
- personal protection regulations / accidents prevention - European: EN..EC / Germany: UVV/ZH
  e.g. VBG 1, VBG 5, VBG 61, ZH 1/200, ZH 1/255, ZH 1/8, ZH 1/10

- Technical regulations for combustible liquids and for gases: Germany TRbF / TRG e.g. TRbF 100, 110 / TRG 280
- Ex-proof / spark-proof for ventilators: Germany VDMA-24169 part 1
- Homologation of technical plant and equipment - European: conformity certificates (e.g. PTB, Cesi, Damko)
- EN 378, Refrigerating systems and heat pumps, Safety and environmental requirements
- pr EN 1612-2 Reaction molding machines
- EG machine directive (89/392/ESG, revised edition 91/368/EEC)
- CEI/IEG 335-2-24, Safety of household and similar electrical appliances
- IEC 79-10/EN 60079-10/VDE 0165 Part 101: Electrical apparatus for explosive gas atmospheres - classification of hazardous areas.

2.2 Documentation of the PU plants and the peripherals

- Storage tank Type 10.000 l / 3.000 l
  Work order 35/98M
  100/98
  Commissioning and Conformity Certificates

- Storage tank Type 10.000 l / 3.000 l
  Work order 35/98M
  100/98
  Technical documentation Item Lists and drawing

- Machine Pentafoam HP 100/50
  Work order 35/98B
  Serial Number 0835
  Technical documentation

- Machine Pentafoam HP 100/50
  Work order 35/98B
  Serial Number 0835
  Instruction for Equipments composing the plant

- Machine Pentafoam HP 100/50
  Work order 35/98B
  Serial Number 0835
  Testing and Conformity Certificates

- Machine Pentafoam HP 100/50
  Work order 35/98B
  Serial Number 0835
  Directions for use

- Machine Pentafoam HP 40/20
  Work order 35/98B
  Serial Number 0834
  Item lists and Drawings

3 Short description of the inspected plants

3.1 Plant for factory 1

3.1.1 Pentane Storage Tank (underground tank) according to drawing 1078/98 No.:820

a) Dates according to type plate:
Producer: C:I:S
No.: 98-317 271 MI
Volume: 10.000 l for Jacket 1000 l
Double walled

b) Important Safety Equipment:

- 2 x Pressure Gauge
  1 x for N_2.pressure inside the tank room,
  1 x for N_2-Pressure inside the jacket
- Safety relief valve Type SMIFN Nr.:981565 checked by ISPESL (set point 1.5 bar)
- Liquid level switch (super, max) Type: Nivelco,
  Cert-TÜV-A-Nr. Ex 97.D014.X
- Automatic-Valve, Type Air Torque
- Automatic-Valve, Type Bremer, GTXN 92 x 90 NP 17A
- Level indicator, Type VEGA-EL 21Ex, PTB No. Ex-95.D.2097
- Pump/Motor:
  Motor F.I. M.M., EEx II b T 4, CESI-CERT-AD-01.119
  Magnetic coupling made by Burgmann
  Pump: ANAR TIPO 1C25 TMG (set point of pump protection is 6 bar)

- Electro Panel: Mod. Stocc. Pent., Matr. 002 106
  Cod. A 00.360, Data 7/10/98

3.1.2 Pentafoam 100 (Wetpart)

a) Dates according to type plate:
Producer: OMS
No. of Day Tank: 98-314 541 MI / 806

b) Equipment:

- Polyol / Pentane-Mixing unit: (automatic entrance valve, flow meter, Pump/Motor)
- Polyol / Pentane Tank No. 806
  (Temperature -10°C / +90°C, automatic Valves, Overfilling switch, filling detection system, Stirrer, Stirrer motor, Leakage control system, pressure gauge for N_2, electrical heater, PT 100, Thermostat, approved safety relief valve)
- HP Pump (Motor, Leakage control system, Filter, Automatic valve)
- Gas sensors (2 x)
- Leakage- Sensor
- Technical ventilation (2 fans, Flow-switch)
- N_2-System for door/cabinet-inertisation: (pressure switch, flow-meter including flow-switch)
- Complete enclosure of the Pentafoam 100 including door control system
- The Iso-part is outside the enclosure.
- Electro panel for machine: CEROM, CE, Part. No. 002090

3.1.3 Safety-Panel

a) Dates according to type plate:
CEROM, 400 V, Part-No. 002134, diagram A 00364

b) Components:
- Gas alarm system (MSA 9020, Sensors EEx-d II C T6. CESI Ex 90050 X)
- Safety switch devices Type. Siemens 3 TK 2893, BIA No. 94 0080
- Control system for technical ventilation.

3.2 Plant for factory 2

3.2.1 Pentane tank (above ground)
according to drawing 1077/98 No.:821

a) Producer: C.I.S.
No. 98. 317 972 MI No:821
Volume: 3.000 l
Single walled

b) Equipment:

- Pressure Gauge (for N2 inside the tank)
- Level switch (super-max.), Type. Nivelco,
Cert. TÜV-A-No. Ex 97.014.X
- Automatic-Valve, Type. Air Torque
- Pneumatic membrane pump, (Type. Capitanio) in particular pit
- Pipe to the Mixing room:
Pipe will be flanged
Material of pipe. Stainless steel 1.4301
Flange. PN 10/16 UNI 6092-93 304l
Gasket: armed (metal ring) Teflon were no explosion zone is possible in the other parts only normal Teflon.
- Electro Panel: Mod. Stocc.Pent, Matr. 002 107, Cod. A 00 359, Data 07/10/98

3.2.2 Penta foam 40 (Wet part)

a) Dates according to Type plate.
Producer: OMS
No. of Day Tank: 98-314 539 MI / 804

b) Equipment:

- Similar like. part in 2.1.2 b
- Electro panel for Machine: CEROM, CE, Par. No. 002 033

3.2.3) Safety Panel

a) Dates according to type plate:
CEROM, 400 V, Part. No. 002 133, Diagram A 00 363

b) Equipment:

- Similar like. part in 2.1.3 b

4. Results of the inspection at the plants for Project UZINA Mecanica Sadu Factory 1, Romania

Remarks

4.1 Pentane-Tank

4.1.1 General

Concerning the used materials and the safety related equipment the tank meets the required technical standards

The approval of the TÜV inspection is restricted to the present equipment which was available during the inspection.

The present documentation is sufficient and meets the technical requirements
See additional Chapter 4.1.2)

4.1.2 Following measures are necessary:

a) Documentation
1. Super-max. level device: The certificates must be available
2. A plan shows the explosion zones must be available.
3. MSA-Tankgard I: The Certificate of conformity CESI Ex-91.C.126 X must be available.
4. The set points of the pressure gauges and thermometers must be inside the documentation.
5. The pressure limit switch of Schubert und Salzer is not in the documentation

b) Electrical control panel for Pentane tank:

1. In the power circuit of the Super-max-levels the relay KA 4 is not as reliable as requested. (Must be one failure safe)

Remarks

4.2 Pentafoam 100

4.2.1 General

The safety system against fire and explosion hazard at all is according to the technical standards and the state of the art.

The present documentation is sufficient and meets the technical requirements.
See additional Chapter 4.2.2)

4.2.2 Following measures are additional necessary:

1. The signals must be transmitted to an central place where a competent staff is always available.

2. The situation in the factory in case the electrical power brakes down must be clarified finally. The specific situation of the company must be considered.

3. The necessary function coupling to other safety relevant parts of the factory (e.g. the fire detection equipment) must be approved by experts in relation to the particular situation.

5 Results of the inspection at the plants for Project UZINA Mecanica Sadu Factory 2, Romania

5.1 Pentan-Tank

5.1.1 The results are same like in chapter 4.1.1.

5.1.2 Following measures are additional necessary:

a) Documentation

1. The technical documentation of the flexible Pentane pipes are available but In the present documentation it is not visible which kind of pipes will be used and whether the pipe is suitable for pentane or flammable liquids.

2. Operator instructions, e. g. Filling of the tank.

3. Pump
In the documentation of the Capitanio pump is not recognizable whether the pump is suitable for flammable liquids.

Remarks

b) Tank / Unloading place

1. Basin
   the basin for the tank will contain more than 3 m³
   It is planned to use concrete without cracks and it will be painted with anti electrostatic paint.

2. Overfilling sensor
   The sensor must be adjusted that the tank can not be filled for more than 95%.

5.2 Pentafoam 40 and Safety-Panel

5.2.1 Concerning the documentation are this parts similar as the parts mentioned in chapter 4.2

6 Measures, Function tests

During the inspection following measures and function tests has been carried out:

Measures/ Function tests	Result	Function according to the Matrix yes	no	Remark
1. Storage tanks		X		
2. Penta foam				
2.1 Measures:				
a) Potential equalisation / PE-connection	≤ 0,3 Ohm			
b) Electrostatic/ Field Intensity:				
- Tank insulant „Keimannflex ")	0 kV/m			
- Glass of the enclosure				
• Friction with Mohair	100 kV/m			
• without Friction	0 kV/m			
2.2 Function tests				
a) Gas alarm system				
- Power from Battery		X		
- Gas alarm 15%		X		
- Gas alarm 30%		X		
b) Ventilation				
- Function		X		
c) Super max-level		X		
d) N_2-Inertisation		X		
e) Leakage control system (control of seals)		X		
f) Leakage control system (Basin)		X		
g).Door control switch		X		

7 Conclusion

Trial operation requires a constant supervision of the plant by expert technical personnel. Furthermore, the organisational aspects of plant operation must also be constantly monitored.

In the opinion of the TÜV experts, operation with pentane can be started after the measures mentioned in the report.

The experts

K-J Richardt

i. A. E. Seeger
E. Mack

Contract 97/106
Conversion of U.M. Sadu
factories of Bumbesti Jiu, Romania
to phase-out the use of CFC-11 and 12
in the production of domestic appliances.

According to enclosed TUF report, after their inspection of 19 and 20.11.98, as per their advice, the following measures have been taken :

Page 8 Point 4.1.2

a) 1- Certificates are available
2- A plan has been supplied and kept with the whole documentation.
3- Certificate is available
4- A drawing showing such points has been supplied.
5- Documentation has been supplied.

b) 1- The tank has been operating with the supplied relay without any problem, however the technician that will visit the Counterpart in the first weeks of next year will replace it

Page 9 Point 4.2.2

1- Alarms and signals are efficient and constantly monitored by the pertaining staff. Even when the lines are not operating, i.e. at night and week-ends, staff is available inside the factory in case of emergency.

2- There is a private power station serving the whole industrial complex of U.M. Sadu, therefore the risk of break-downs is practically non-existant.

3- We were informed that, due to the Public nature of the factory and the type of products, other than refrigerators, being produced inside the whole industrial complex, government experts are constantly monitoring such aspects.

Page 9 Point 5.1.2

a) 1- The documentation used by OMS is a standard and widely accepted one, the nature of the piping used is, also, standard and suitable for use with higly-flammable liquids.
It doesn' t describe the chemical composition of the materials used in manufacturing the piping, which can be examined on site, if necessary. The documentation provided consists of instructions on mounting and maintenance.

2- Instructions on filling the tank were given to the pertaining staff. Normally, it's the supplier of c-pentane's operator(s) that carries out the filling operations.

3- same as point 1, above.

b) 1- The basin is suitable to contain the 3000 liters tank, it is made in strong concrete and has been painted with anti-static paint after the TUF report had been issued.

2- There is no need of such device, as the tank is normally filled at 70/75% of its capacity, allowing the line to operate for months.

The lines are operated only by personnell of U.M. Sadu with, at least, a decade of experience in handling foaming equipments and supervisioned by a team of engineers.

- VISIT TO THE PROJECTS SITE, 6 MONTHS AFTER INSTALLATION JULY 1999

- FURTHER ACTIVITIES UP TO DEC. 1999

Contract 97/106
Conversion of U.M. Sadu
factories of Bumbesti Jiu, Romania
to phase-out the use of CFC-11 and 12
in the production of domestic appliances.

We visited the Project's site at the end of july, 1999 to re-view the situation of the two lines that were operating efficiently.

The assigned operators and staff were carrying out their job, smoothly.

After a few months, as agreed, we despatched a number of spare parts as per enclosed OMS' proforma invoice 82/99, at the Counterpart's request.

Due to the rigid ambient conditions, the Counterpart decided to stop the two lines, temporarily, over december and the Holiday Season, to resume activities early next year at the presence of one technician from our side.

Instructions on how to empty the machines and fill them with proper liquids, in order to prevet corrosion and damages, have been given as per enclosed fax dated 02.12.99

Riviera s.r.l.

21100 Varese (Italy) - Via Silvestro Sanvito, 60 - tel. 0332 / 282984 - telefax 0332 / 240309 - telex 325126
Partita IVA 02149680122 Capitale Sociale L. 20.000.000 Reg. Soc. 20485 Tribunale di Varese - C.C.I.A.A. 234056

Varese, li 07.07.99

vs. rif.

ns. rif.

Messrs.
Uzina Mecanica SADU
Bumbesti Jiu
c.c. **Arsenalul Armatei**
Bucuresti
ROMANIA

Object : Contract 97/106

Dear Sirs,

please note that, due to unexpected personal engagements, OMS technician, Mr Cannata, will have to be replaced by Mr Tiziano Perego.
However, due to this change, we regret informing You that our group will arrive in Bucuresti on 20.07.99 and will perform its activities at Your factory until 23.07.99.

Our delegation will be composed as follows :

Mr GIAMPIERO PEDRONI - Riviera technical manager - pass. no. 773596A

Mr ROLANDO TEDIOLI - Riviera technician - pass. no. 747896L

Mr TIZIANO PEREGO - OMS technician - pass. no. 025360T

Mr ANTONIO FORNI - Riviera projects' coordinator - pass. no. Y006559

Flight details will be informed at the beginning of next week.

We are sorry for the inconvenience and we trust in Your understanding.

Thank You for Your attention and best regards.

Yours faithfully,
Riviera S.r.l.
Antonio Forni
Projects' coordinator

IMPIANTI OMS

OMS Group
Polyurethane Evolution

Impianti OMS Spa
Via Sabbionetta 4
20050 Verano Brianza (Mi) Italy
Tel. +39-0362-983.1
Fax +39-0362-983217
internet: www.omsgroup.it
e-mail: impianti.oms@omsgroup.it

ICIM
ISO 9002
Cert. n° 0577

Verano Brianza, 28.10.99

Vs. rif.

Ns. rif.

UZINA MECANICA SADU
STR. PARANGULUI NR. 1 BUMBESTI JIU
1435 JUD. GORJ
ROMANIA

PROFORMA INVOICE N° 82/99

OGGETTO:

QTY	*DESCRIPTION*	*CODE*	*UNIT PRICE USD.*	*UNIT NET WEIGHT KG.*	*CUSTOMS CODE*
2	SELF-CLEANING FILTER ½" MOD. 25	921000124	10	1	84779010
2	2-WAYS LP BALL VALVE ¼"	920900308	1	1	84779010
2	OUTPUT REGULATOR ¼"	920505557	1	2	84779010
2	CALIBRATOR CARTRIDGE GROUP 1"	133121002	5	2	84779010
2	BALL VALVE 2V MVZ 1"1/2	920900304	5	2	84779010
4	PRESSURE GAUGE HOLDER DIAM. 18	134173016	2	0,5	84779010
1	PRESSURE GAUGE 0-20 1 CONTACT ½" DN100	920100139	10	2	84779010
1	AMPLIFIER FOR LEVEL SENSORS	930100124	10	1	84779010
2	HYDRA-CELL VOLUMETRIC PUMP	902200300	30	8	84779010
2	ADDING BASE	134203002	5	5	84779010
2	COUPLING TRASCO28-38 24-7/8	134203001	2	1	84779010
2	TANK LT 0.5 ¼"	920800314	1	0,5	84779010
2	LEVEL INDICATOR IEG 1P-100W	930100119	1	0,2	84779010
2	P&F BARRIER	930401706	10	0,5	84779010
4	O-RING 4081-75 SHORE VITON	920200812	1	0,1	84779010
2	LIP SEAL SAFCO AR 600258	920200303	1	0,1	84779010
2	O-RING 4750-75 SHORE VITON	920200838	1	0,1	84779010
2	LIP SEAL 52-40-7 VITON	920200448	1	0,1	84779010
2	O-RING 162-75 SHORE VITON	920200807	1	0,1	84779010
2	NON RETURN VALVE TYPE CA38/4 COUPLING 1-1/2"	920404040	1	0,5	84779010
2	UNION E302-22L	920401706	1	0,5	84779010
2	UNION E222-22L	920401407	1	0,5	84779010
2	UNION E221-22L	920401207	1	0,5	84779010
2	UNION E231-222L	920400907	1	0,5	84779010

IMPIANTI OMS

OMS Group
Polyurethane Evolution

2	UNION E412-122L	920402105	1	0,5	84779010
2	UNION E281-222L	920401107	1	0,5	84779010
2	UNION E502-22-18L	920402502	1	0,5	84779010
2	UNION E222-18L	920401406	1	0,5	84779010
2	UNION E412-118L	920402104	1	0,5	84779010
2	UNION E402-112L-G1/2"	920402316	1	0,5	84779010
2	UNION E211-212L	920400805	1	0,5	84779010
2	UNION E422-1/4"-3/8"	920402203	1	0,5	84779010
2	UNION E412-108L	920402101	1	0,5	84779010
2	UNION E281-212L	920401105	1	0,5	84779010
4	UNION E211-208L ¼"	920400803	1	0,5	84779010
2	UNION E412-108L	920402101	1	0,5	84779010
2	REDUCTION AIR UNION RA014 ½-1/4	920500405	1	0,2	84779010
2	REDUCTION RA 014 3/8-1/2	920500406	1	0,2	84779010
2	UNION E211-212L	920400805	1	0,2	84779010
2	UNION E502-18-12L	920402501	1	0,2	84779010
2	UNION E211-218L	920400806	1	0,5	84779010
2	UNION E412-142L	920402108	1	1	84779010
2	CONICAL CAP 105811-28L -DISEM	920407102	1	0,5	84779010
2	UNION E222-18L	920401406	1	0,5	84779010
2	UNION E221-18L	920401206	1	0,5	84779010
2	UNION E231-208L	920400903	1	0,2	84779010
2	UNION E211-208L	920400803	1	0,2	84779010
1	SET OF ELECTRIC MATERIAL		20	9	84779010
2	BATTERY SIAC LC15 12V 15AH		20	13	84779010
	TOTAL VALUE ONLY FOR CUSTOMS.....**USD. 300**			**NET W. KG. 114**	

- Goods without value, under guarantee
- Goods rendered CIF

Goods of ITALIAN origin

N. 2 PACKAGES:
1) CM. 112x55x49
2) CM. 42x27x34
Total net weight kg. 114
Total gross weight kg 134
MARK: UZINA MECANICA SADU
1435 BUMBESTI JIU - JUD. GORJ (ROMANIA)
Customs code: 84779010

Riviera s.r.l.

21100 Varese (Italy) - Via Silvestro Sanvito, 60 - tel. 0332/282984 - telefax 0332/240309 - telex 325126
Partita IVA 02149680122 Capitale Sociale L. 20.000.000 Reg. Soc. 20485 Tribunale di Varese - C.C.I.A.A. 234056

Varese, li 02.12.99

vs. rif.

ns. rif.

Messrs.
Uzina MecanicaSADU
Bumbesti Jiu
ROMANIA
k.a. **Eng. Panoiu**
Eng. Lazarescu

Object : Contract 97/106

Dear Sirs,

in order to preserve the two foaming lines until Mr Perego's visit, please note we advice You to purchase, *at least*, kgs 200 of Mesamoll.

In case You would like us to provide it, please note our retail price is ltl. **5.500 per kilo**, equal to **2,85 Euro,** ex-our warehouse in Varese, Italy, and that it comes in drums of kgs 220 each.

Therefore, the total cost, for 1 drum, would be ltl. 1.210.000 or Euro 627 and we would prefer if You arrange the shipment, Yourself, by sending a courier to our warehouse.

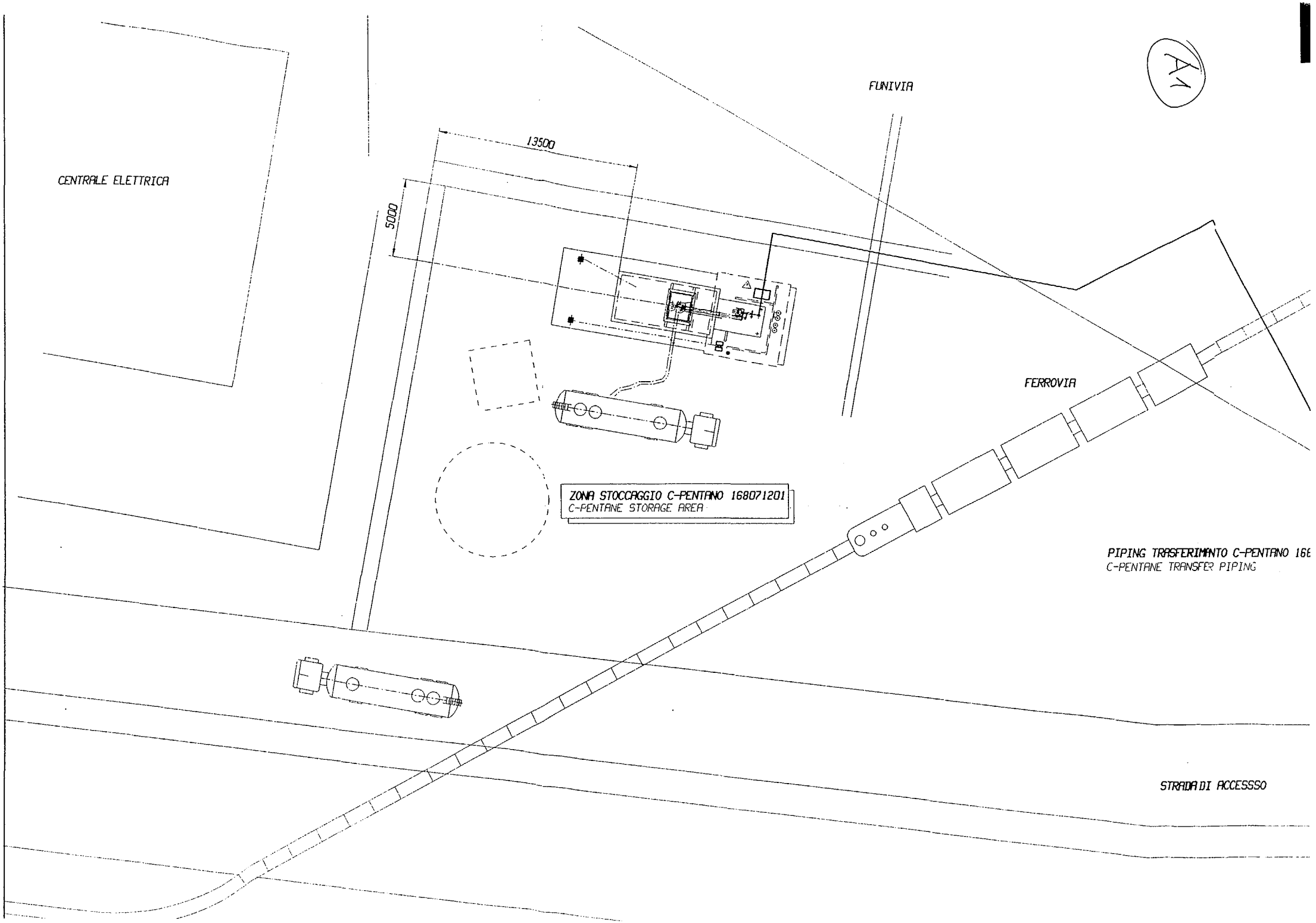
Afterwards, You should proceed as follows :

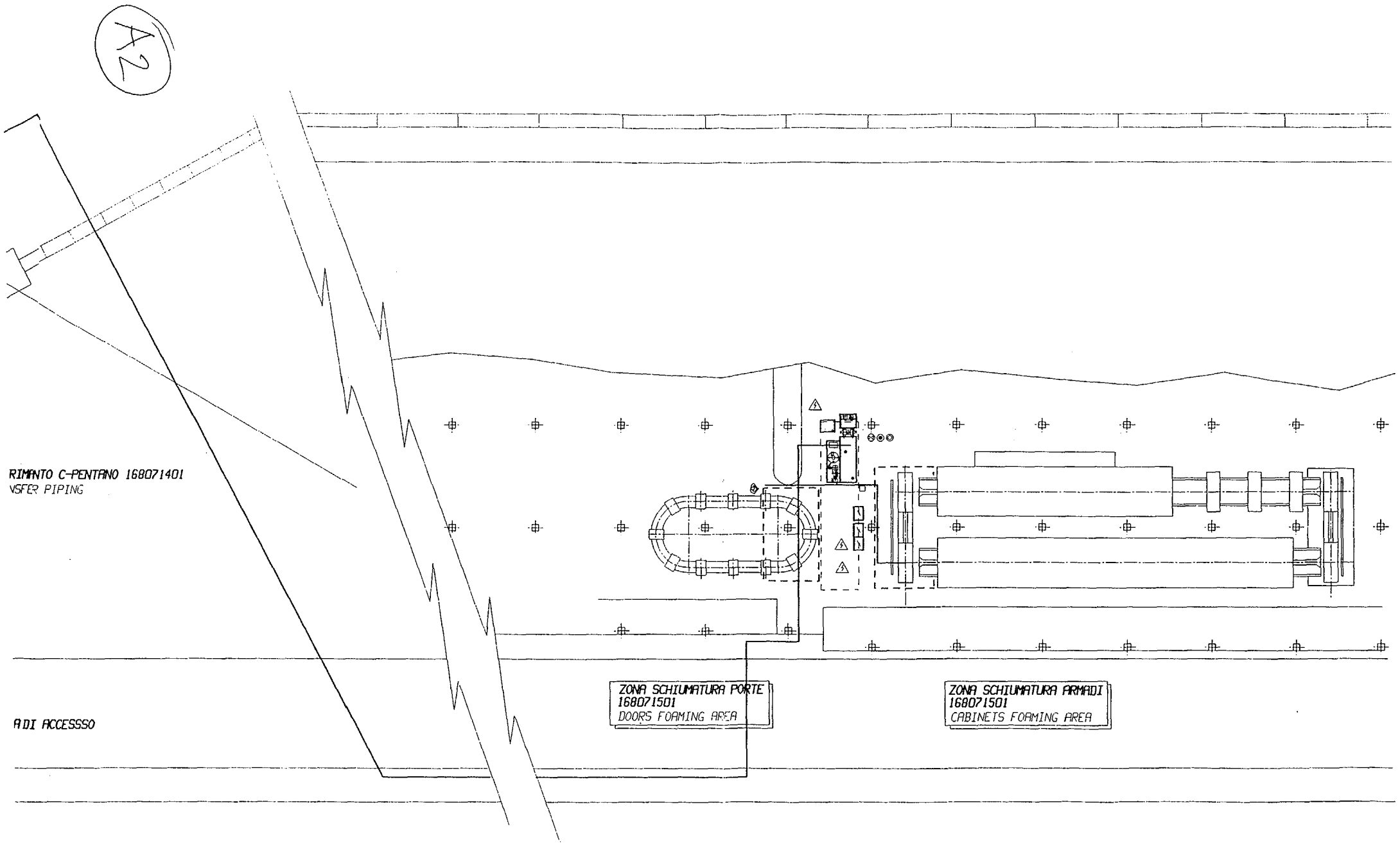
a- descharge all chemical components from the tank(s)
b- fill the tank with Mesamol cleaning agent (about 15-20 liters)
c- by using the valve on the filter, descharge this quantity of Mesamol at about 0,5 bar pressure in the tank.
d- repeat points (b) and (c) two or three times.
e- fill the tank with Mesamol, again (this time about 30 liters)
f- desconnect the tank's feed-back tubes (2-3 bars)
g- give pressure to the tank
h- place a collecting container in correspondance of the desconnected tube.
i- push "Start pompe" for about 10 seconds, then stop the pumps.
l- with selector in "recycle" position ("taratura iniettori") push the injection button and descharge all the Mesamol completely (make sure the high pressure pump does not work without material inside the tank)
m- repeat operations from (e) to (l) two or three times.
n- stop the machine and leave it with about 20 liters of Mesamol in the tank.

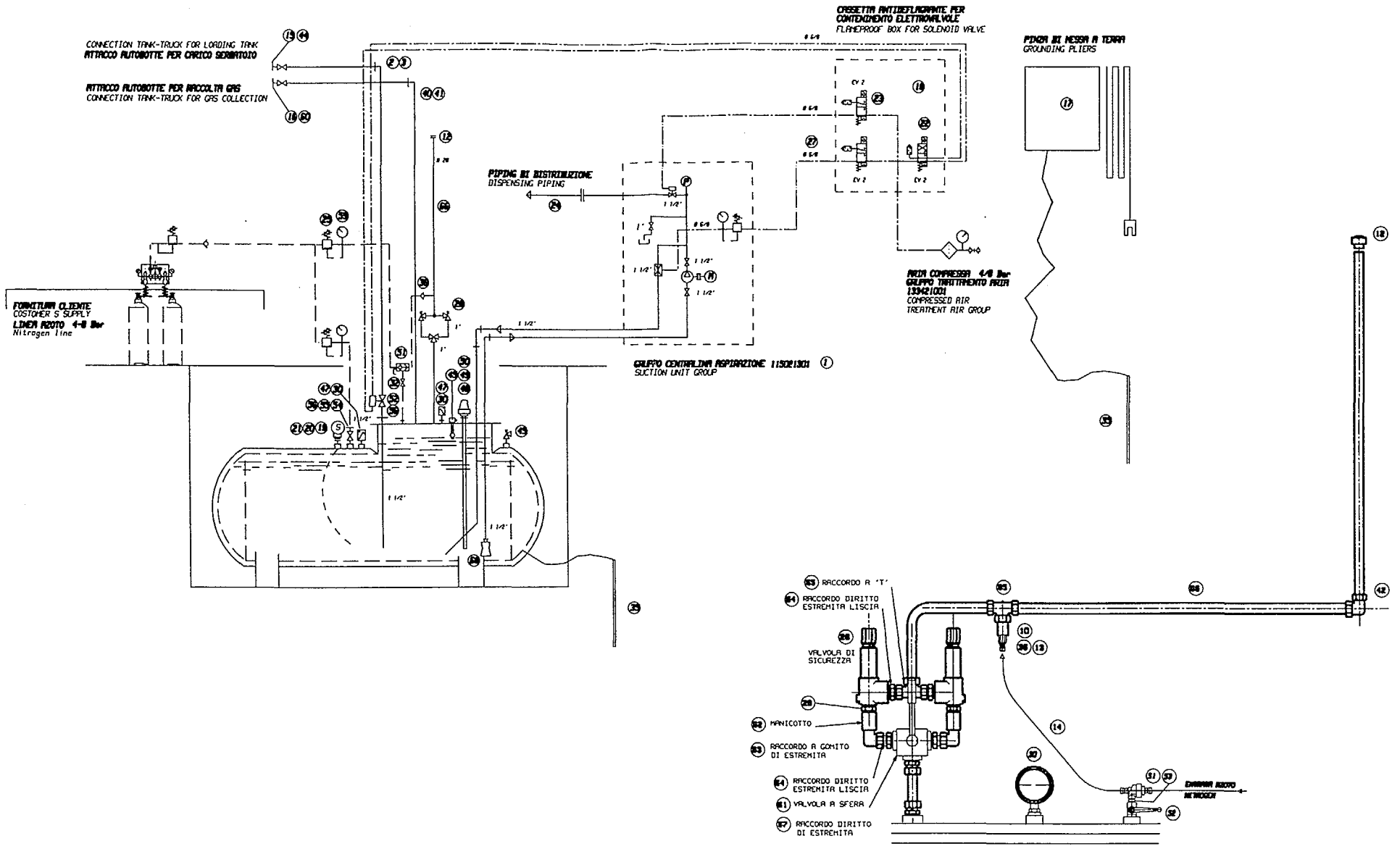
Thank You and warmest regards.

Yours faithfully,
Riviera S.r.l.
Antonio Forni
Projects' coordinator

Antonio Forni


A1
FUNIVIA
13500
5000
CENTRALE ELETTRICA
FERROVIA
ZONA STOCCAGGIO C-PENTANO 168071201
C-PENTANE STORAGE AREA
PIPING TRASFERIMANTO C-PENTANO 16
C-PENTANE TRANSFER PIPING
STRADA DI ACCESSSO


A2
RIMANTO C-PENTANO 168071401
VSFER PIPING
ZONA SCHIUMATURA PORTE
168071501
DOORS FOAMING AREA
ZONA SCHIUMATURA ARMADI
168071501
CABINETS FOAMING AREA
ADI ACCESSSO
FIUME
RIVER



DATA	MODIFICA

SCOSTAMENTI AMMESSI PER QUOTE SENZA TOLLERANZA SECONDO UTN 002

Campi dimensioni nominali	›0.5 ÷3	›3 ÷6	›6 ÷30	›30 ÷120	›120 ÷315	›315 ÷1000	›1000 ÷2000
Scostamento grado grossolano	0.15	0.2	0.5	0.8	1.2	2	3
Scostamento grado medio	0.10	0.1	0.2	0.3	0.5	0.8	1.2

OMS Group Polyurethane Evolution

REPLACE DRW. *	DATE 30-04-98	MACHINED *
REPLACED DRW. *	SIGNATURE CP	SCALE 1:10

DESCRIPTION *

SCHEMA DI FLUSSO REPARTO STOCCAGGIO

* STORAGE AREA FLOW-DIAGRAMM

DRAWING 168075301

DATA	MODIFICA

SCOSTAMENTI AMMESSI PER QUOTE SENZA TOLLERANZA SECONDO UTN 002

Campi dimensioni nominali	›0.5 ÷3	›3 ÷6	›6 ÷30	›30 ÷120	›120 ÷315	›315 ÷1000	›1000 ÷2000
Scostamento grado grossolano	0.15	0.2	0.5	0.8	1.2	2	3
Scostamento grado medio	0.10	0.1	0.2	0.3	0.5	0.8	1.2

CONNECTION TANK-TRUCK FOR LOADING TANK
ATTACCO AUTOBOTTE PER CARICO SERBATOIO

ATTACCO AUTOBOTTE PER RACCOLTA GAS
CONNECTION TANK-TRUCK FOR GAS COLLECTION

FORNITURA CLIENTE
COSTOMER S SUPPLY

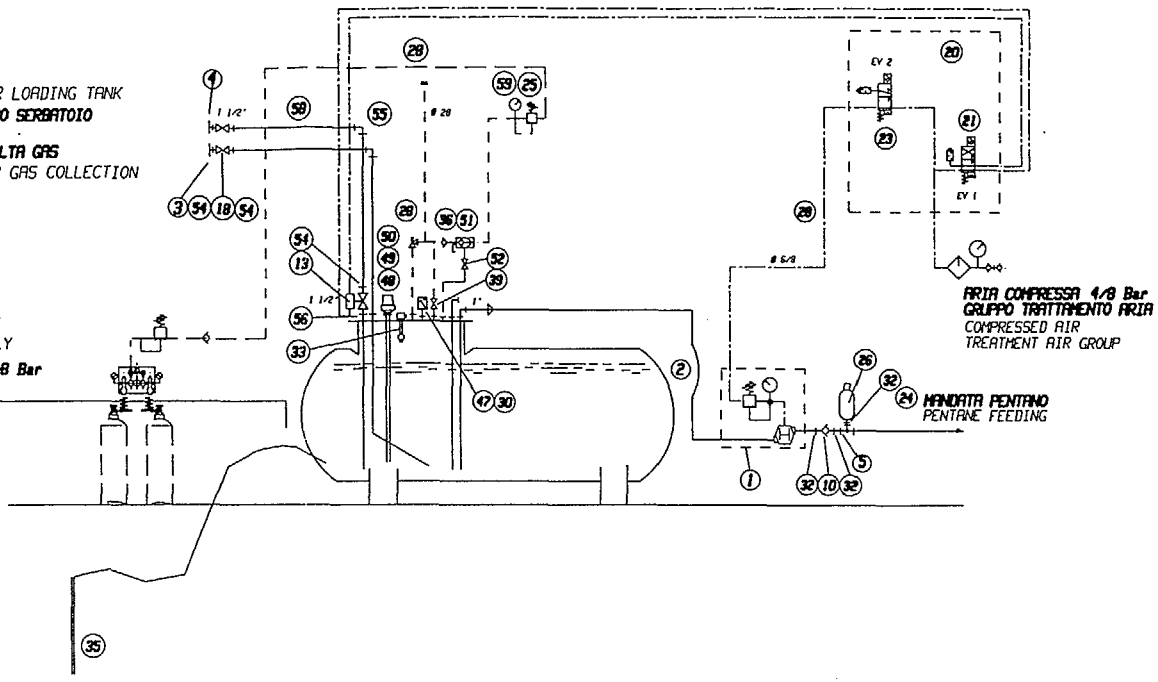
LINEA AZOTO 4-8 Bar
Nitrogen line

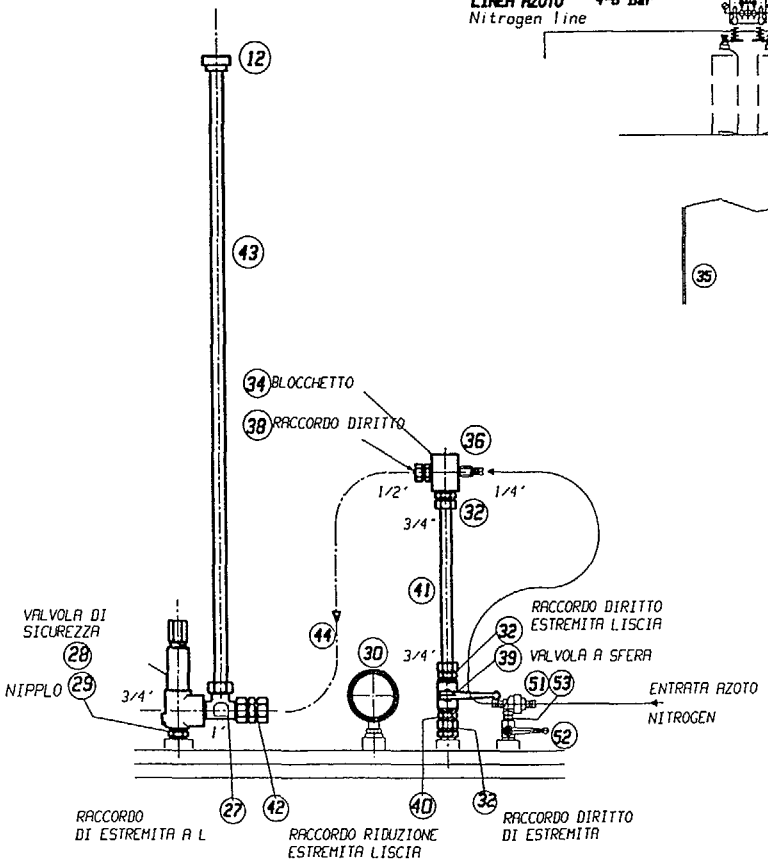
CASSETTA ANTIDEFLAGRANTE PER CONTENIMENTO ELETTROVALVOLE
FLAMEPROOF BOX FOR SOLENOID VALVE

ARIA COMPRESSA 4/8 Bar GRUPPO TRATTAMENTO ARIA
COMPRESSED AIR TREATMENT AIR GROUP

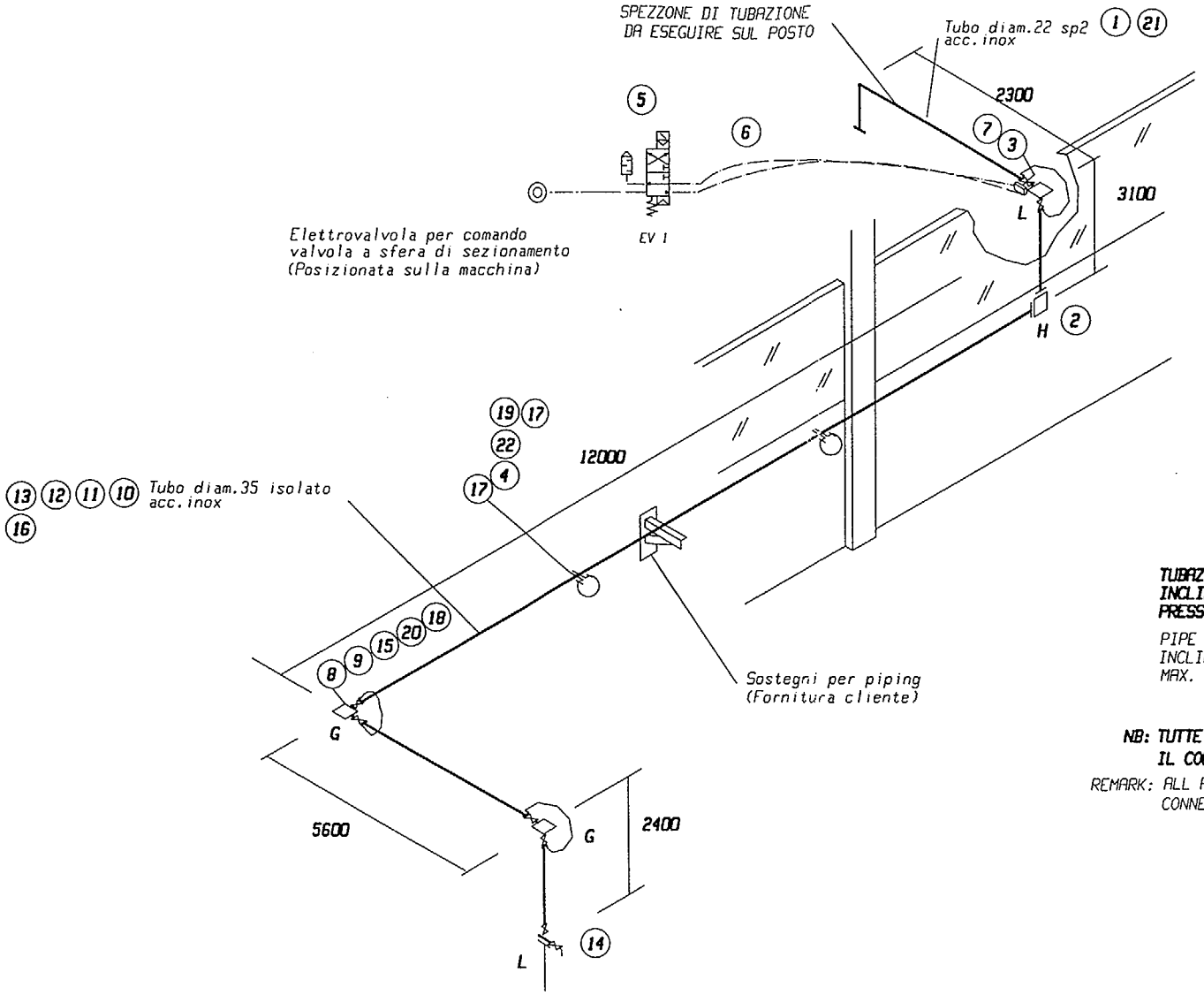
MANDATA PENTANO
PENTANE FEEDING

PINZA DI MESSA A TERRA
GROUNDING PLIERS





OMS Group Polyurethane Evolution	REPLACE DRW. *	DATE 25-05-98	MACHINED *
	REPLACED DRW. *	SIGNATURE CP	SCALE 1:10
DESCRIPTION * SCHEMA E MONTAGGIO ACCESSORI SU SERBATOIO STOCCAGGIO * DIAGRAM AND ACCESSORIES FOR TANK STORAGE		DRAWING 168065301	



TUBAZIONE DISTRIBUZIONE C-PENTANO
INCLINAZIONE 0.5% (Verso il serbatoio stoccaggio)
PRESSIONE MAX. 15Bar

PIPE FOR C-PENTANE DISPENSING
INCLINATION 0.5% (Storage tank side)
MAX. PRESSURE

NB: TUTTE LE TUBAZIONI DEVONO AVERE
IL COLLEGAMENTO DI MESSA A TERRA

REMARK: ALL PIPING SHOULD HAVE EARTHING CONNECTIONS

REPARTO STOCCAGGIO 3 m ^{3}
STORAGE AREA

DATA	MODIFICA

SCOSTAMENTI AMMESSI PER QUOTE SENZA TOLLERANZA SECONDO UTN 002

Campi dimensioni nominali	›0.5 ÷3	›3 ÷6	›6 ÷30	›30 ÷120	›120 ÷315	›315 ÷1000	›1000 ÷2000
Scostamento grado grossolano	0.15	0.2	0.5	0.8	1.2	2	3
Scostamento grado medio	0.10	0.1	0.2	0.3	0.5	0.8	1.2

OMS Group Polyurethane Evolution

REPLACE DRW. *		DATE 03-07-98	MACHINED *
REPLACED DRW. *		SIGNATURE CP	SCALE 1:1

DESCRIPTION *

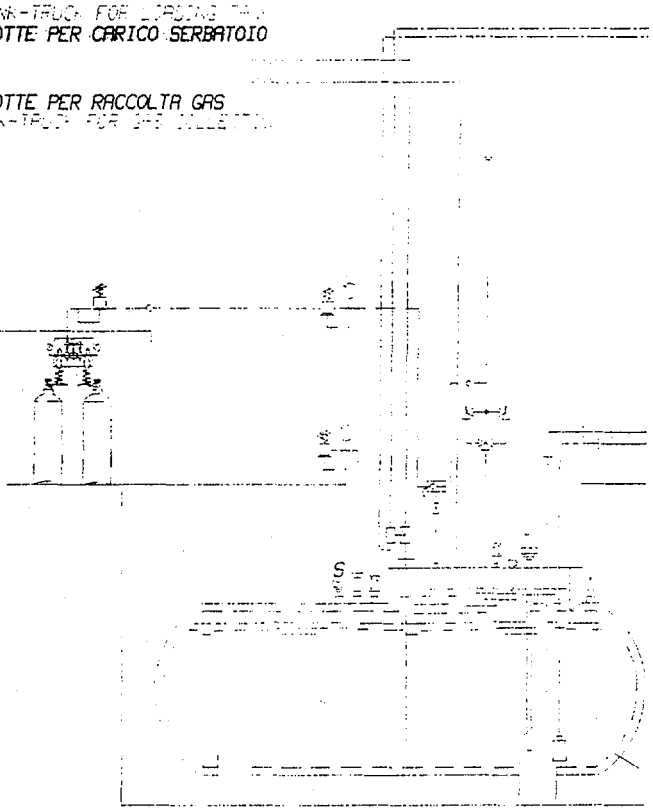
PIPING TRASFERIMENTO C-PENTANO

* C-PENTANE TRANSFER PIPING

DRAWING 168061401

CONNECTION TANK-TRUCK FOR LIQUID TAKE
ATTACCO AUTOBOTTE PER CARICO SERBATOIO

ATTACCO AUTOBOTTE PER RACCOLTA GAS
CONNECTION TANK-TRUCK FOR GAS RECOVERY



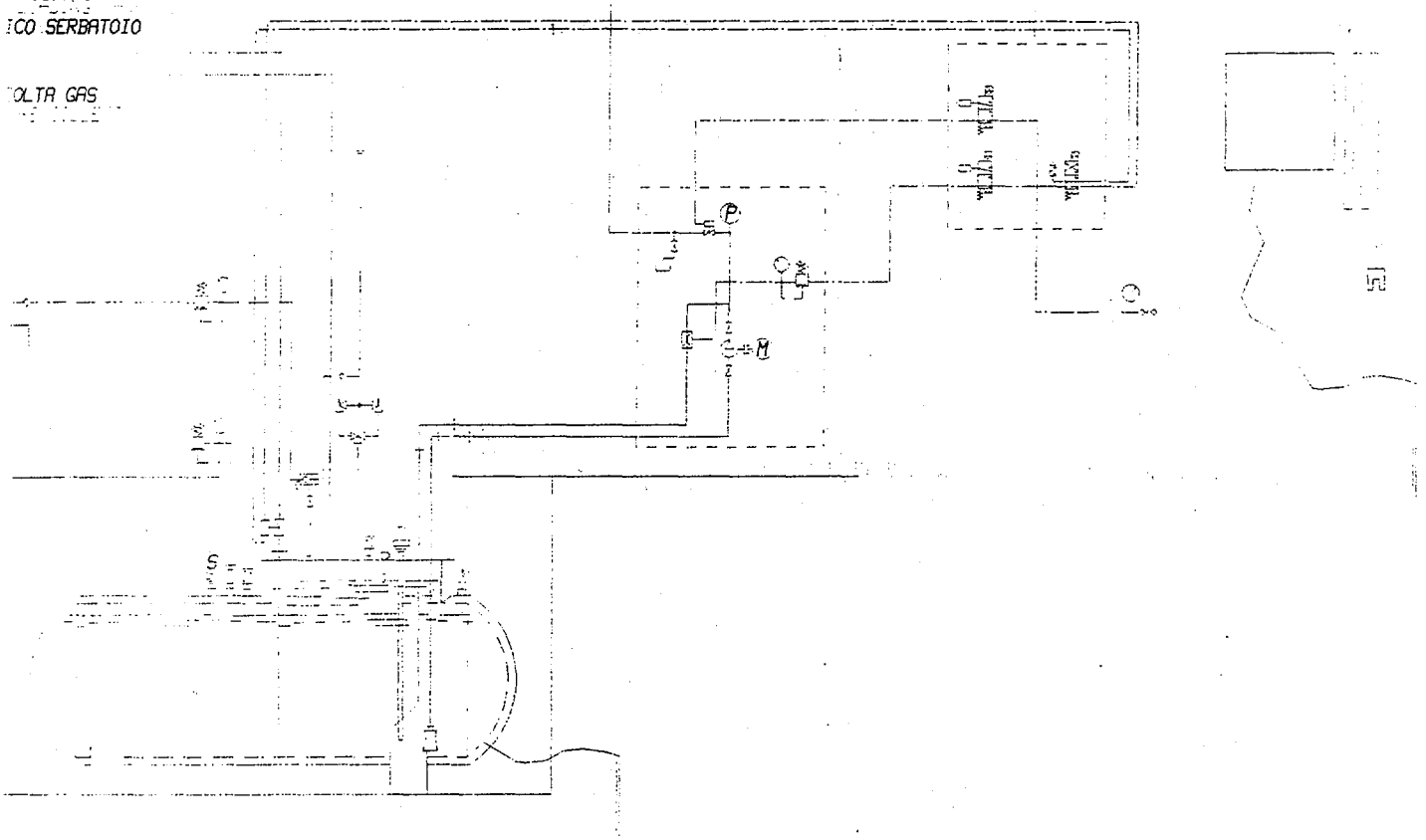
FORNITURA CLIENTE
COSTOMER S SUPPLY
LINEA AZOTO 4-8 Bar
Nitrogen line

SCHEMA DI FLUSSO IMPIANTO STOCCAGGIO 1680
STORAGE PLANT FLOW-DIAGRAM

E1

ICO SERBATOIO

OLTA GAS



SCHEMA DI FLUSSO IMPIANTO STOCCAGGIO 168075301
STORAGE PLANT FLOW-DIAGRAM

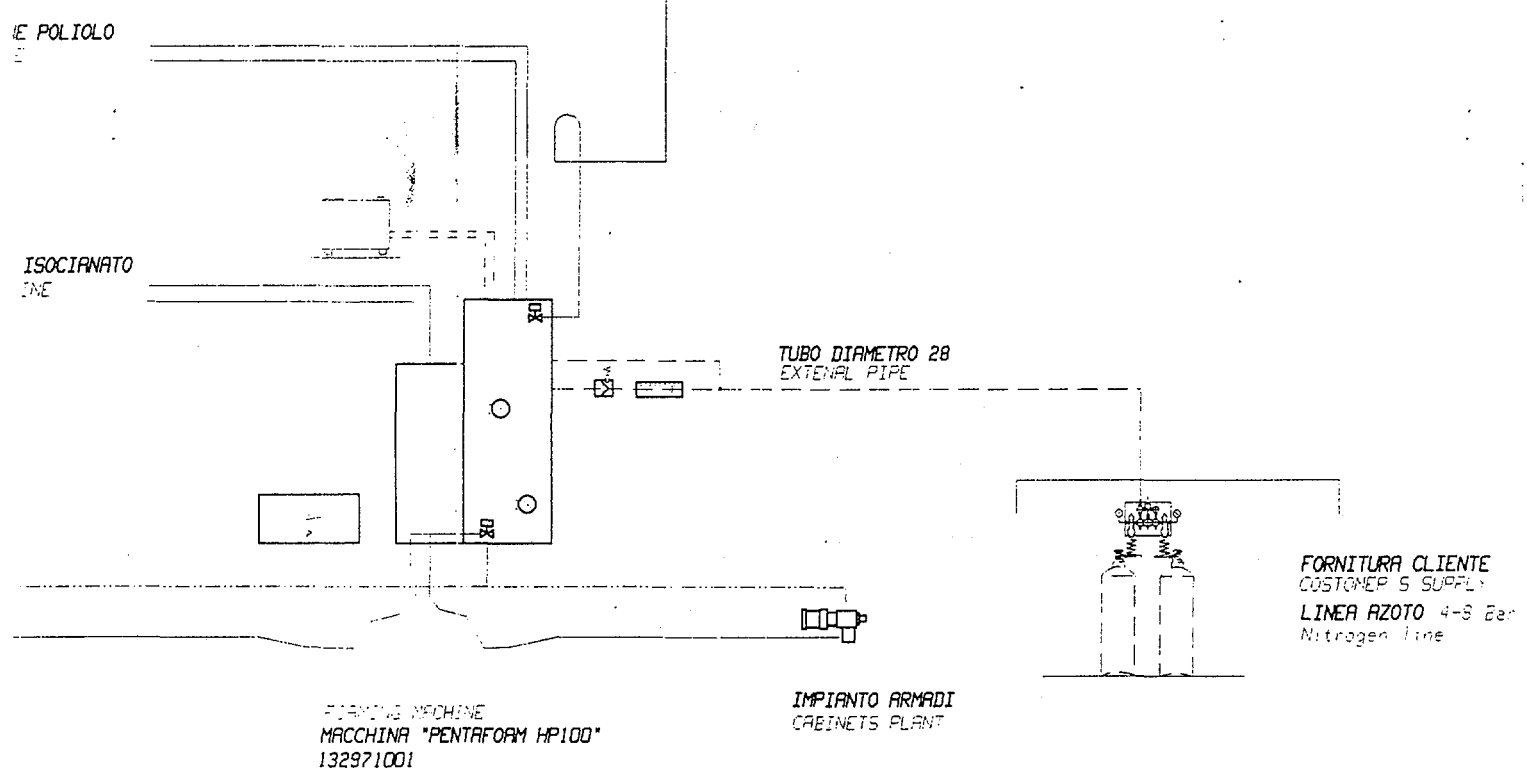
LINEA ALIMENTAZIONE POLIOLO
POLYOL FEEDING LINE

LINEA ALIMENTAZIONE ISOCIANATO
ISOCIANATE FEEDING LINE

IMPIANTO PORTE
DOORS PLANT

MACCH
13297

E2

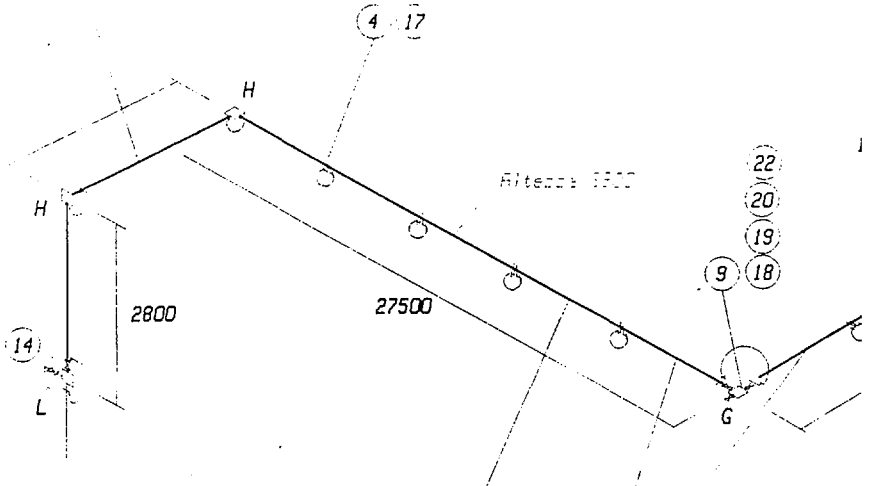


E3

OMS Toud Polyurethane Evolution	REPLACE DRW. *	DATE 11-05-98	MACHINES *
	REPLACED DRW. *	SIGNATURE CP	SCALE 1:10
*	SCHEMA DI FLUSSO IMPIANTO		168075101

[redacted]

SEZIONE DI CAPPOTTE
DA ESEGUIRE SUL POSTO

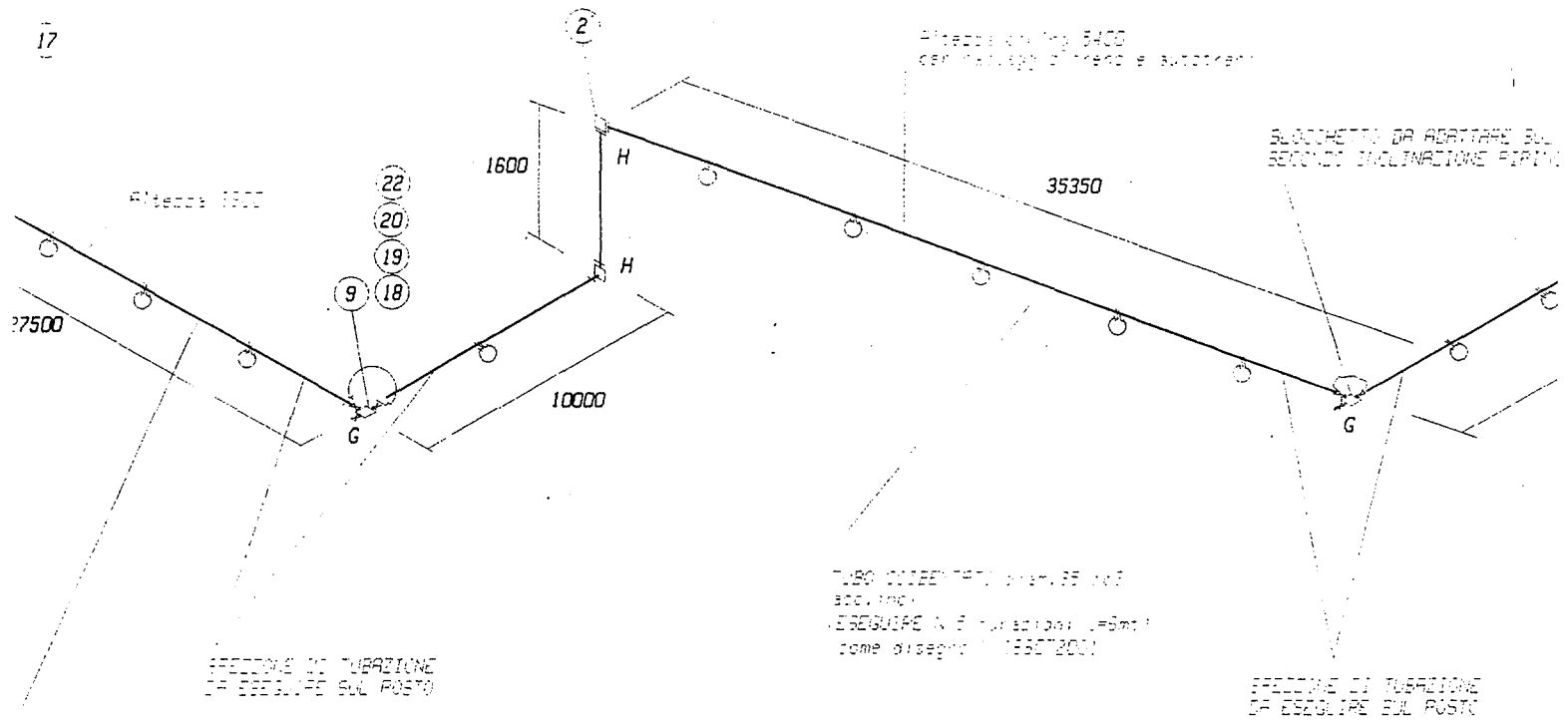


STOCCAGGIO C-PENTANO
10 m³

SEZIONE DI TUBAZIONE
DA ESEGUIRE SUL POSTO

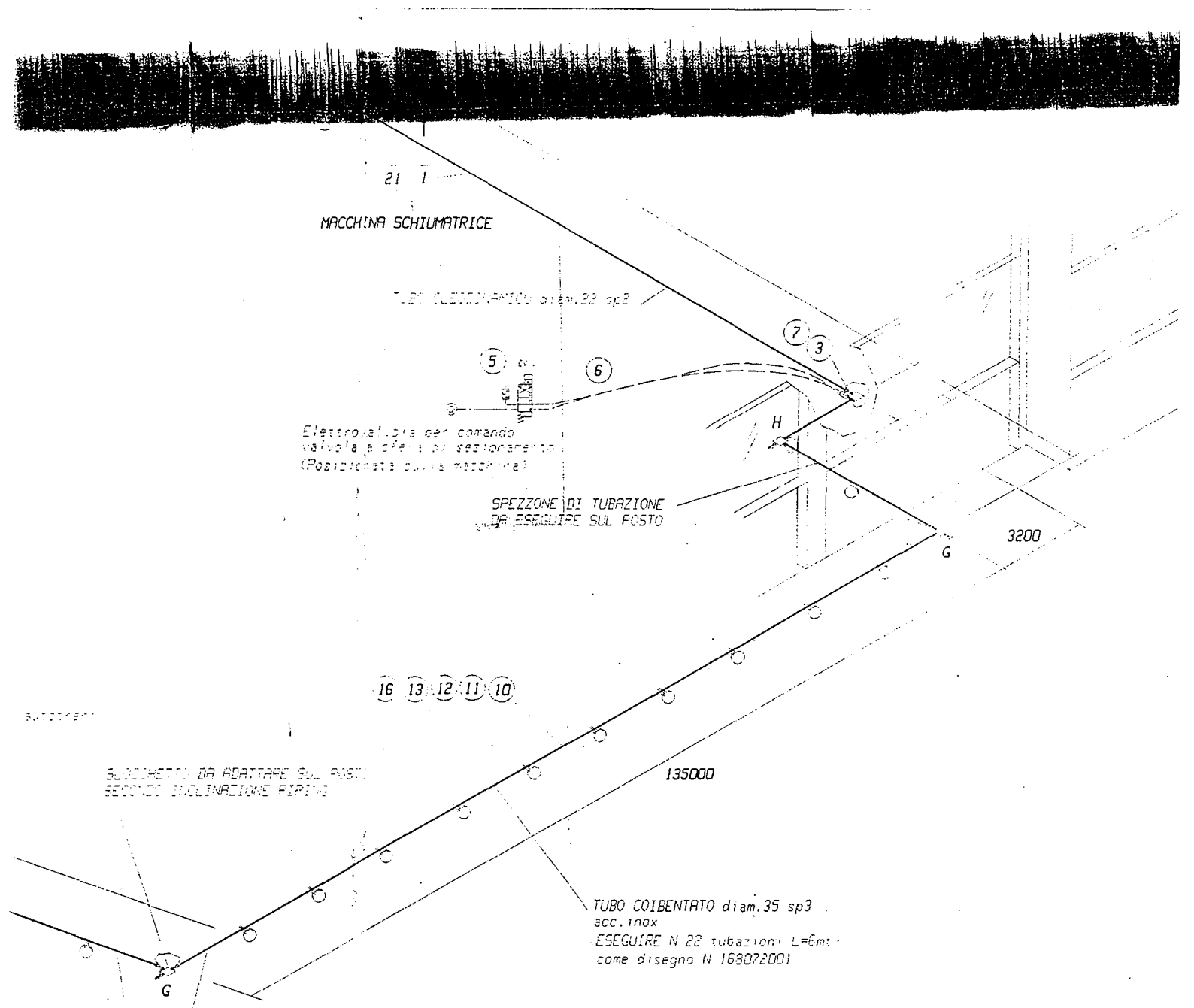
TUBO COIBENTATO : [illegible]m.35 sp3
acc. inox
(ESEGUIRE N.4 tubazioni L=45mt)
come disegno N. [illegible]

Sostegni per piping
(Fornitura cliente)



TUBO COIBENTATO ø mm.35 sp3
acc.inox
(ESEGUIRE N 4 tubazioni L=6mt)
come disegno N 1551200

F2



TUBAZIONE DISTRIBUZIONE C-PENTANO
INCLINAZIONE 0.5% (Verso il serbatoio stoccagg
PRESSIONE MAX. 15Bar

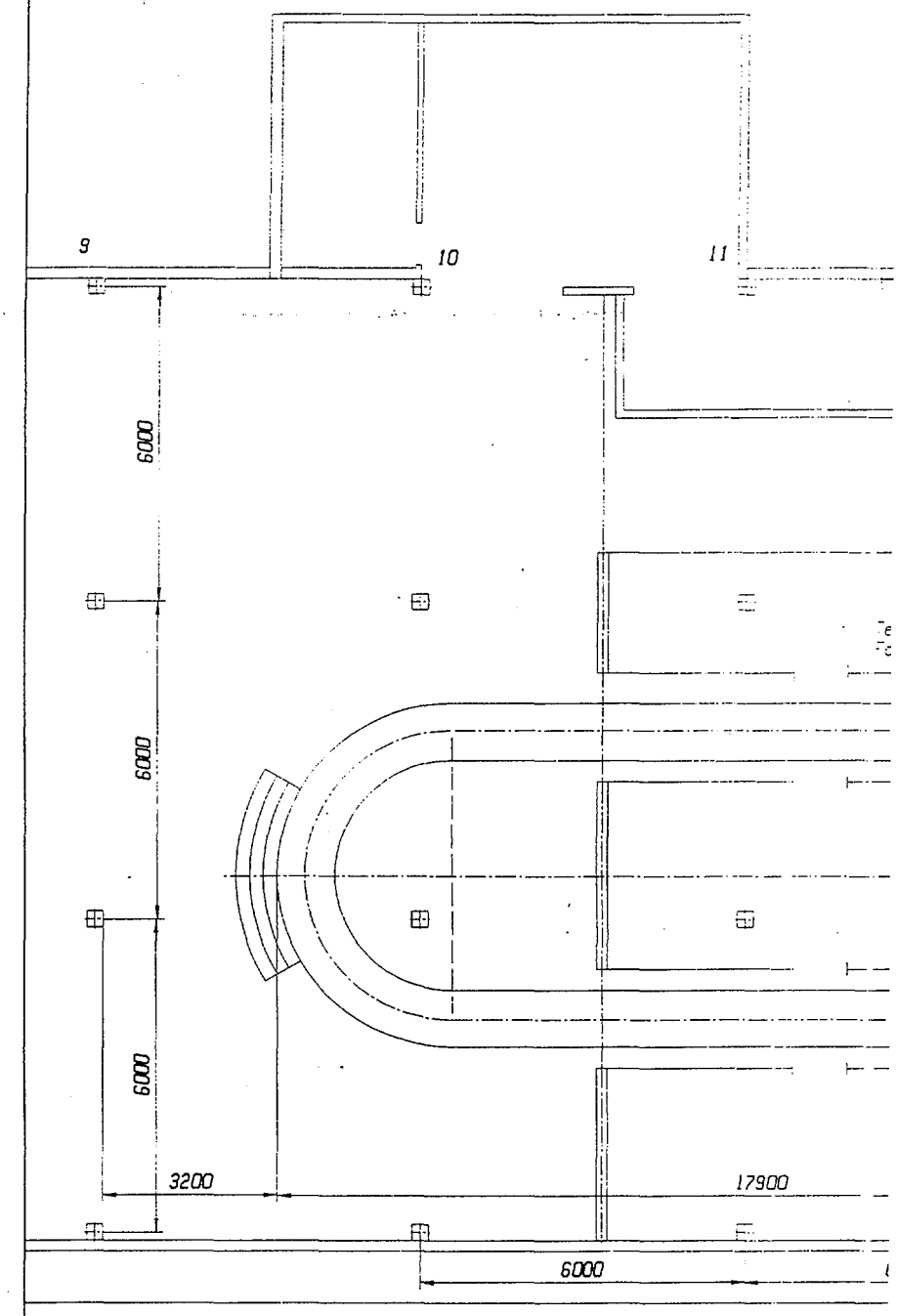
PIPE FOR C-PENTANE DISPENSING
INCLINATION 0.5% (Storage tank side)
MAX. PRESSURE

NB: TUTTE LE TUBAZIONI DEVONO AVERE
IL COLLEGAMENTO DI MESSA A TERRA

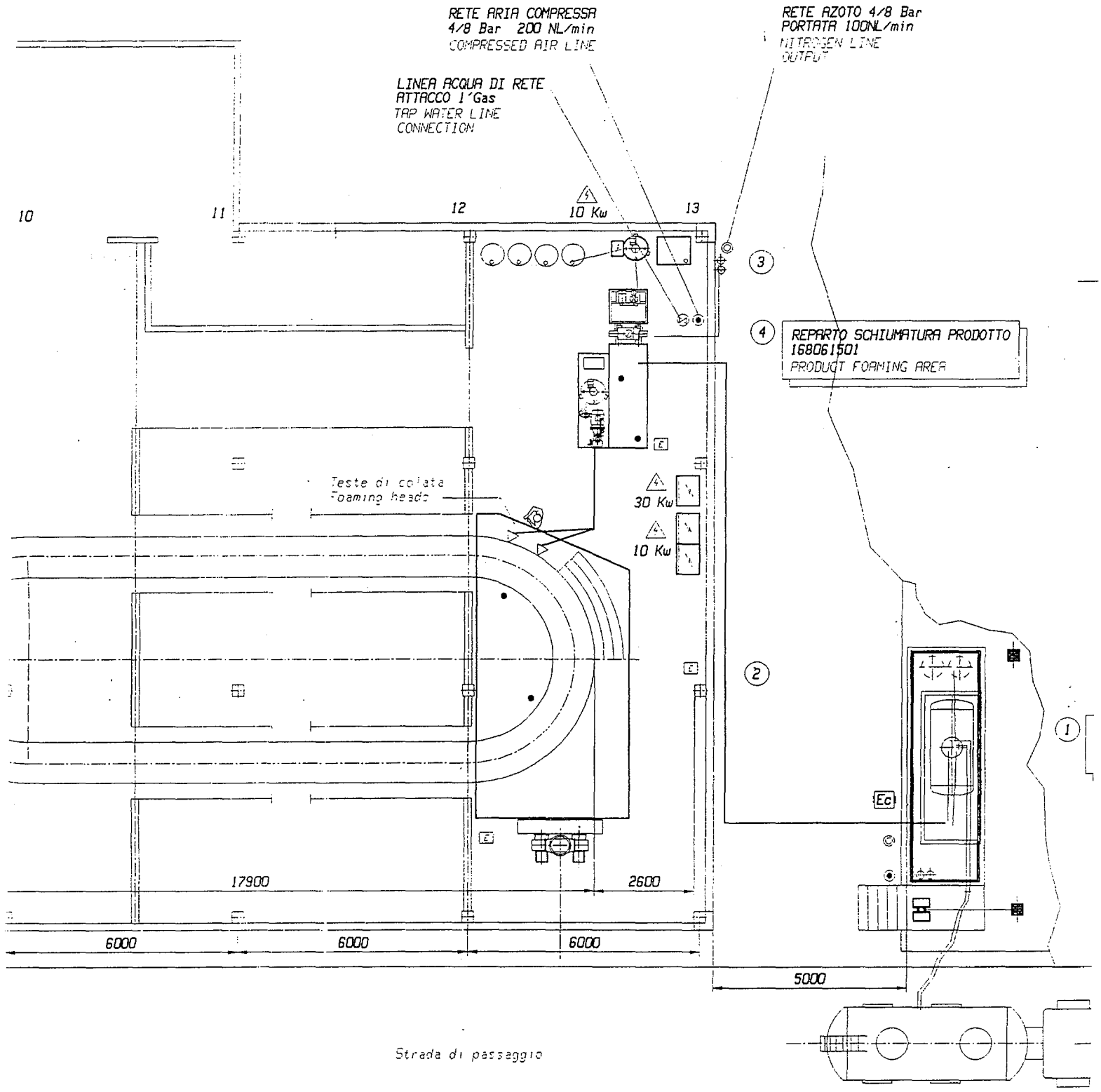
REMARK: ALL PIPING SHOULD HAVE EARTHING
CONNECTIONS

F3

ONS Group Polyurethane Evolution	REPLACED DRW. *	DATE 07-07-98	REVISIONE *
	REPLACED DRW. *	SIGNATURE CP	SCALE 1:1.
*			
PIPING TRASFERIMENTO C-PENTANO			16807140!
*			



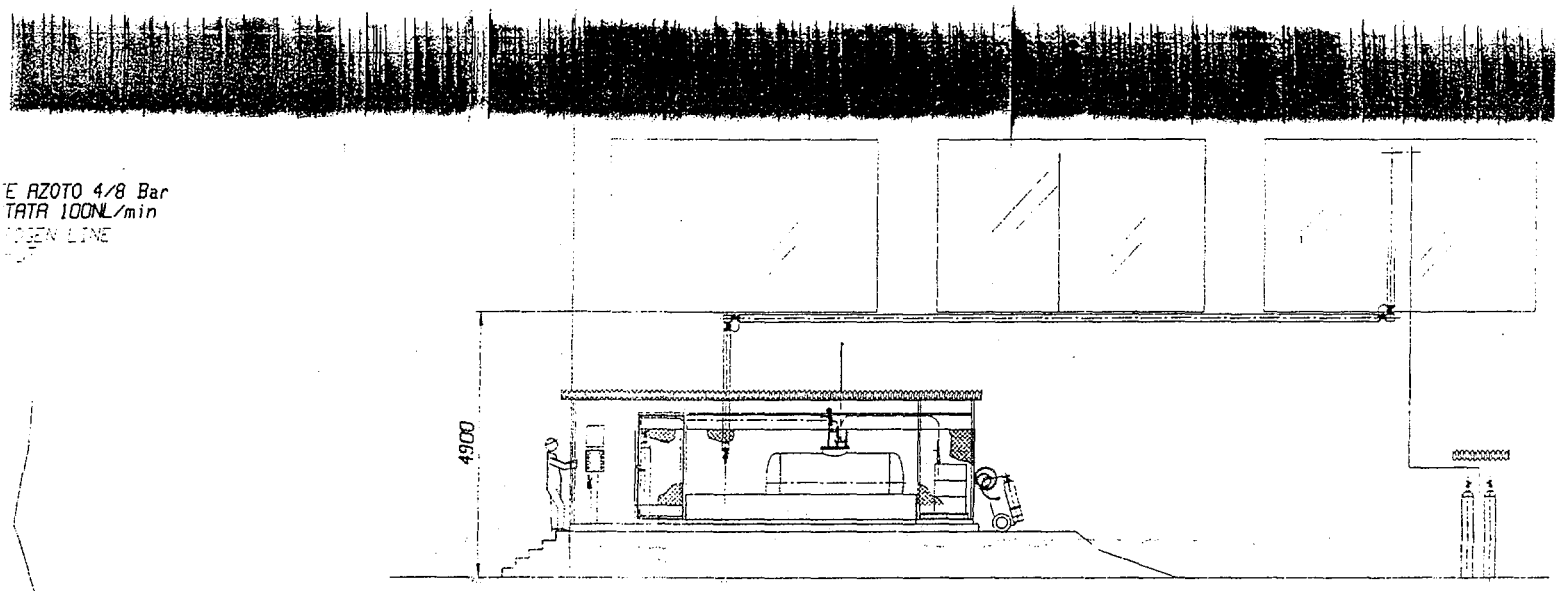
C1



92

DATA	MODIFICA
SCOSTAMENTI AMMESSI PER QUOTE SENZA TOLLERANZA	

Campi dimensioni nominali	0.5 ÷3	÷3 ÷6	÷6 ÷30	30 ÷13
Scostamento grado grossolano	0.15	0.2	0.5	0.8



E AZOTO 4/8 Bar
TATA 100NL/min
OGEN LINE

4900

EPARTO SCHIUMATURA PRODOTTO
68061501
ODUCT FOAMING AREA

1 REPARTO STOCCAGGIO C-PENTANO
168061201
C-PENTANE STORAGE AREA

Ec

5000

G3

POTENZA ELETTRICA
400Vac - 50Hz - 3Fasi
ELECTRICAL POWER
400Vac - 50Hz - 3ph

SENSORI GAS
GAS DETECTOR

Ec E ESTINTORE
FIRE ESTINGUISHER

RETE AZOTO
NITROGEN LINE

RETE ARIA COMPRESSA
COMPRESSED AIR LINE

LINEA ACQUA DI RETE
ATTACCO 1'Gas
TAP WATER LINE
CONNECTION

MODIFICA

AMENTI AMMESSI PER QUOTE SENZA TOLLERANZA SECONDO UNI 002

Dimensioni nominali	0.5 ÷3	3 ÷6	6 ÷30	30 ÷120	120 ÷315	315 ÷1000	1000 ÷2000
Varie grado grossolano	0.15	0.2	0.5	0.8	1.2	2	3

OMS Group Polyurethane Evolution

PERLACE DPW. *		DATE 27-04-98	MACHINE *
PERLACCO DPW. *		SIGNATURE CP	SCALE 1:

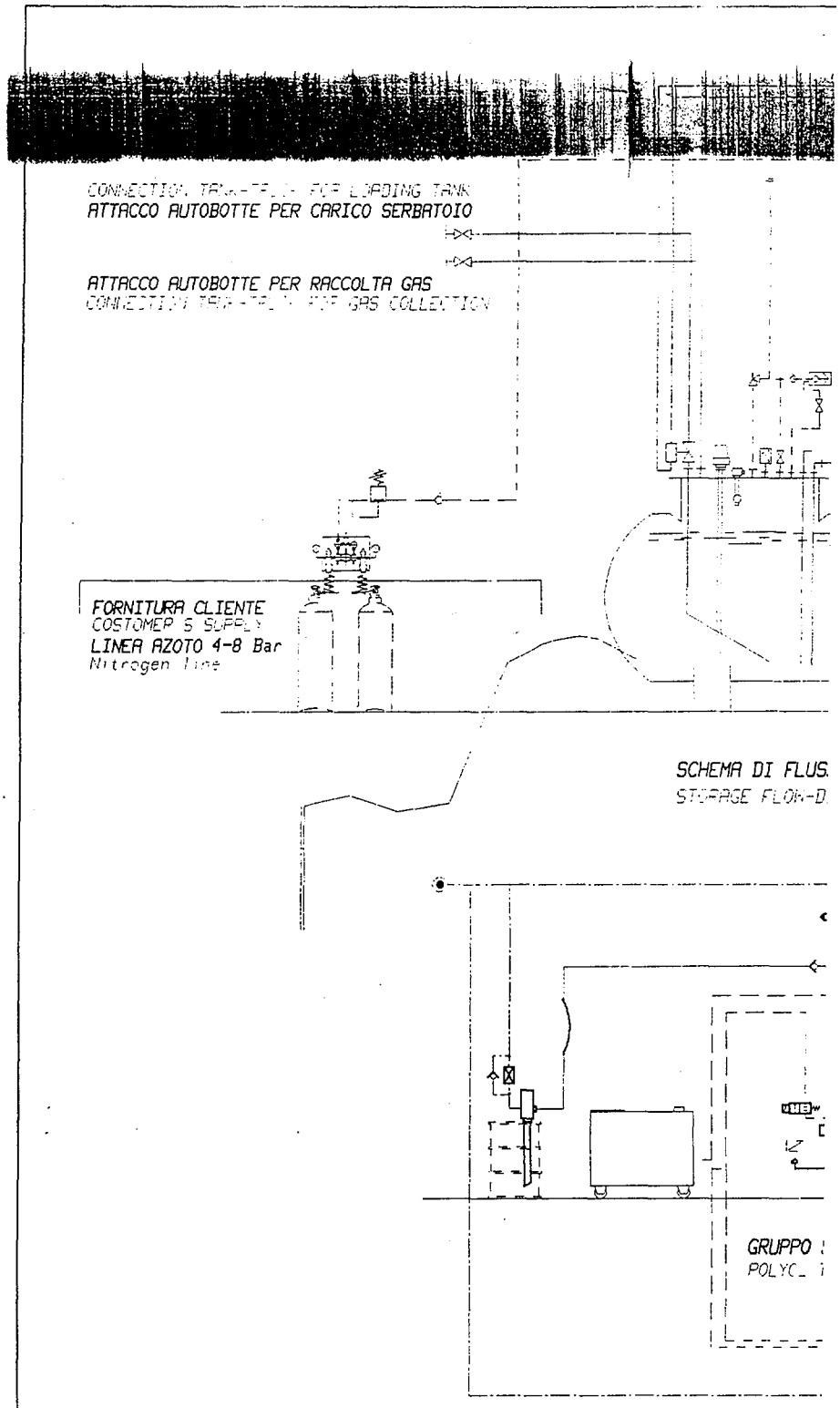
DESCRIPTION *

IMPIANTO SCHIUMATURA ARMADI E PORTE

* CABINETS AND DOORS PLANT LAYOUT

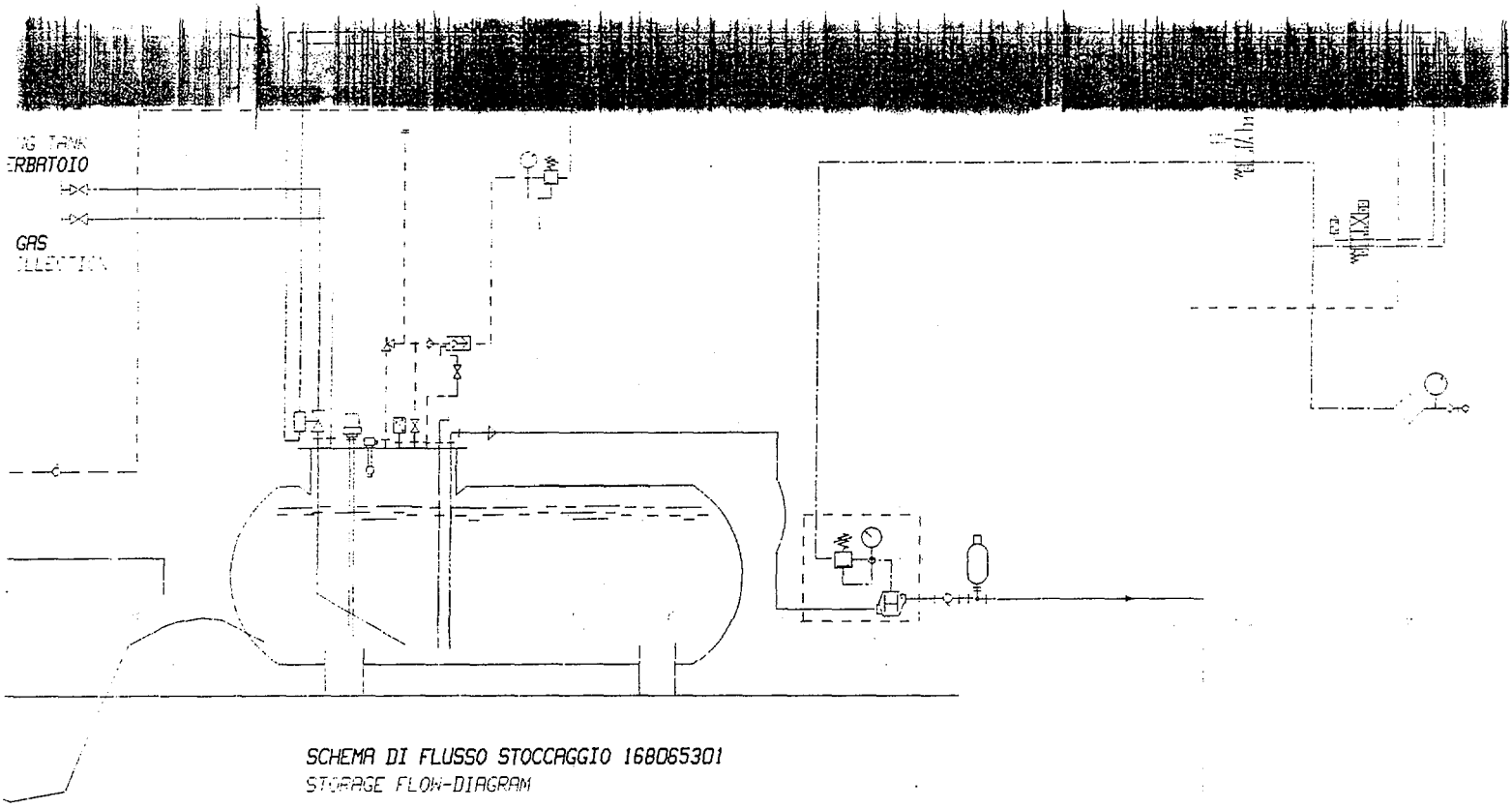
DRAWING

168061001

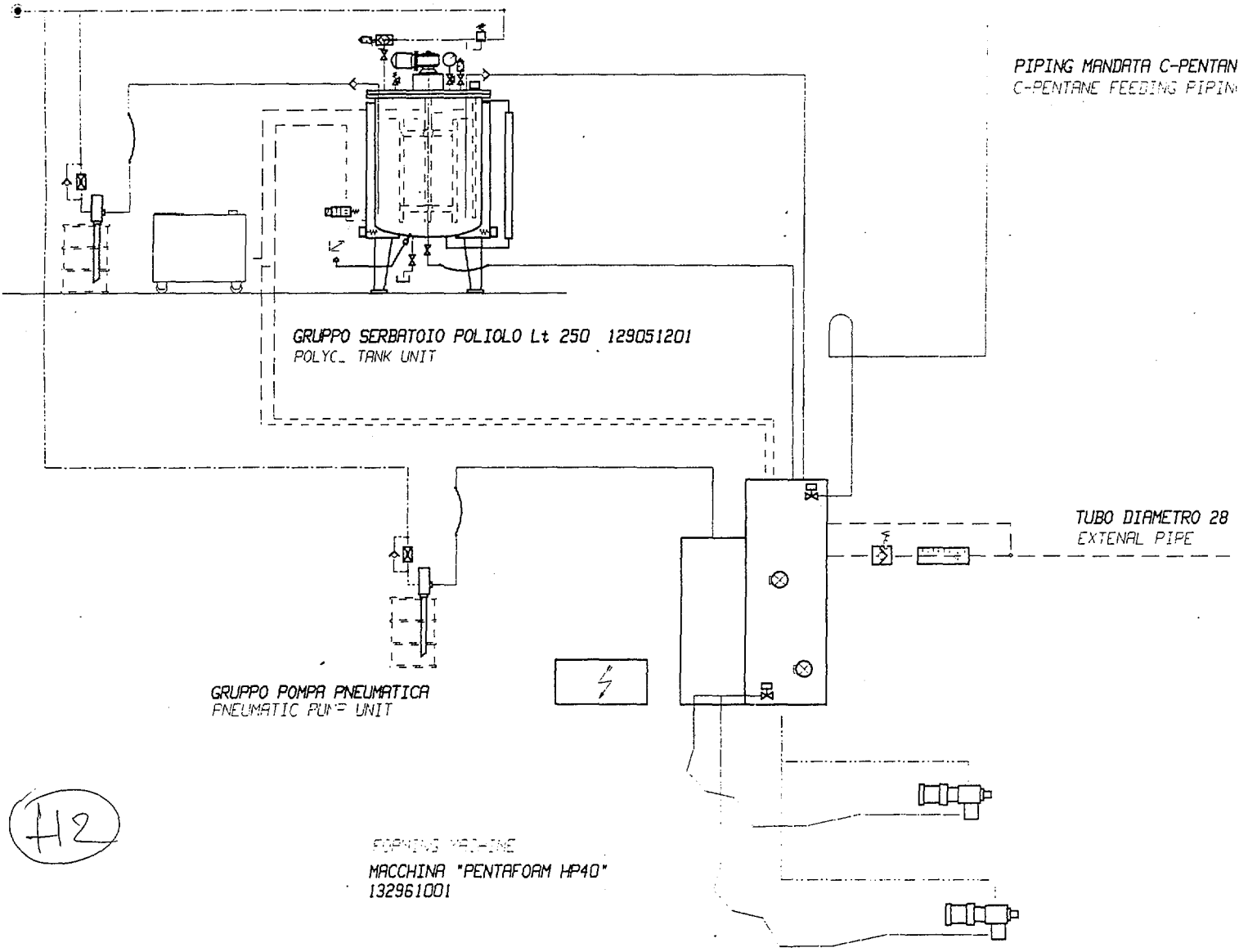


GRUPPO POMPA PNE
PNEUMATIC PUMP

H1



SCHEMA DI FLUSSO STOCCAGGIO 168065301
STORAGE FLOW-DIAGRAM

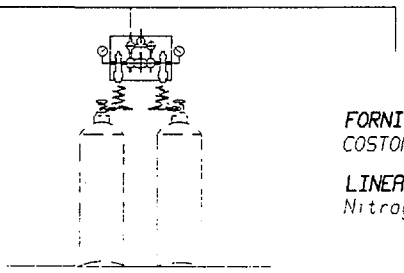


H2

PINZA DI MESSA A TERRA
GROUNDING CLAMP

PIPING MANDATA C-PENTANO 168061401
C-PENTANE FEEDING PIPING

TUBO DIAMETRO 28
EXTENAL PIPE

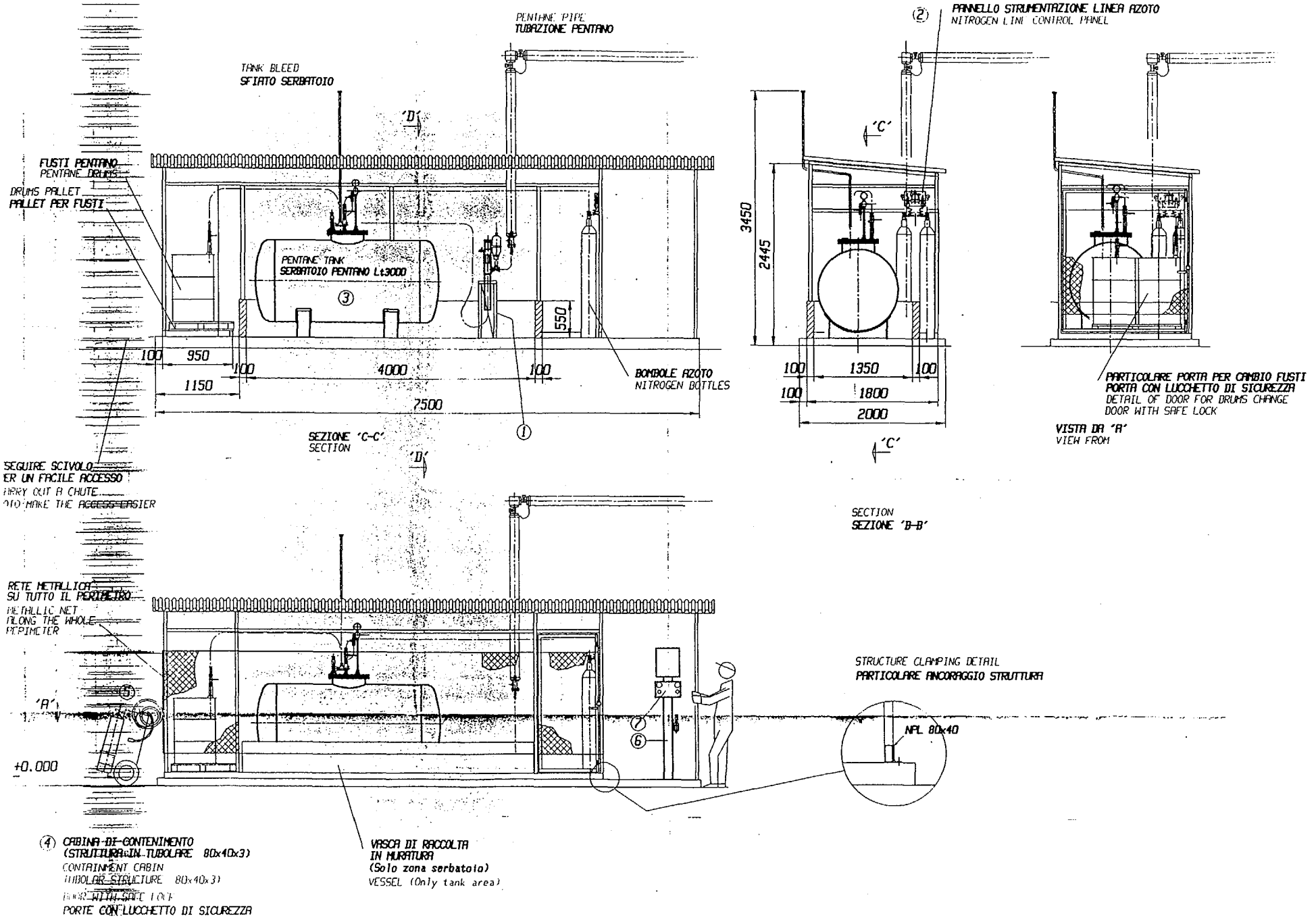


FORNITURA CLIENTE
COSTOMER S SUPPLY

LINER AZOTO 4-8 Bar
Nitrogen line

H3

OMS Group Polyurethane Evolution	REPLACE DRW. *	DATE 09-05-98	MACHINES *
	REPLACED DRW. *	SIGNATURE CP	SCALE 1:7.
DESCRIPTION * SCHEMA DI FLUSSO IMPIANTO * PLANT FLOW-DIAGRAM		DRAWING 168065101	



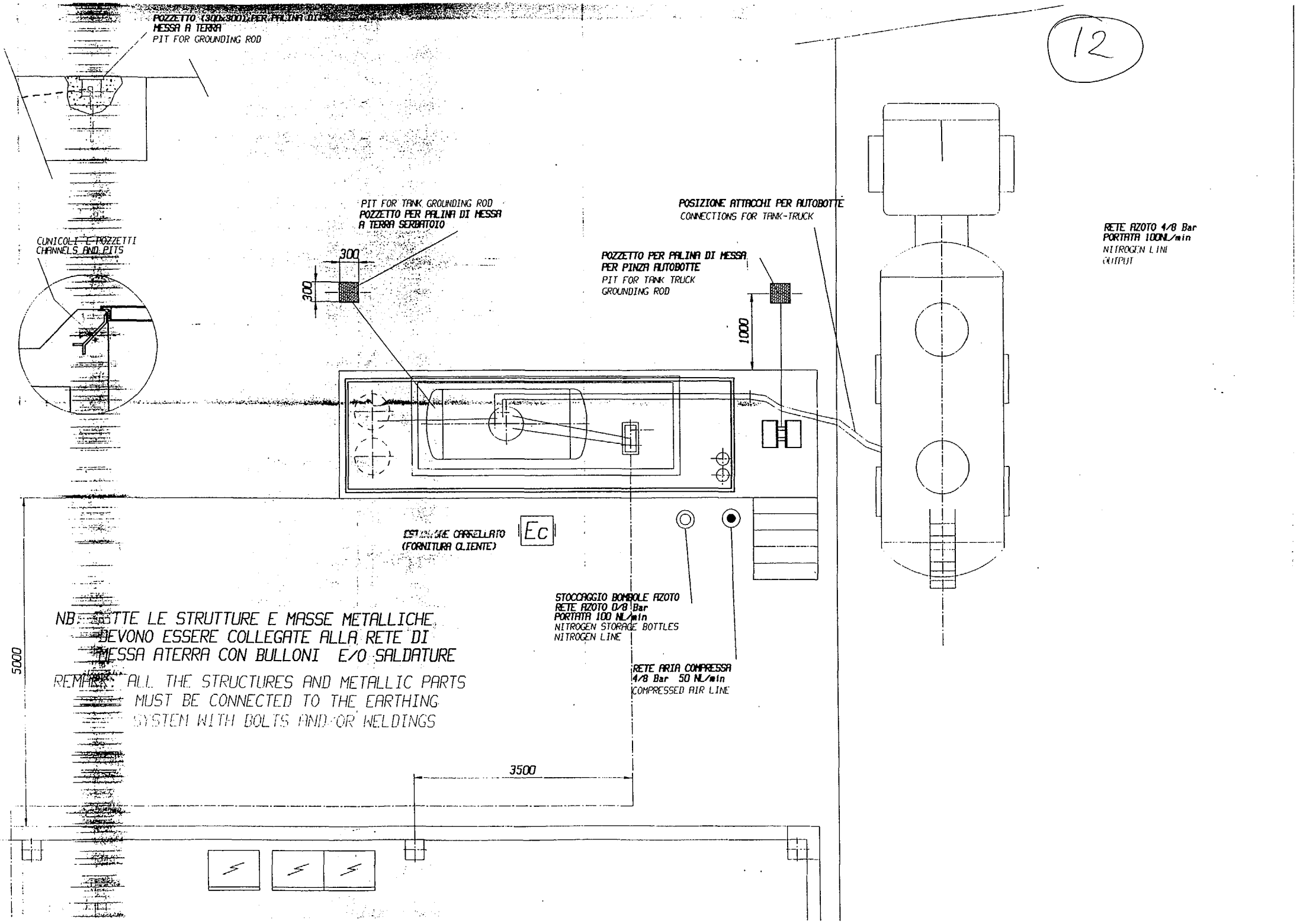
MACHINED *		SCALE	1:50
DATE	05-05-98	SIGNATURE	CP
REPLACE DRW. *		REPLACED DRW. *	
DESCRIPTION *			

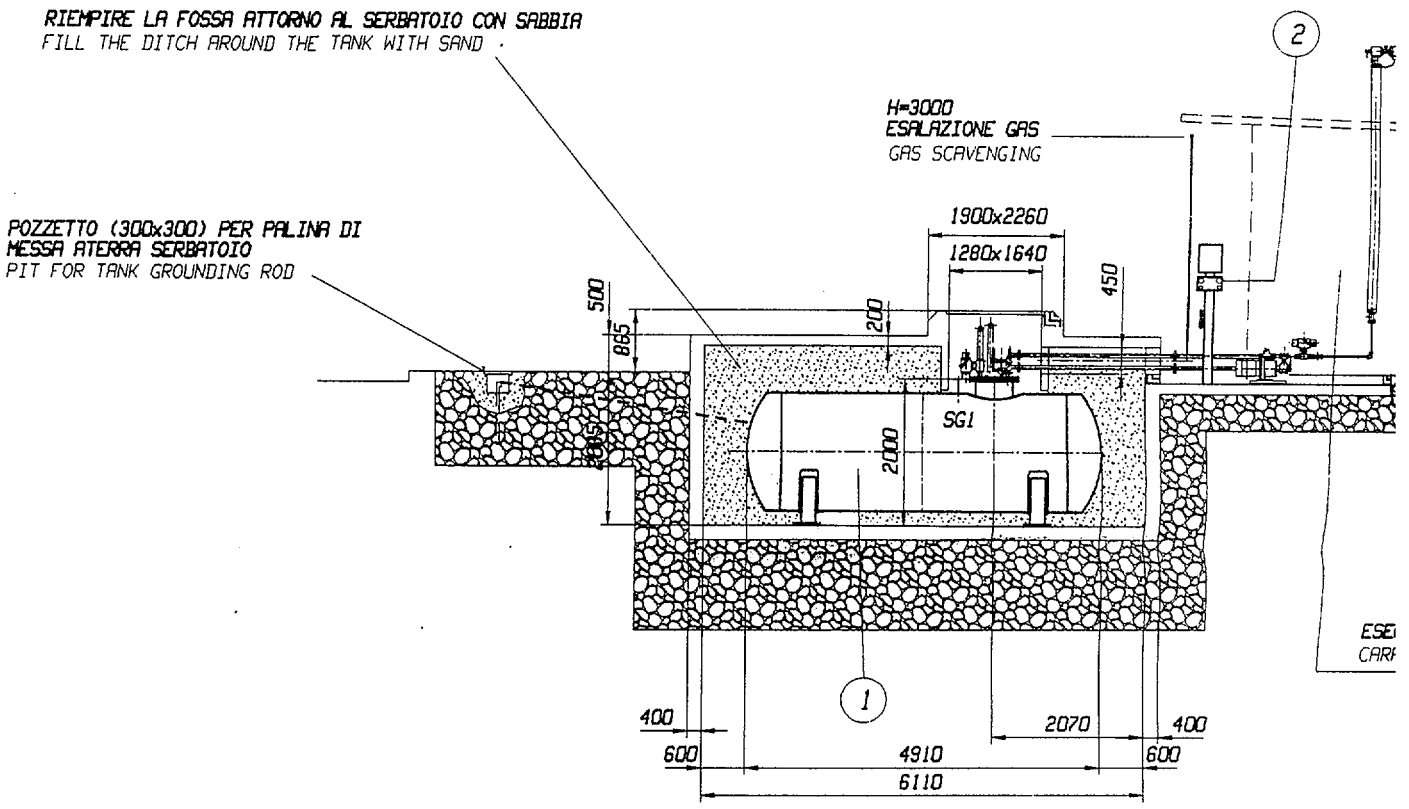
DRAWING 168061201

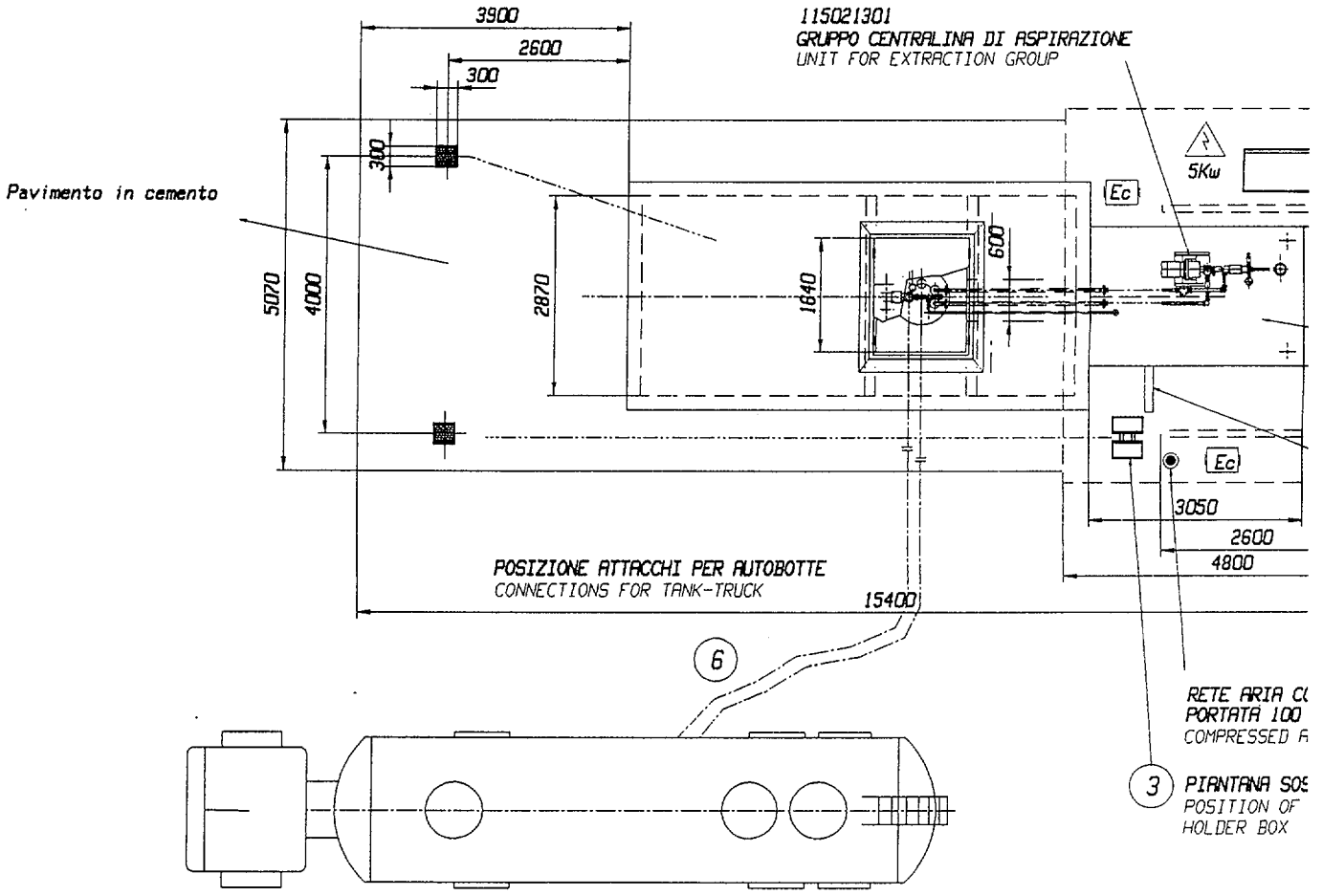
DISPOSIZIONE REPARTO STOCCAGGIO C-PENTANO

* C-PENTANE STORAGE AREA LAYOUT

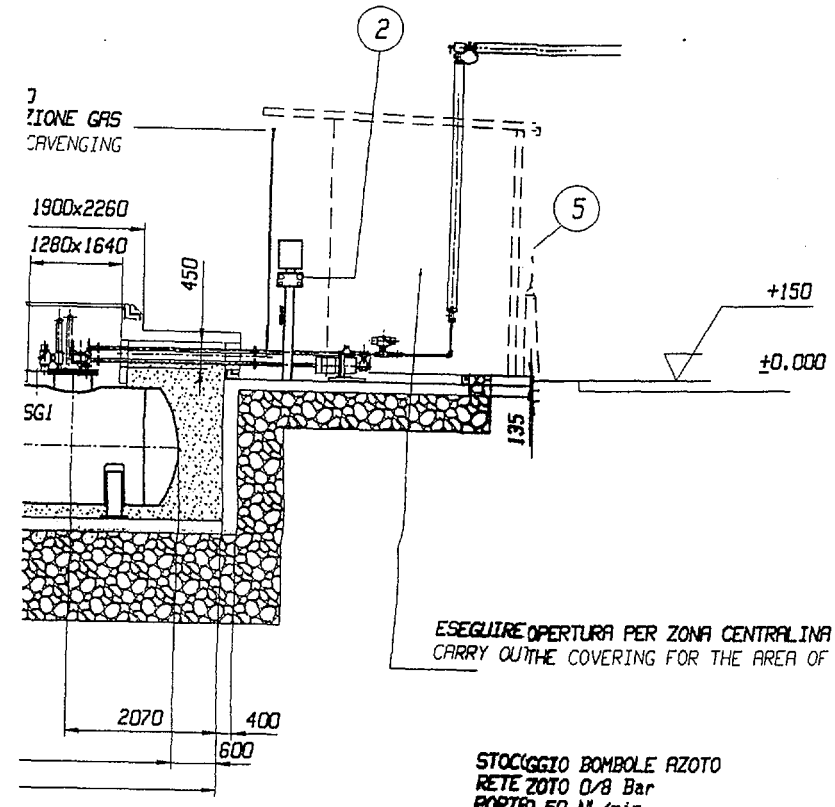
11


POZZETTO (300x300) PER PALINA DI
MESSA A TERRA
PIT FOR GROUNDING ROD
PIT FOR TANK GROUNDING ROD
POZZETTO PER PALINA DI MESSA
A TERRA SERBATOIO
CUNICOLI E POZZETTI
CHANNELS AND PITS
300
300
POSIZIONE ATTACCHI PER AUTOBOTTE
CONNECTIONS FOR TANK-TRUCK
POZZETTO PER PALINA DI MESSA
PER PINZA AUTOBOTTE
PIT FOR TANK TRUCK
GROUNDING ROD
1000
RETE AZOTO 4/8 Bar
PORTATA 100NL/min
NITROGEN LINE
OUTPUT
ESTINTORE CARRELLATO
(FORNITURA CLIENTE)
Ec
STOCCAGGIO BOMBOLE AZOTO
RETE AZOTO 0/8 Bar
PORTATA 100 NL/min
NITROGEN STORAGE BOTTLES
NITROGEN LINE
RETE ARIA COMPRESSA
4/8 Bar 50 NL/min
COMPRESSED AIR LINE
NB: TUTTE LE STRUTTURE E MASSE METALLICHE
DEVONO ESSERE COLLEGATE ALLA RETE DI
MESSA ATERRA CON BULLONI E/O SALDATURE
REMARK: ALL THE STRUCTURES AND METALLIC PARTS
MUST BE CONNECTED TO THE EARTHING
SYSTEM WITH BOLTS AND/OR WELDINGS
5000
3500





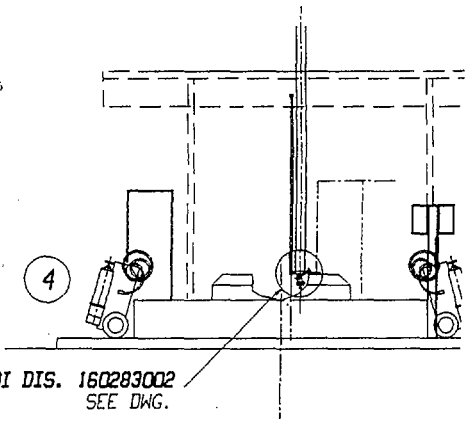
J1



ZIONE GAS
CAVENGING

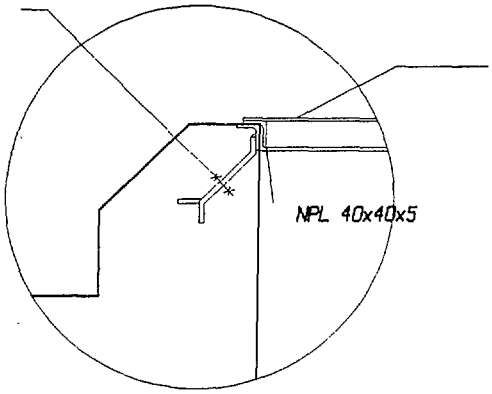
SGI

ESEGUIRE OPERTURA PER ZONA CENTRALINA ASPIRAZIONE
CARRY OUTHE COVERING FOR THE AREA OF UNIT



VEDI DIS. 160283002
SEE DWG.

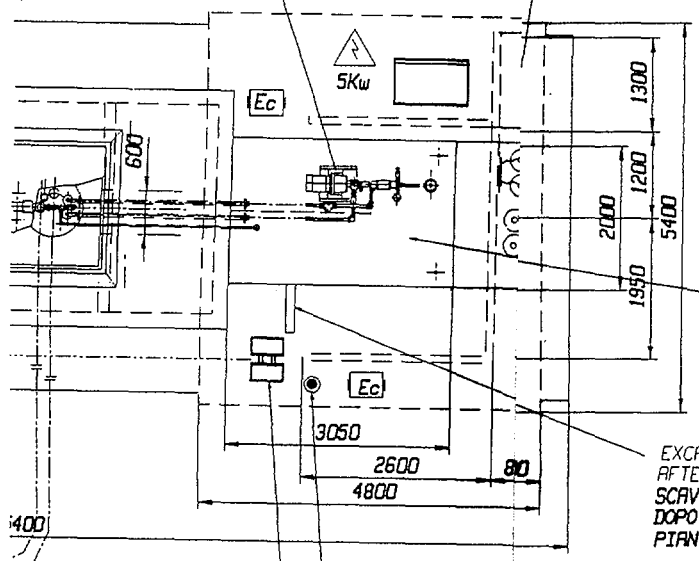
ATTACCO PER MESSA A TERRA
GROUNDING CONNECTION



SOLUZIONE '1'

STOCCAGGIO BOMBOLE AZOTO
RETE AZOTO 0/8 Bar
PORTATA 50 NL/min
NITROGEN STORAGE BOTTLES
NITROGEN LINE

II
ENTRALINA DI ASPIRAZIONE
EXTRACTION GROUP



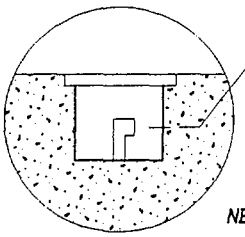
PENDENZA 1%
SLOPE
(CON FORO DI DRENAGGIO)
(DRAIN HOLE)

EXCAVATION TO BE CARRIER OUT
AFTER THE POSITIONING OF COLUMN
SCAVO DA ESEGUIRE IN OPERA
DOPO IL POSIZIONAMENTO DELLA
PIANTANA

RETE ARIA COMPRESSA 4/8 Bar
PORTATA 100 NL/mi
COMPRESSED AIR LIE

3 PIANTANA SOSTEGNO CASSETTA PORTA PINZA
POSITION OF SUPPORT COLUMN FOR PLIERS
HOLDER BOX

PARTICOLARE COPEI
COVERING DETAIL (



NB: TUTTI
DEVO
MESSI

REMARK: ALL TH
MUST E
SYSTEI

J2

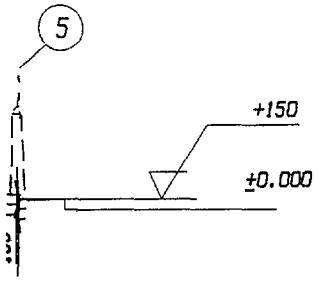
OMS Group Polyurethane Evolution

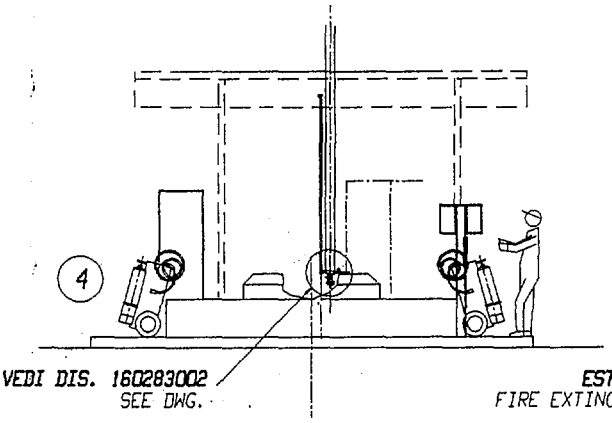
REPLAC
REPLAC

DESCRIPTION *

DISPOSIZIONE REPARTO STOCCAG

* C-PENTANE STORAGE LAY-OUT

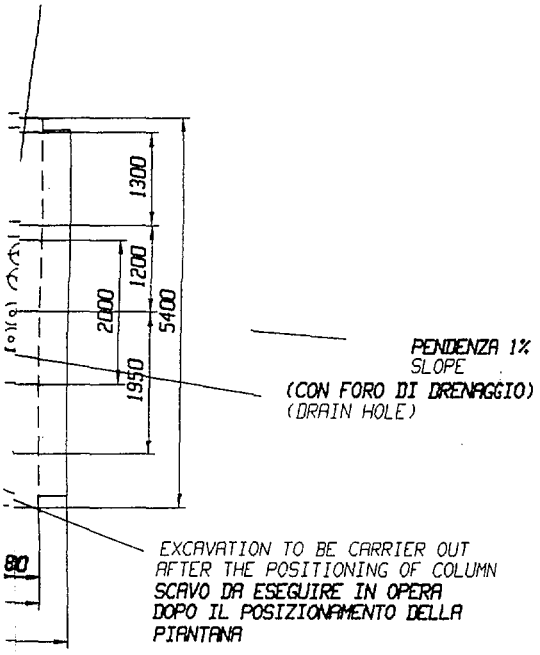


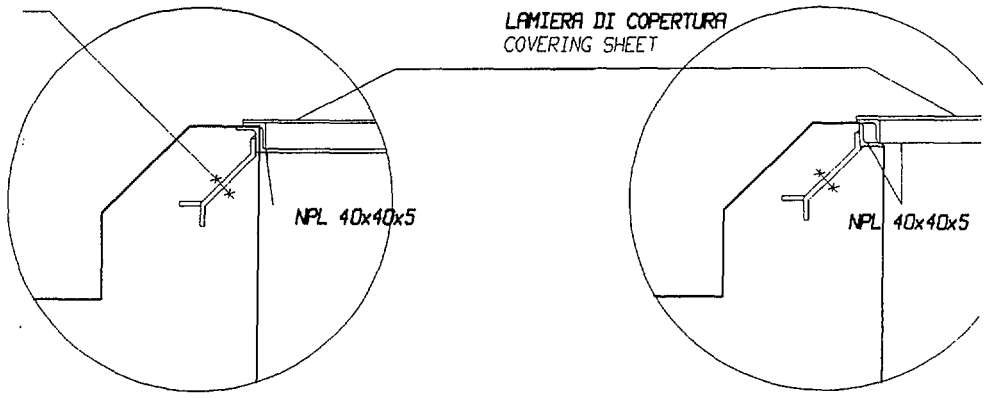


ATTACCO PER MESSA A TERRA
GROUNDING CONNECTION

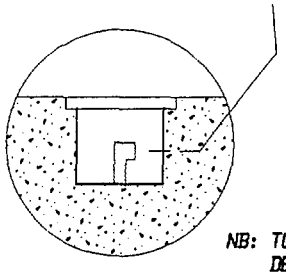
OPERTURA PER ZONA CENTRALINA ASPIRAZIONE
THE COVERING FOR THE AREA OF UNIT

GGIO BOMBOLE AZOTO
ZOTO 0/8 Bar
A 50 NL/min
EN STORAGE BOTTLES
EN LINE

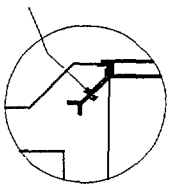




PARTICOLARE COPERTURA
COVERING DETAIL OF



CUNICOLI E POZZETTI
CHANNELS AND PITS



NB: TUTTE LE STRUTTURE E MASSE METALLICHE
DEVONO ESSERE COLLEGATE ALLA RETE DI
MESSA ATERRA CON BULLONI E/O SALDATURE

REMARK: ALL THE STRUCTURES AND METALLIC PARTS
MUST BE CONNECTED TO THE EARTHING
SYSTEM WITH BOLTS AND/OR WELDINGS

SA 4/8 Bar
E

ORSSETTA PORTA PINZA
T COLUMN FOR PLIERS

J3

DMS Group Polyurethane Evolution	REPLACE DRW. *	DATE 18-06-98	MACHI
	REPLACED DRW. *	SIGNATURE CP	SCALE
DESCRIPTION *		DRAWING	
DISPOSIZIONE REPARTO STOCCAGGIO 10m		168071201	
* C-PENTANE STORAGE LAY-OUT			