“Medidas Experimentais em Golfadas de Líquido”

I. Aparato Experimental

II. Processamento de Dados

I. Aparto Experimental

a) Descrição Geral

b) Misturadores

c) Seção de Teste

a) Circuitos de Gás e Líquido

- Circuito de Líquido
  - bombas
  - filtros
  - medidores de vazão
  - tanques de armazenagem
  - válvulas
- Circuito de Gás
  - compressores
  - vaso pulmão
  - filtros
  - válvulas

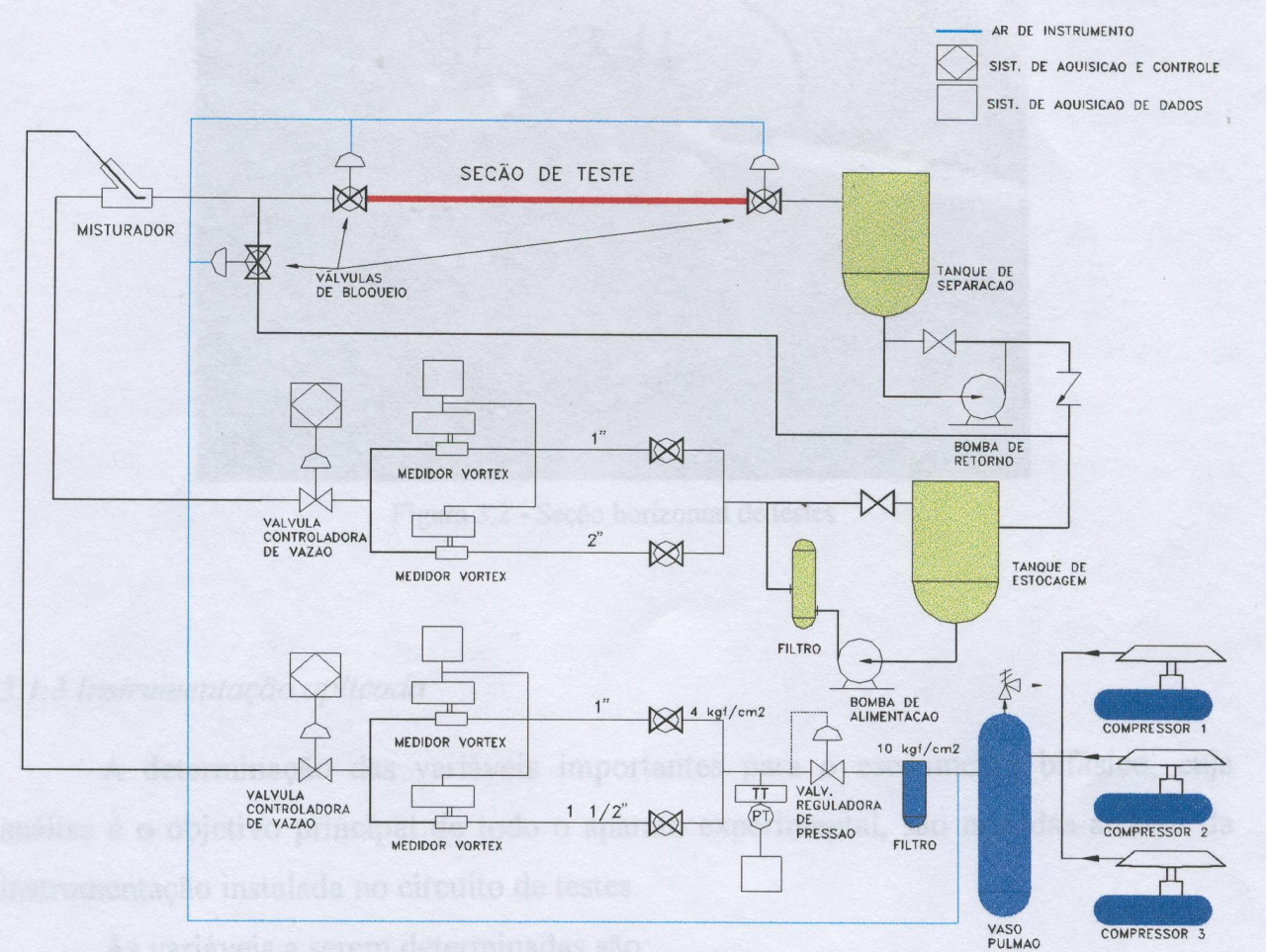
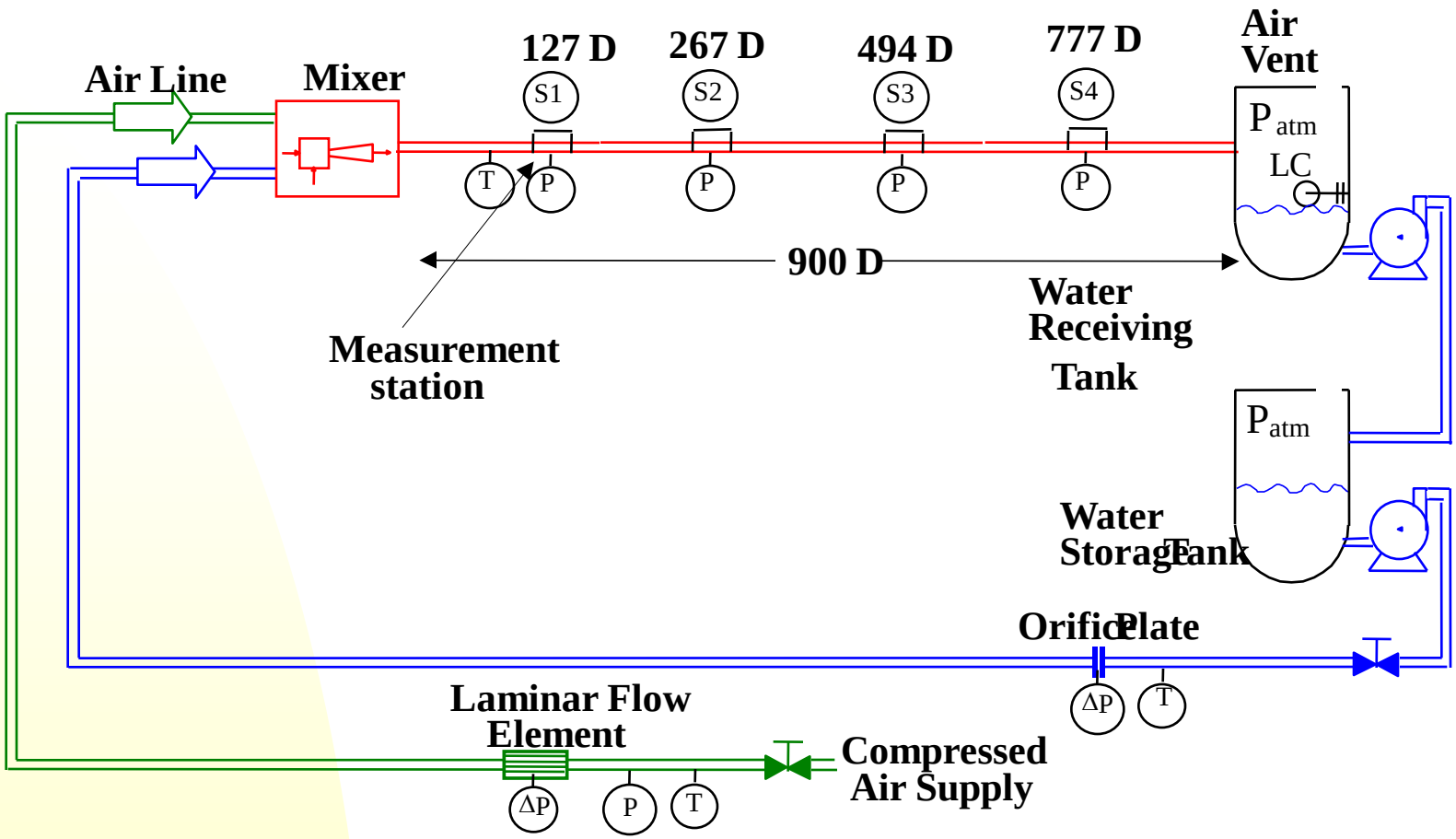


Figura 3.1- Fluxograma do aparato experimental

CIRCUITO ar & água/glicerina (acrilico)

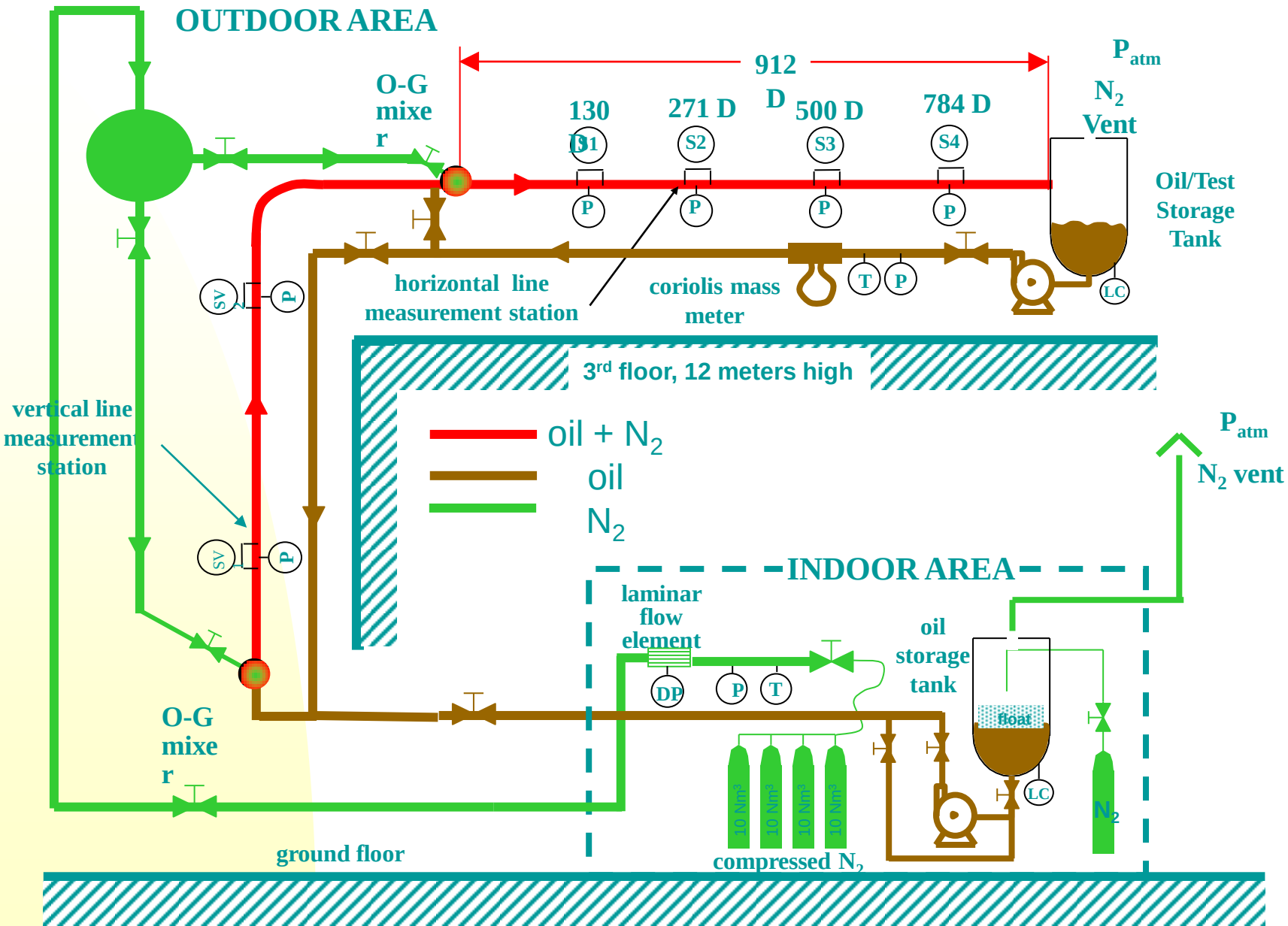


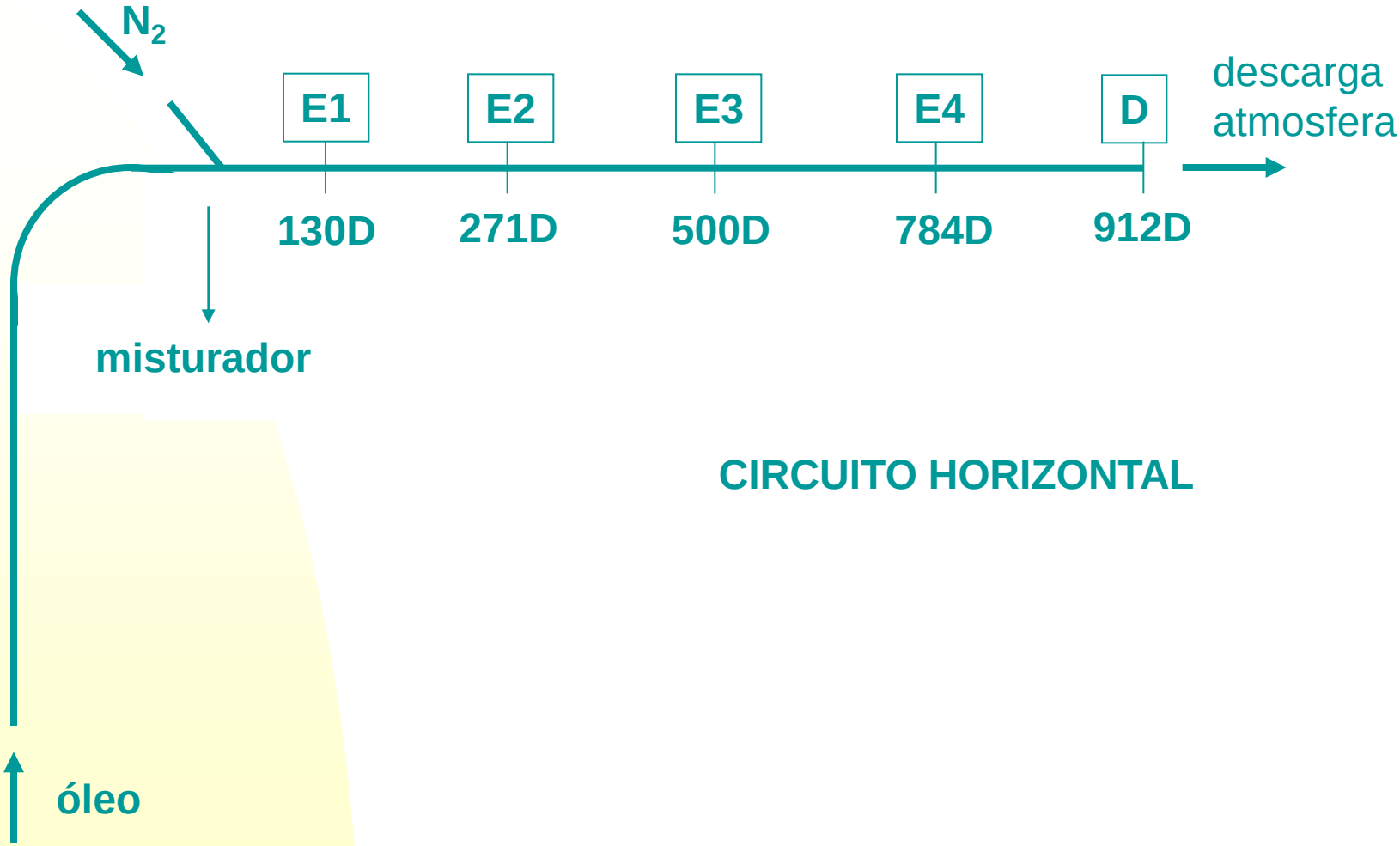
Ar e Água & Ar e Glicerina

980mBar & 25ºC

mm & 22,50 m

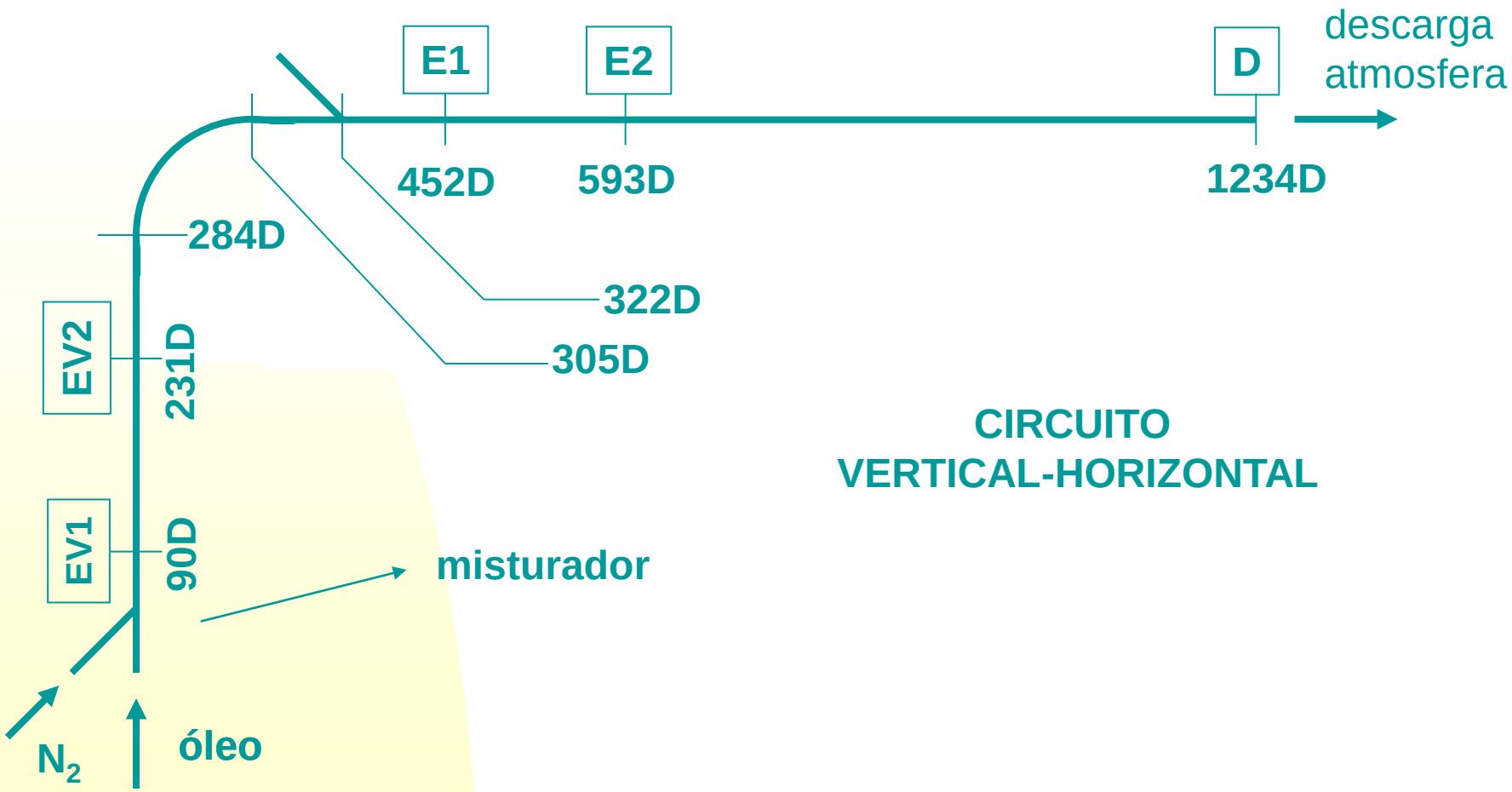
CIRCUITO N2 & óleo (aço) Pmax 9Barg





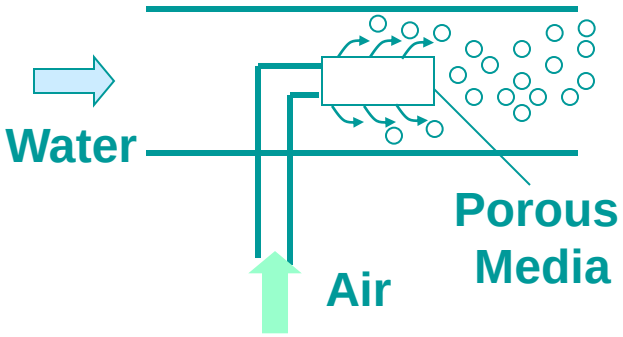
CIRCUITO HORIZONTAL

CIRCUITO VERTICAL

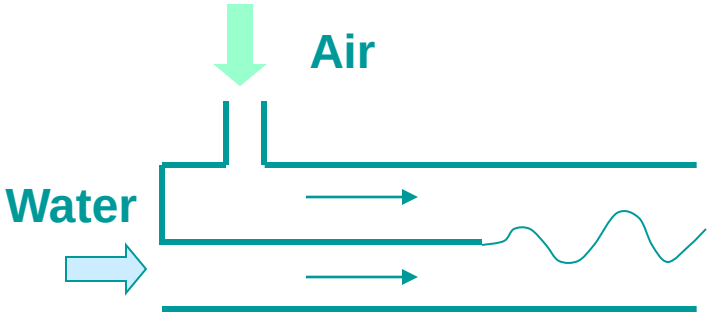

E1
E2
D
descarga
atmosfera
452D
593D
1234D
284D
322D
305D
EV2
231D
EV1
90D
misturador
CIRCUITO
VERTICAL-HORIZONTAL
N2
óleo

b) Misturadores

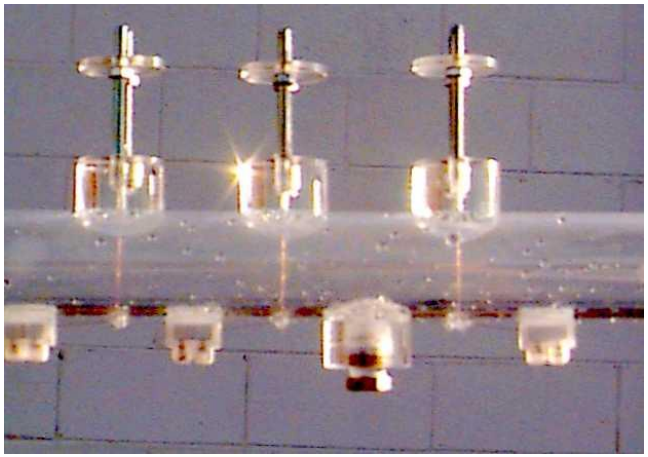
- Misturador de Correntes Concêntricas



- Misturador de Correntes Paralelas

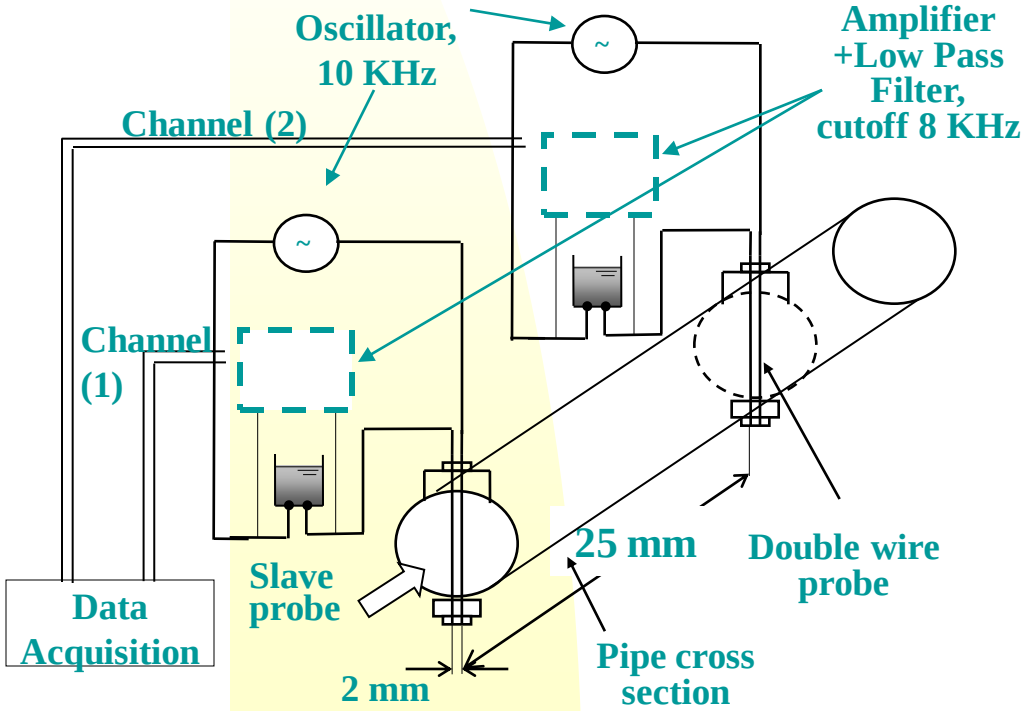


Técnica de Medida
(sondas gêmeas de fios paralelos)

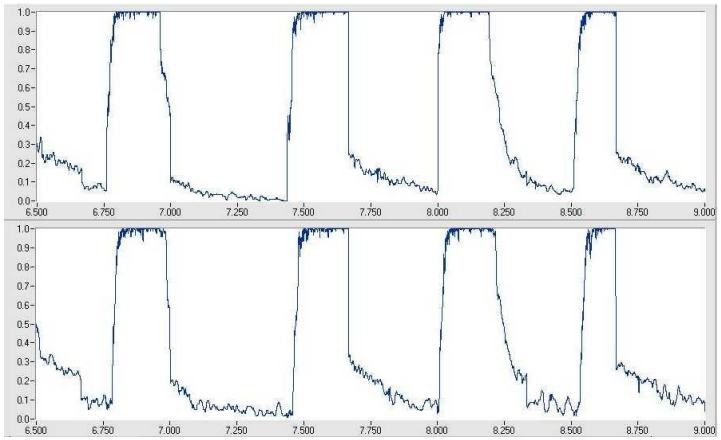


Foto

Opera no princípio resistivo,
as sondas detectam a passagem do pistão de líquido e da bolha de gás.



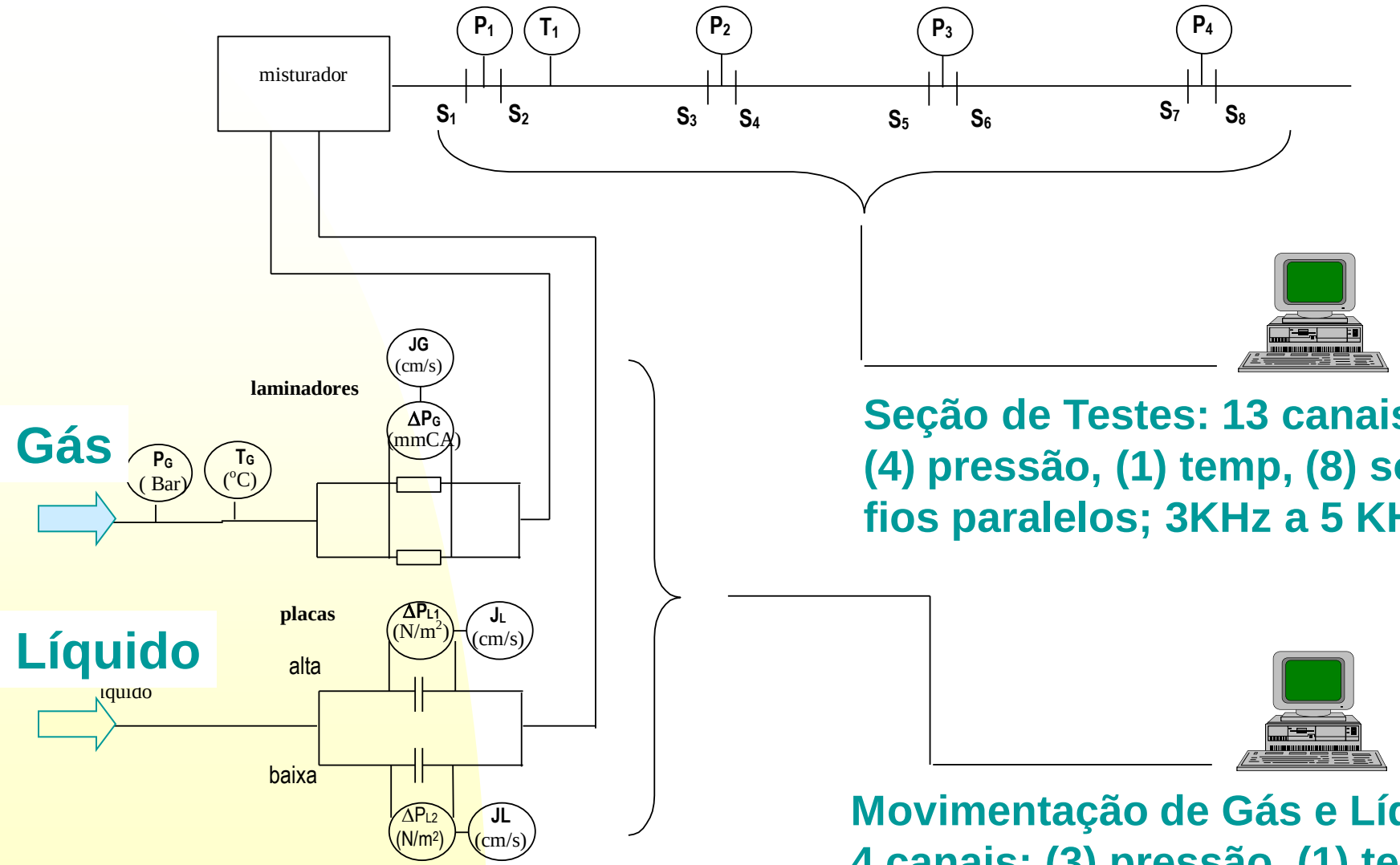
Esquemático



Sinal caraterístico das sondas gêmeas

Aquisição de Sinais:

(esquemático dos dois circuitos)



Seção de Testes: 13 canais
(4) pressão, (1) temp, (8) sonda
fios paralelos; 3KHz a 5 KHz

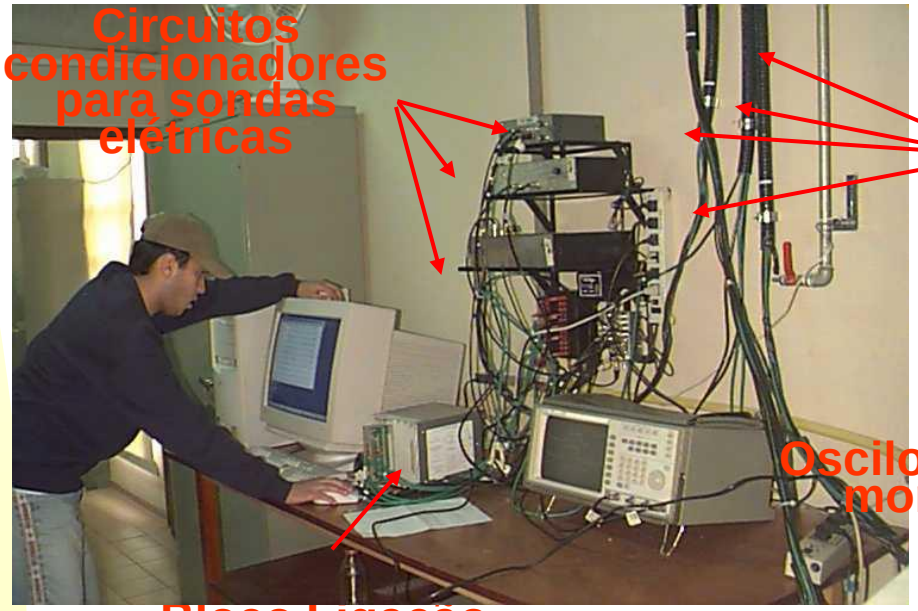
Movimentação de Gás e Líquido:
4 canais: (3) pressão, (1) temp,
1 Hz.

Aquisição de Sinais:
(fotografias hardware)

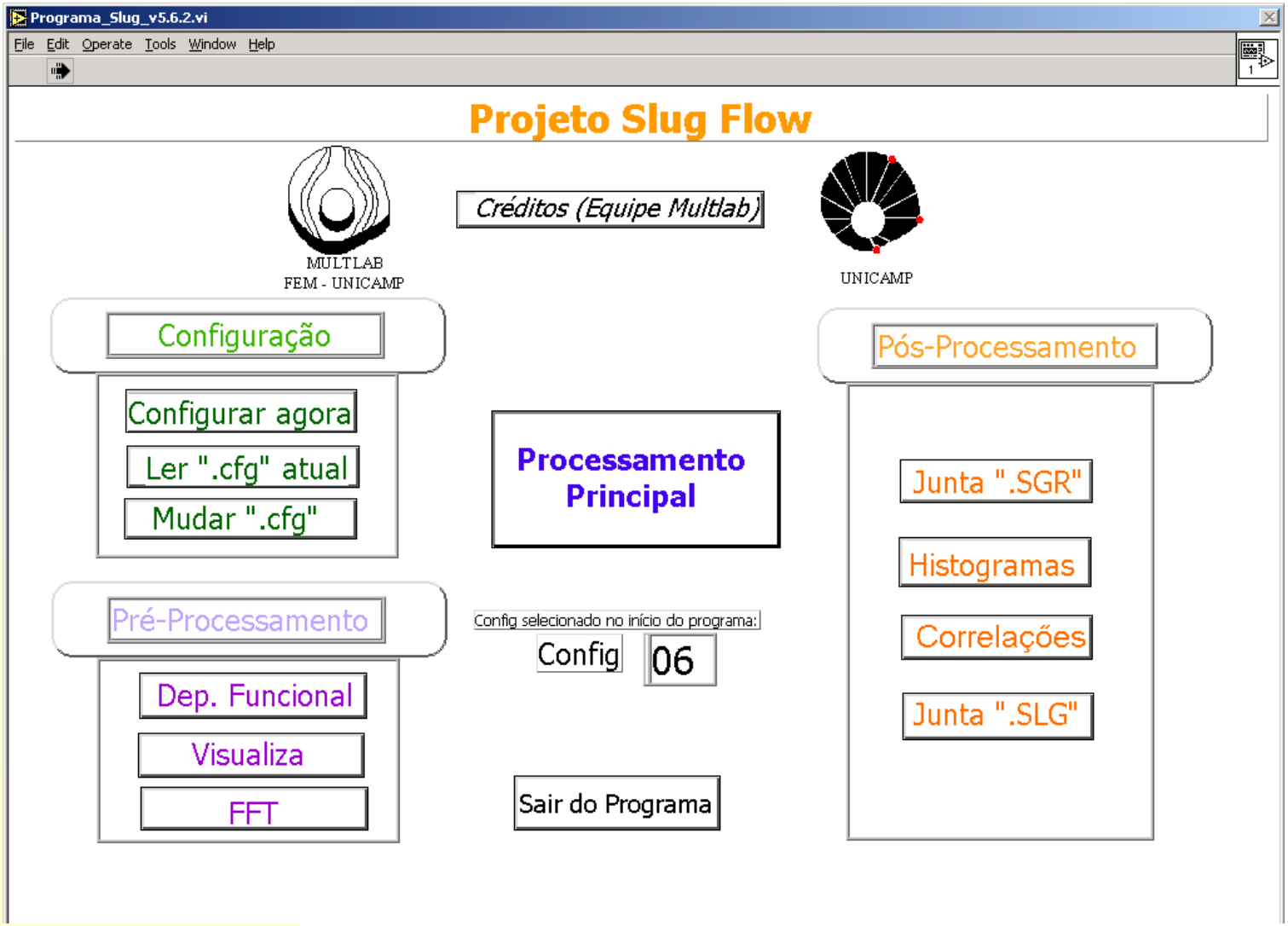
Sistema Aquisição. Seção de Testes

Sistema Aquisição. Monitoramento das Vazões

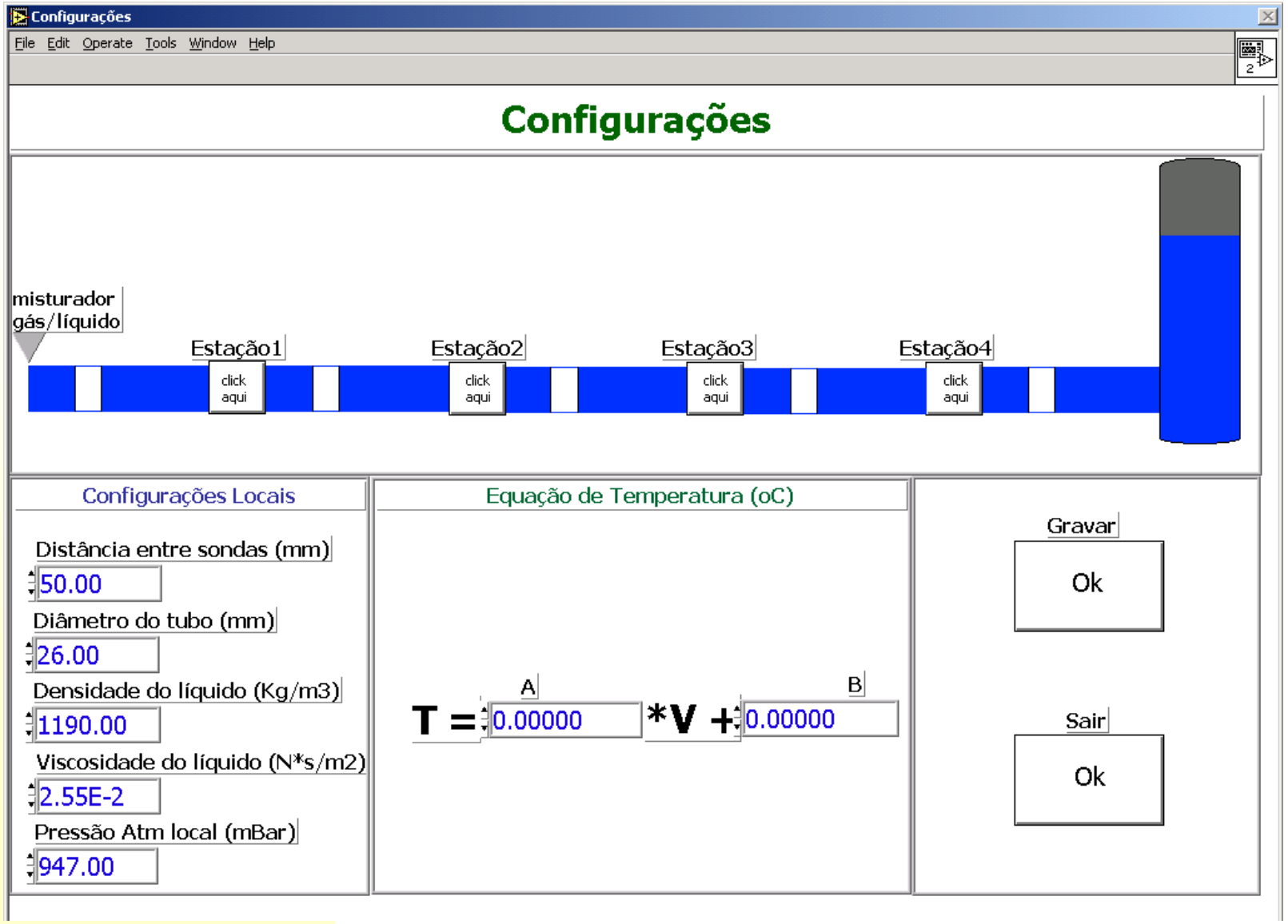
PC para aquisição de dados

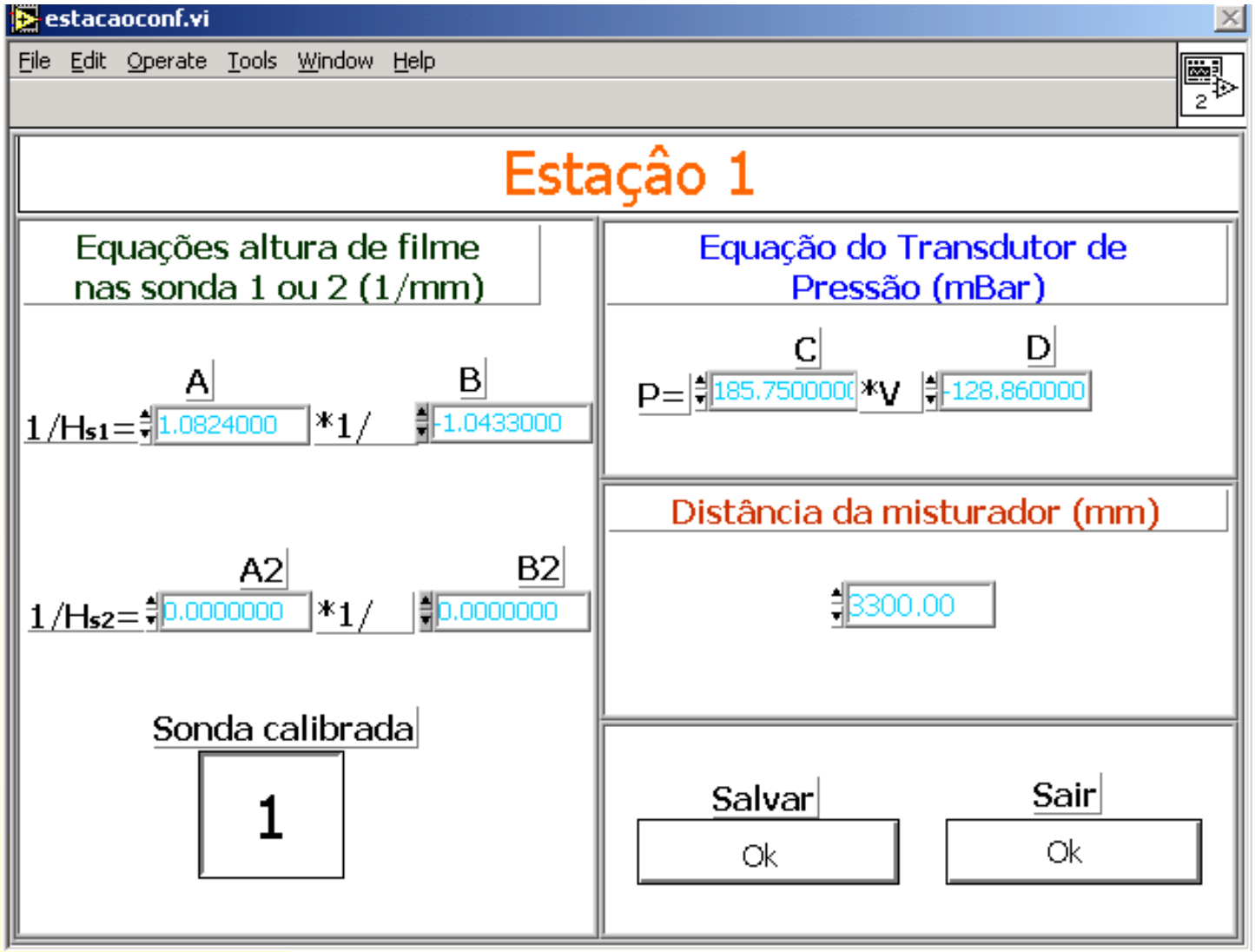


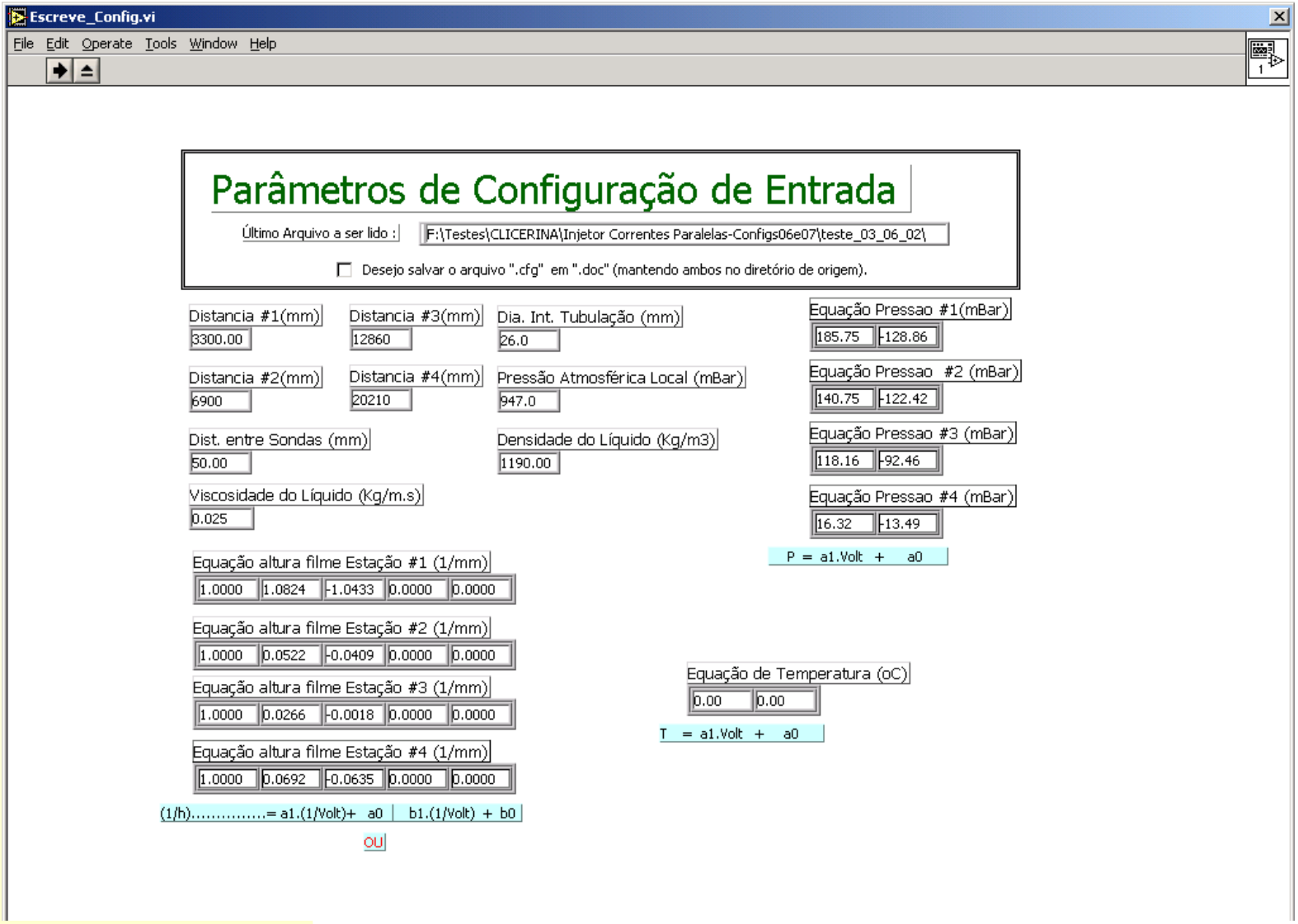
II. Processamento de Dados



a) Configuração



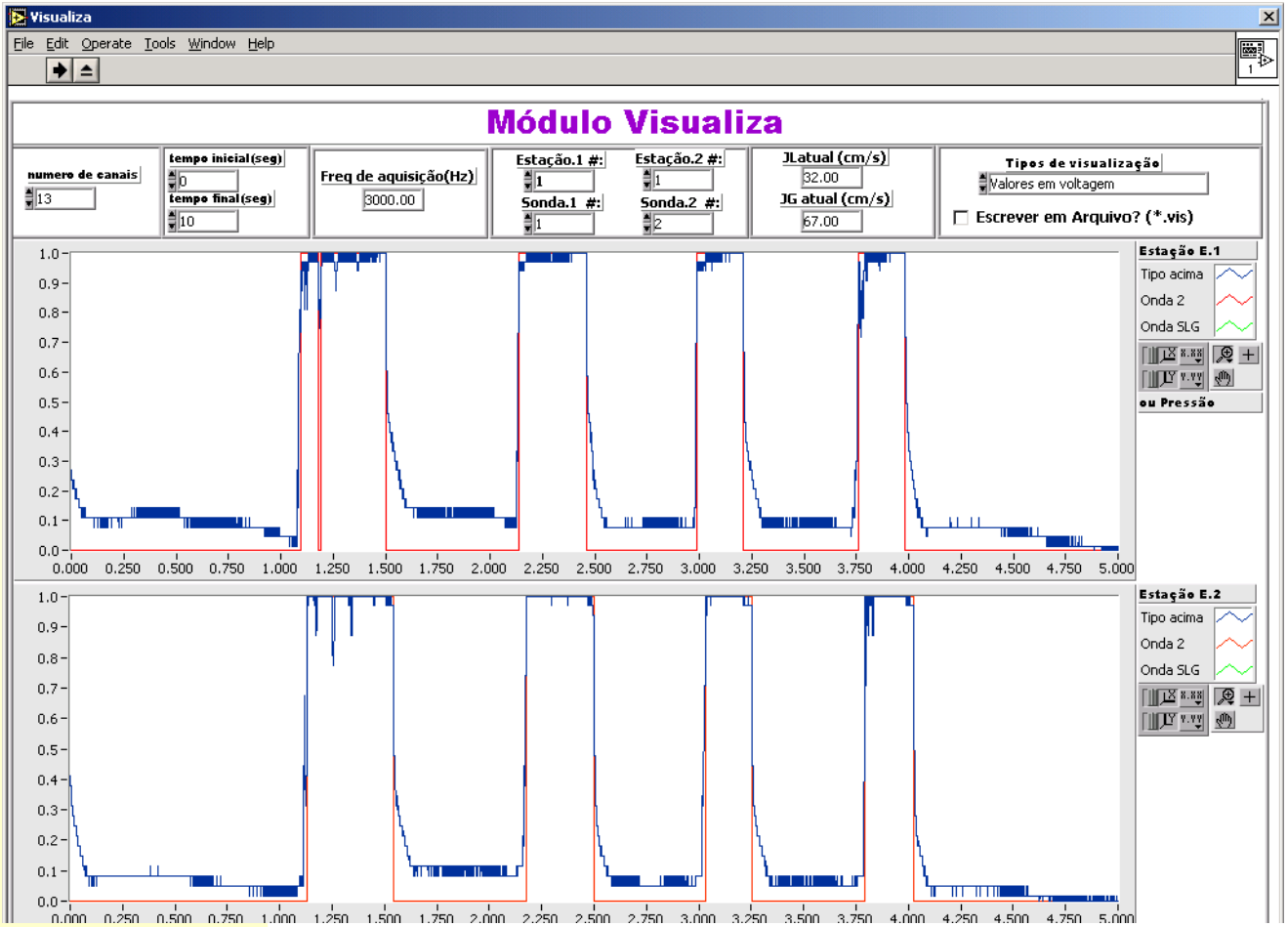

estacaoconf.vi
File Edit Operate Tools Window Help
Estaçâo 1
Equações altura de filme nas sonda 1 ou 2 (1/mm)
A
B
1/Hs1=
1.0824000
*1/
-1.0433000
A2
B2
1/Hs2=
0.0000000
*1/
0.0000000
Sonda calibrada
1
Equação do Transdutor de Pressão (mBar)
C
D
P=
185.7500000
*V
-128.860000
Distância da misturador (mm)
3300.00
Salvar
Ok
Sair
Ok


Escreve_Config.vi
File Edit Operate Tools Window Help
Parâmetros de Configuração de Entrada
Último Arquivo a ser lido :
F:\Testes\CLICERINA\Injetor Correntes Paralelas-Configs06e07\teste_03_06_02\
Desejo salvar o arquivo ".cfg" em ".doc" (mantendo ambos no diretório de origem).
Distancia #1(mm)
3300.00
Distancia #3(mm)
12860
Dia. Int. Tubulação (mm)
26.0
Distancia #2(mm)
6900
Distancia #4(mm)
20210
Pressão Atmosférica Local (mBar)
947.0
Dist. entre Sondas (mm)
50.00
Densidade do Líquido (Kg/m3)
1190.00
Viscosidade do Líquido (Kg/m.s)
0.025
Equação Pressao #1(mBar)
185.75
-128.86
Equação Pressao #2 (mBar)
140.75
-122.42
Equação Pressao #3 (mBar)
118.16
-92.46
Equação Pressao #4 (mBar)
16.32
-13.49
P = a1.Volt + a0
Equação altura filme Estação #1 (1/mm)
1.0000 1.0824 -1.0433 0.0000 0.0000
Equação altura filme Estação #2 (1/mm)
1.0000 0.0522 -0.0409 0.0000 0.0000
Equação altura filme Estação #3 (1/mm)
1.0000 0.0266 -0.0018 0.0000 0.0000
Equação altura filme Estação #4 (1/mm)
1.0000 0.0692 -0.0635 0.0000 0.0000
(1/h).....= a1.(1/Volt)+ a0 b1.(1/Volt) + b0
OU
Equação de Temperatura (oC)
0.00 0.00
T = a1.Volt + a0

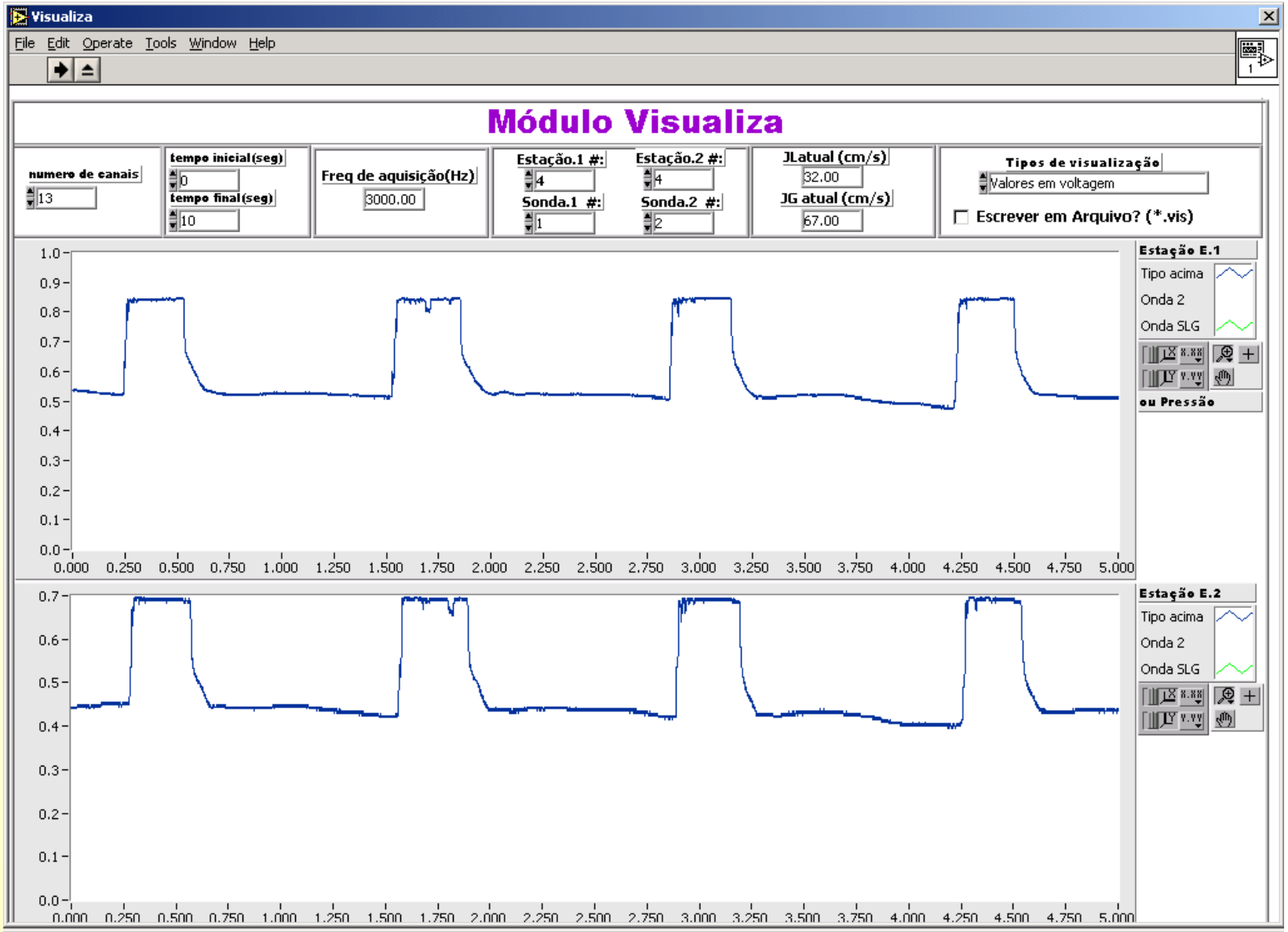
a) Pré-Processamento

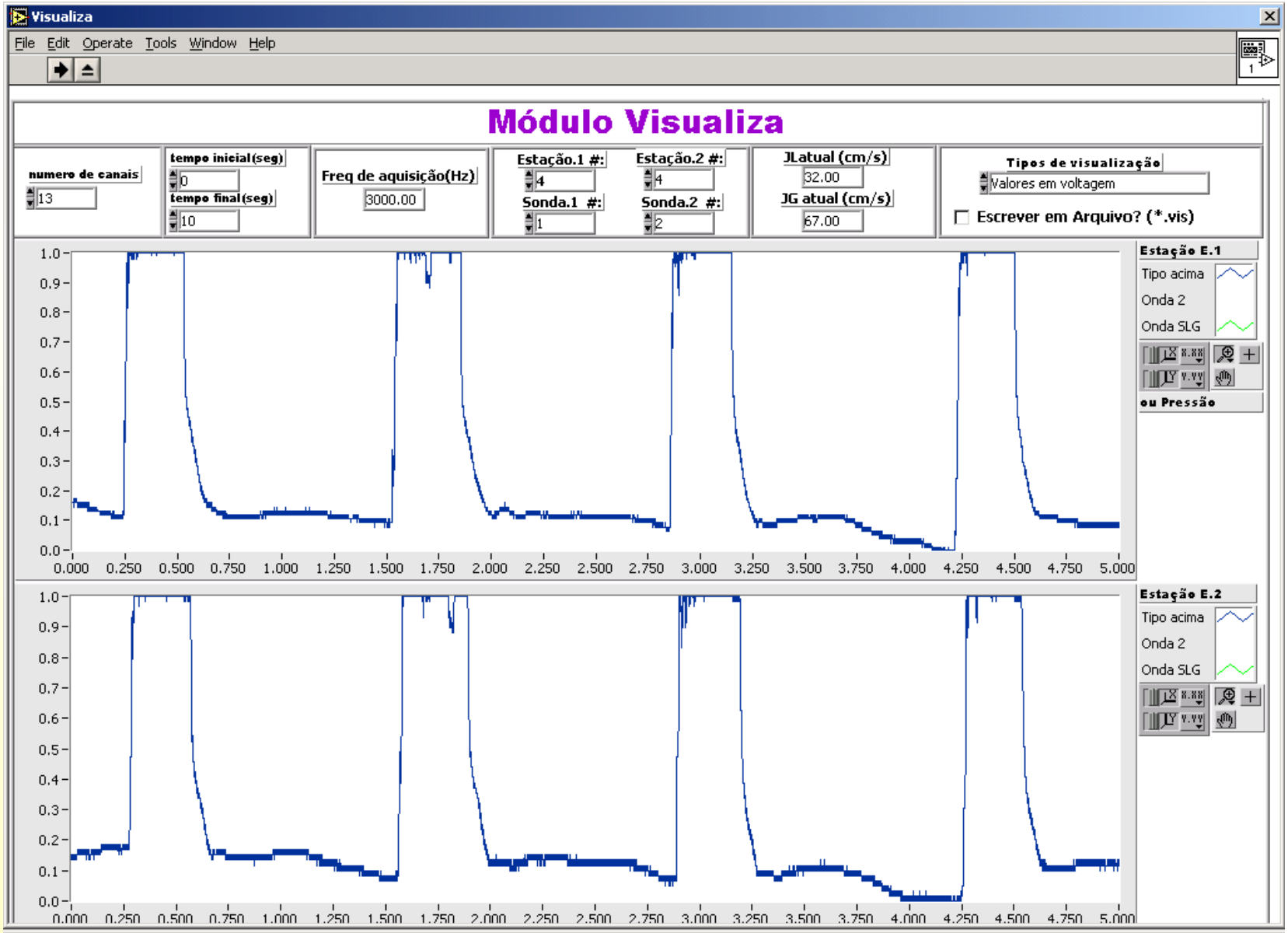
- Normalização do Sinal

$$V^* = \frac{(V - V_{mim})}{(V_{máx} - V_{mim})}$$

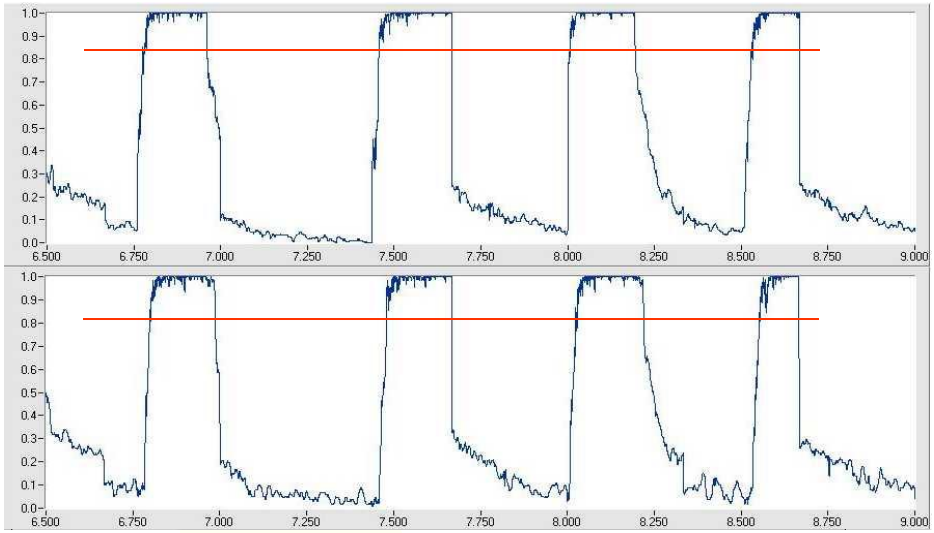


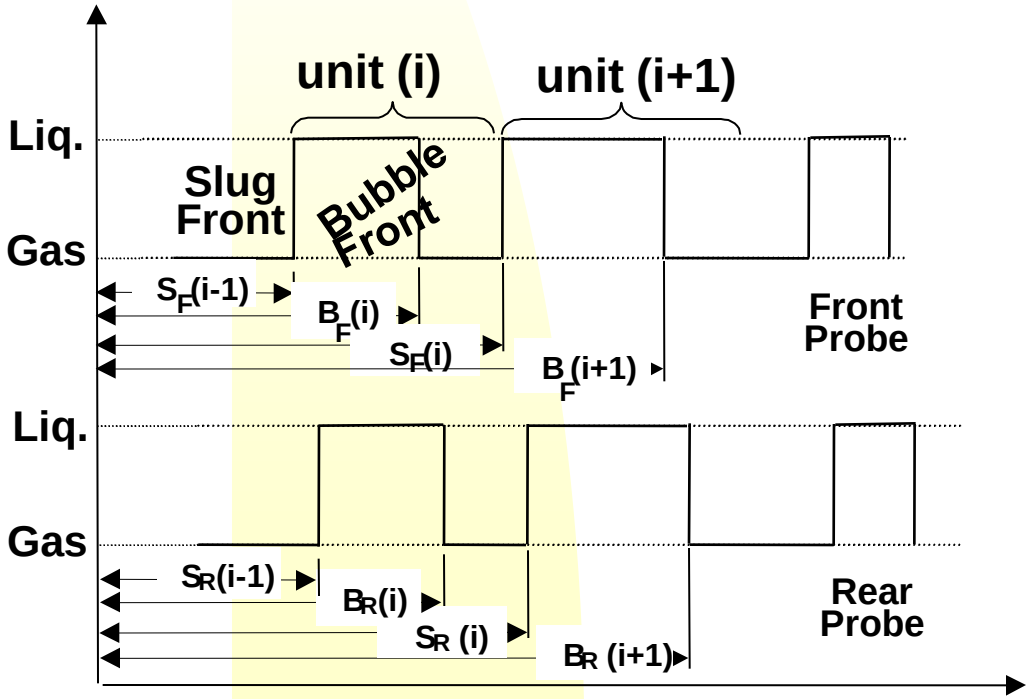
Fator Normal




Visualiza
File Edit Operate Tools Window Help
Módulo Visualiza
numero de canais
13
tempo inicial(seg)
0
tempo final(seg)
10
Freq de aquisição(Hz)
3000.00
Estação.1 #:
4
Sonda.1 #:
1
Estação.2 #:
4
Sonda.2 #:
2
JLatual (cm/s)
32.00
JG atual (cm/s)
67.00
Tipos de visualização
Valores em voltagem
Escrever em Arquivo? (*.vis)
Estação E.1
Tipo acima
Onda 2
Onda SLG
ou Pressão
Estação E.2
Tipo acima
Onda 2
Onda SLG
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
0.000 0.250 0.500 0.750 1.000 1.250 1.500 1.750 2.000 2.250 2.500 2.750 3.000 3.250 3.500 3.750 4.000 4.250 4.500 4.750 5.000

Processamento Sinais

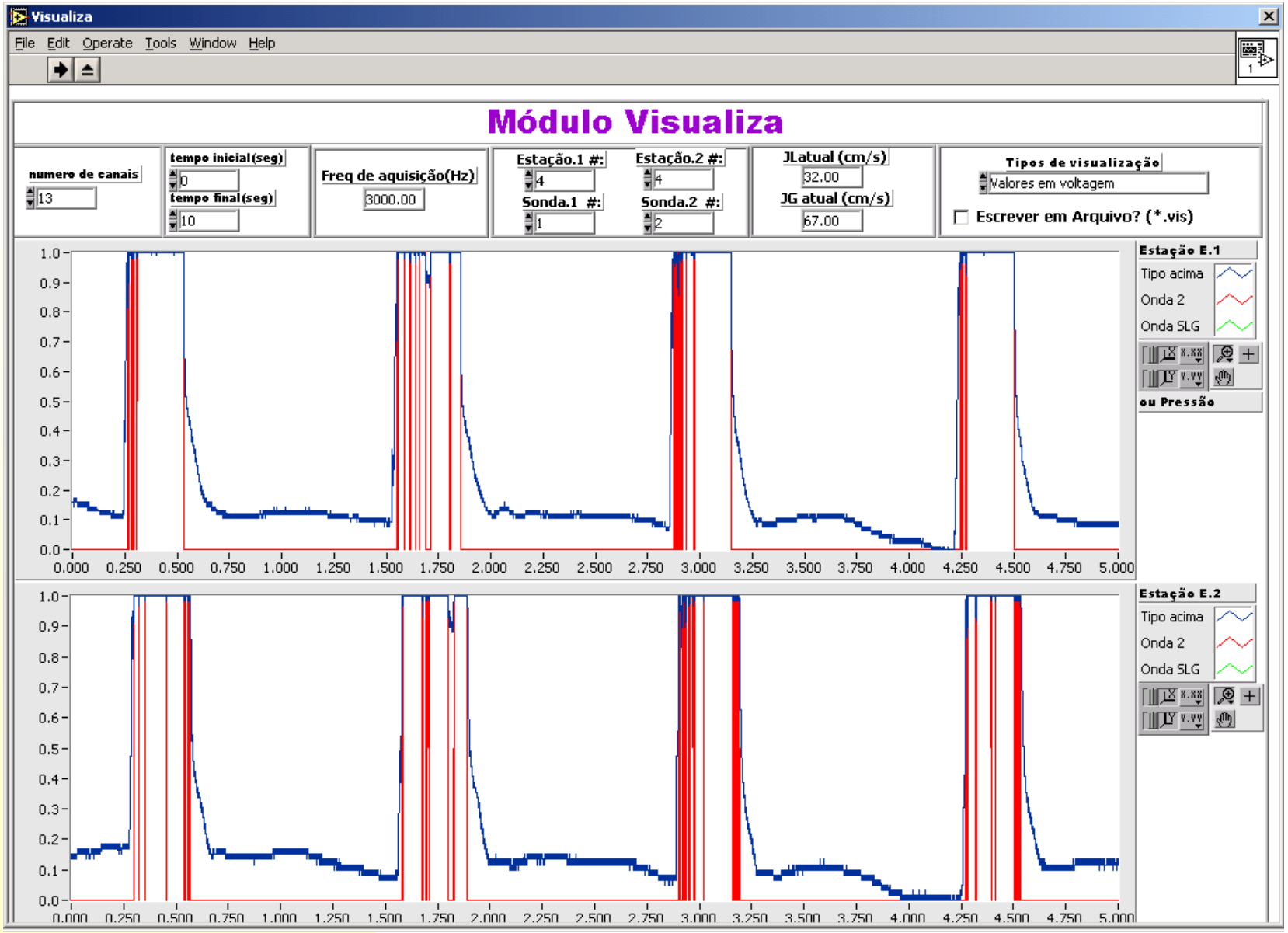




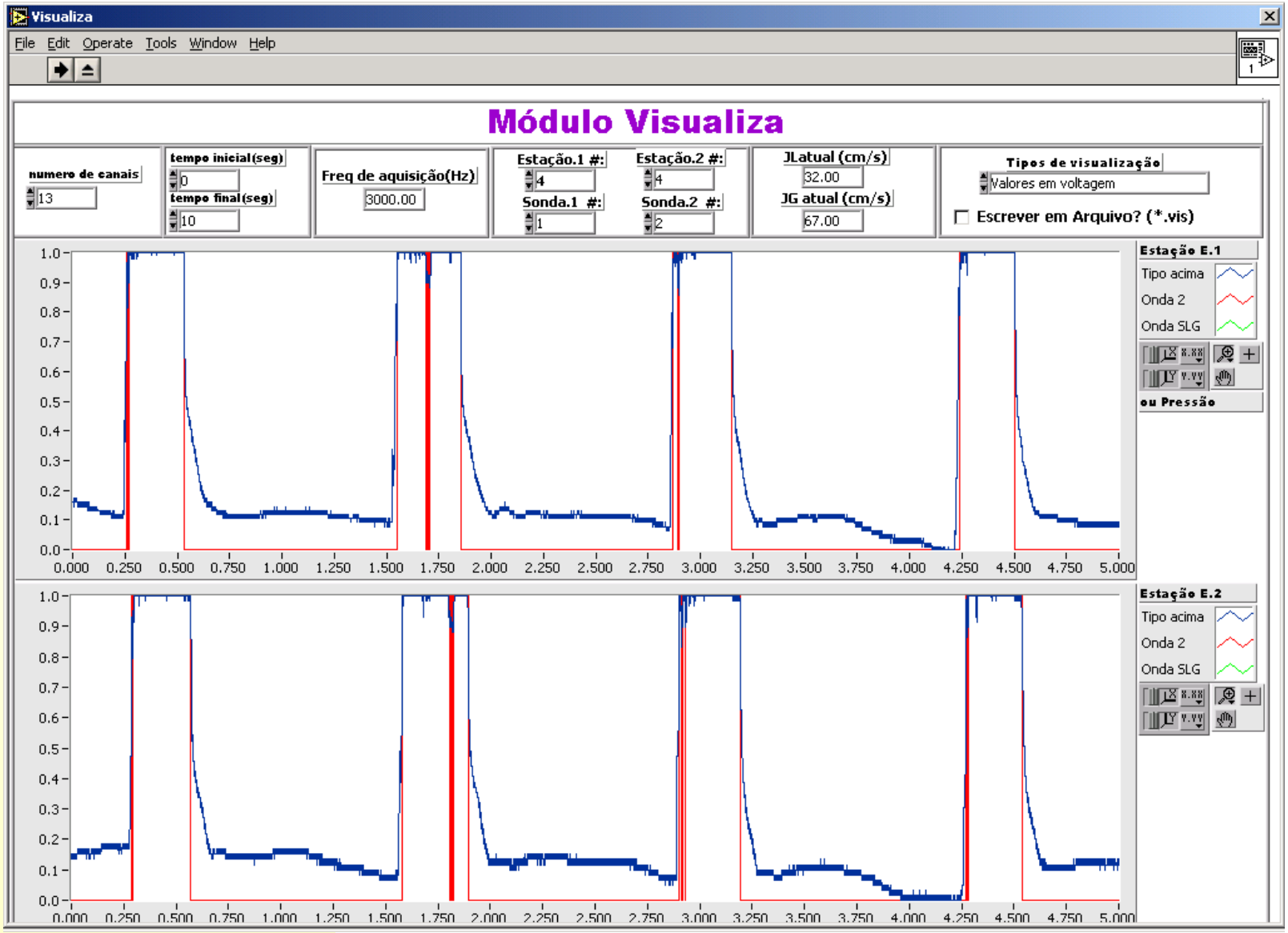
Aplicação de um fator de corte para discriminar a ocorrência da fase gás e da fase líquido

Casamento ou rejeição dos sinais defasados no tempo para constituir um par válido para análise

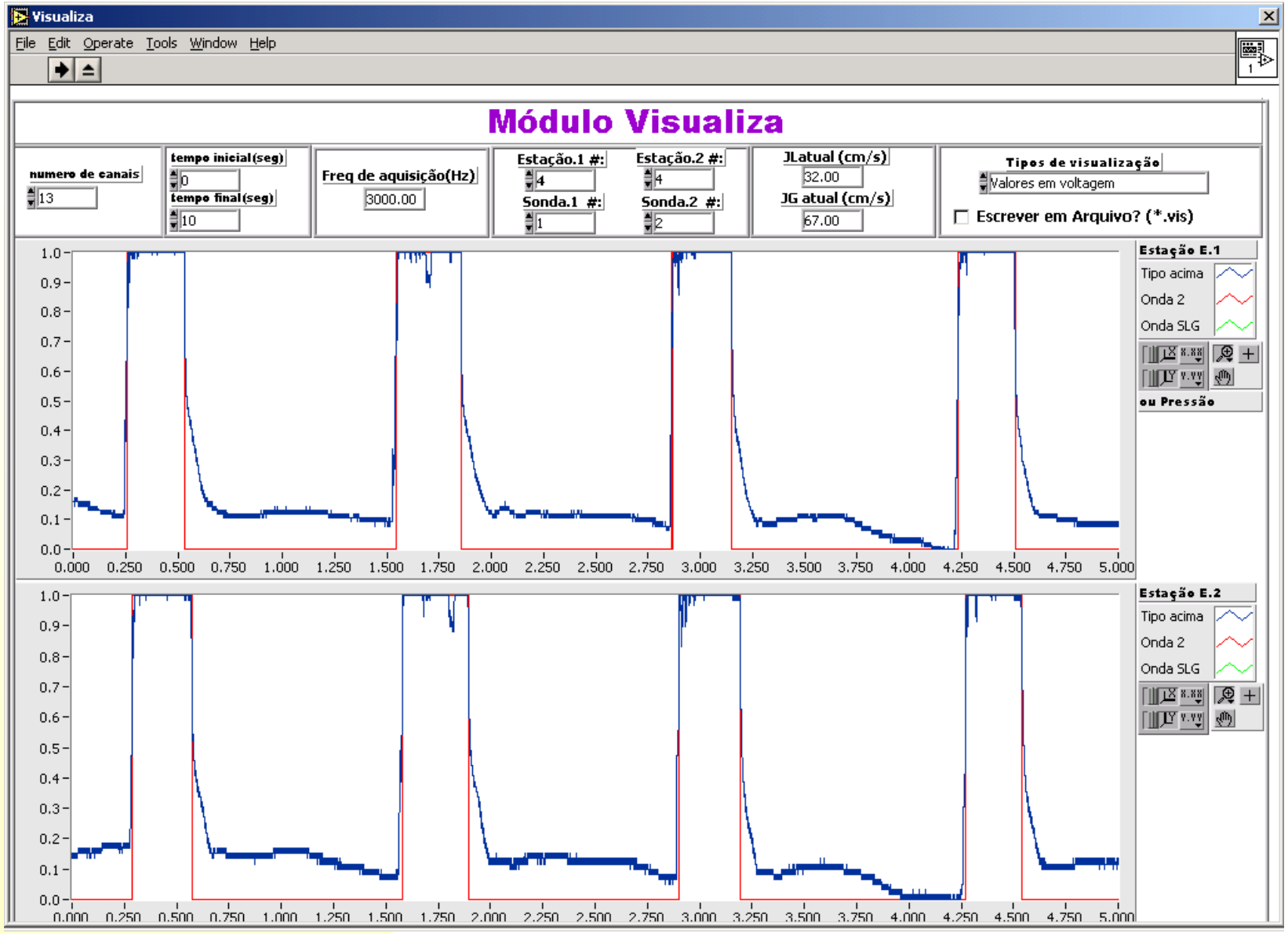
Fator de Corte, FC = 0.95



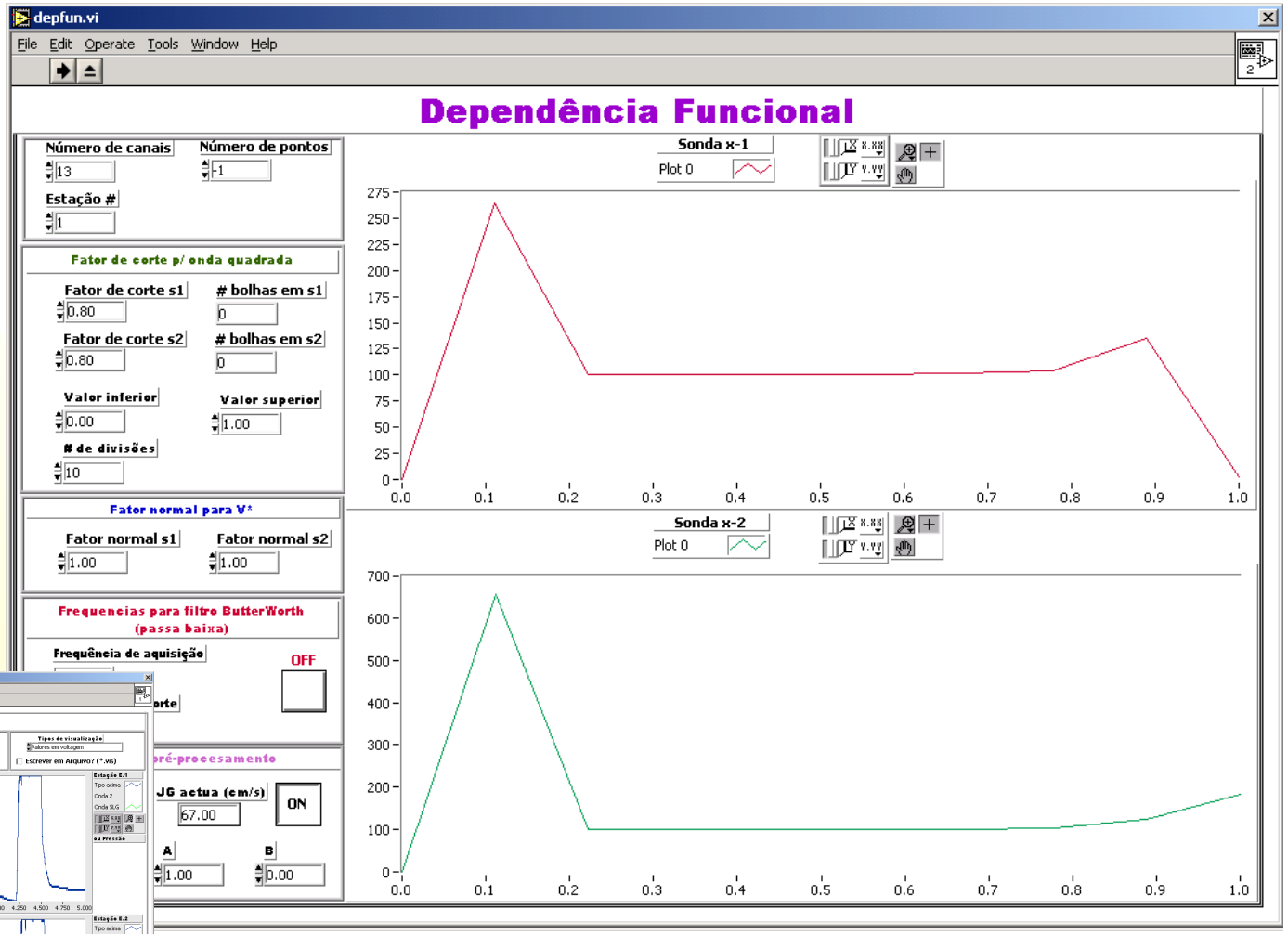
Fator de Corte, FC = 0.85

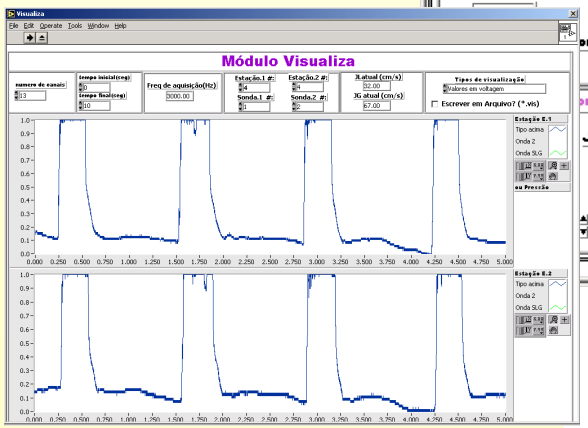


Fator de Corte, FC = 0.70

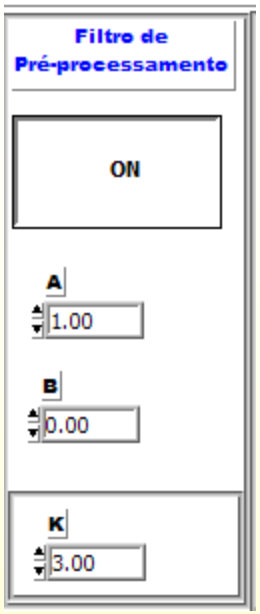


Número de Bolhas em Função do Fator de Corte: Dependência Funcional





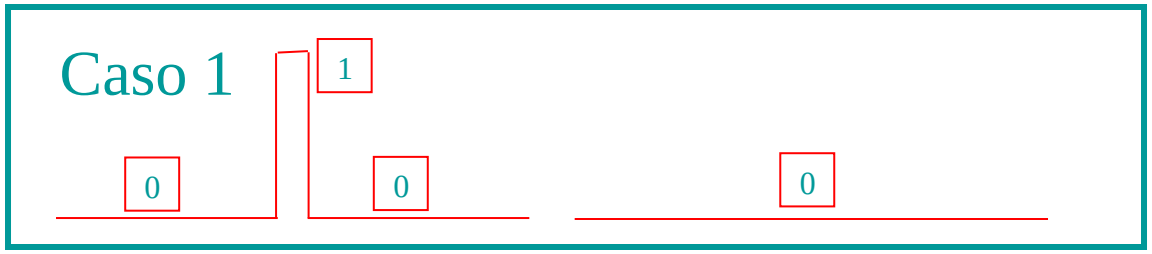
Correção do Sinal

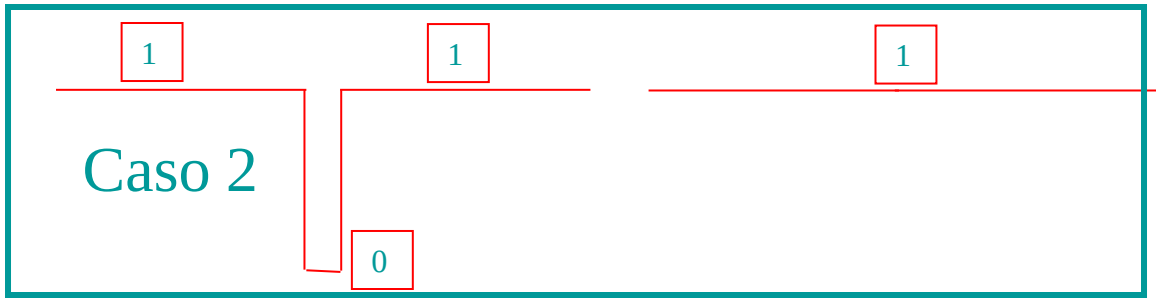


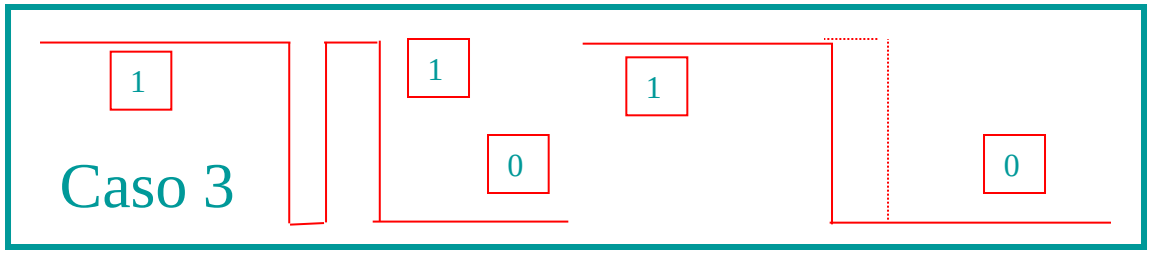
Filtro Linear

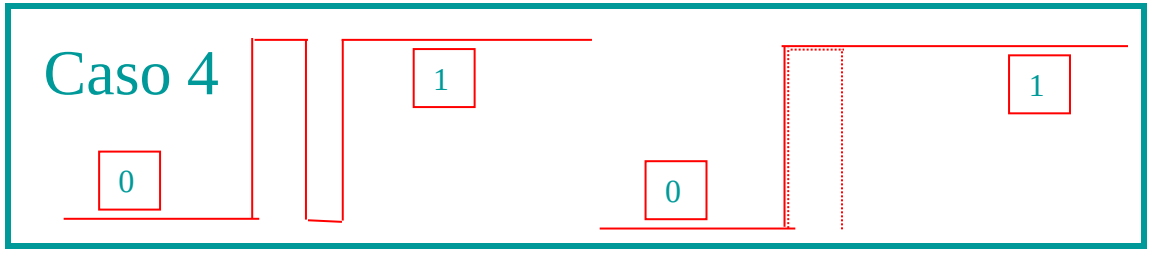
$$t = \frac{d}{(1{,}25.J).k}$$

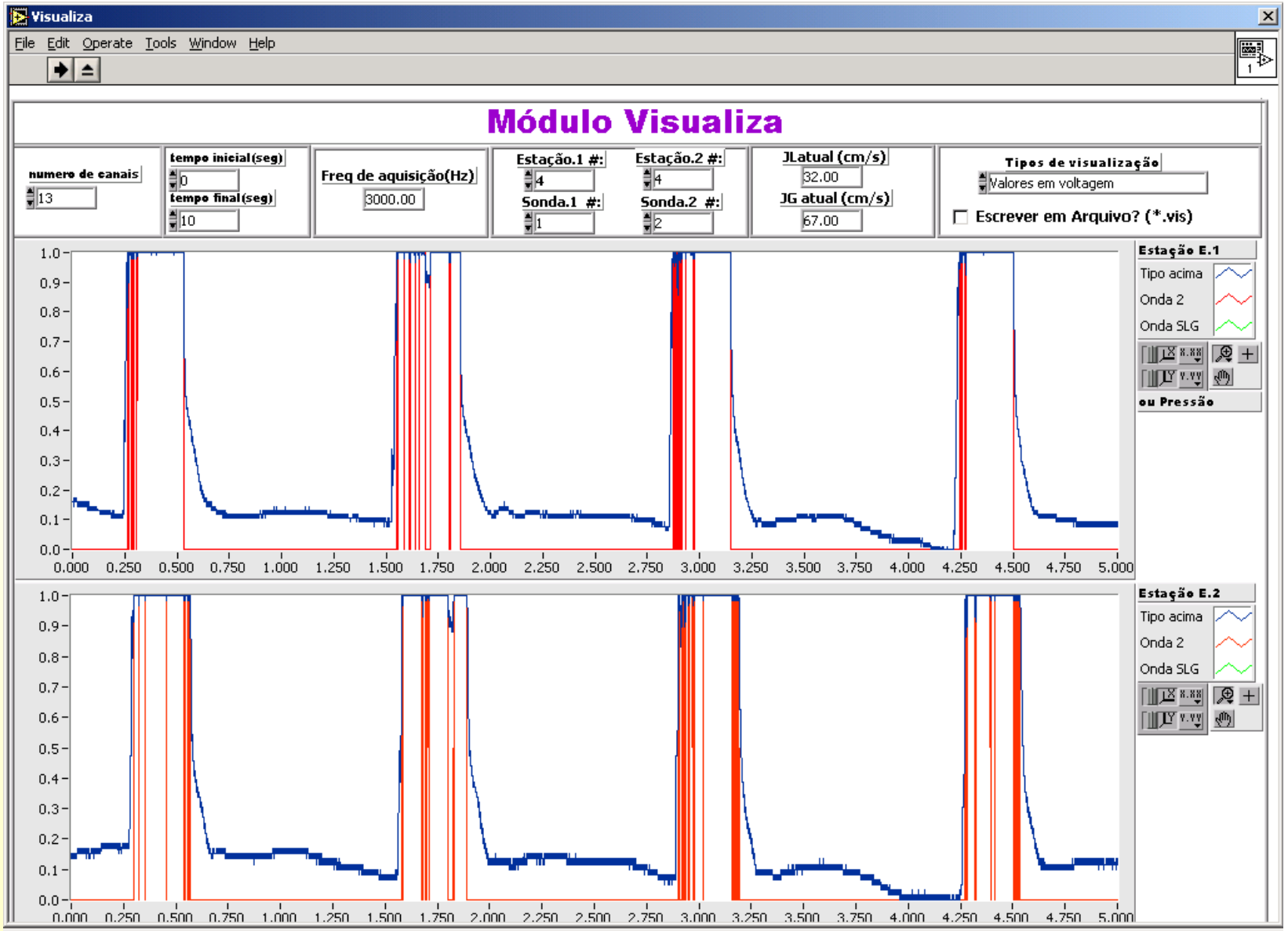
$$f = A.t + B$$

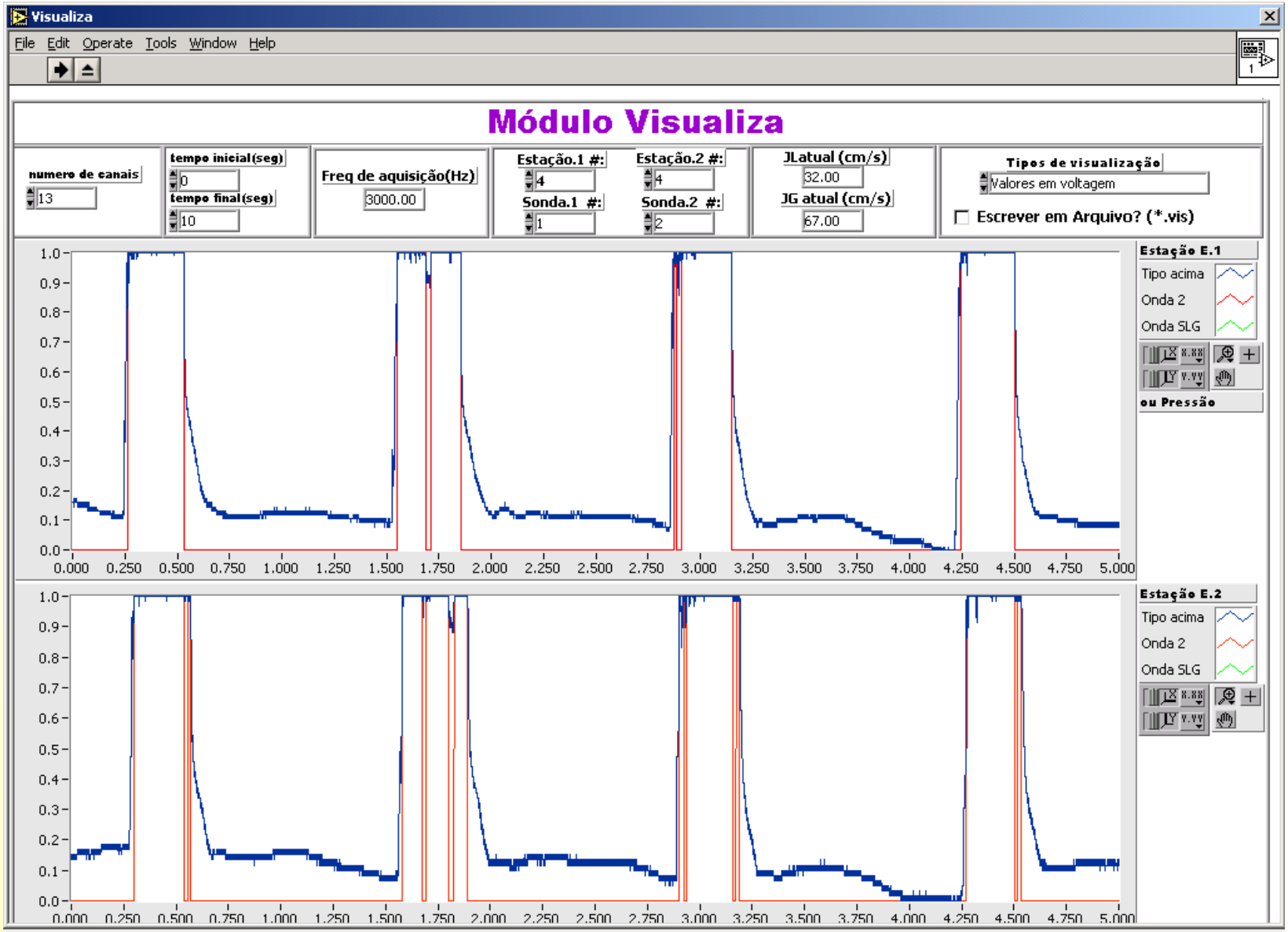


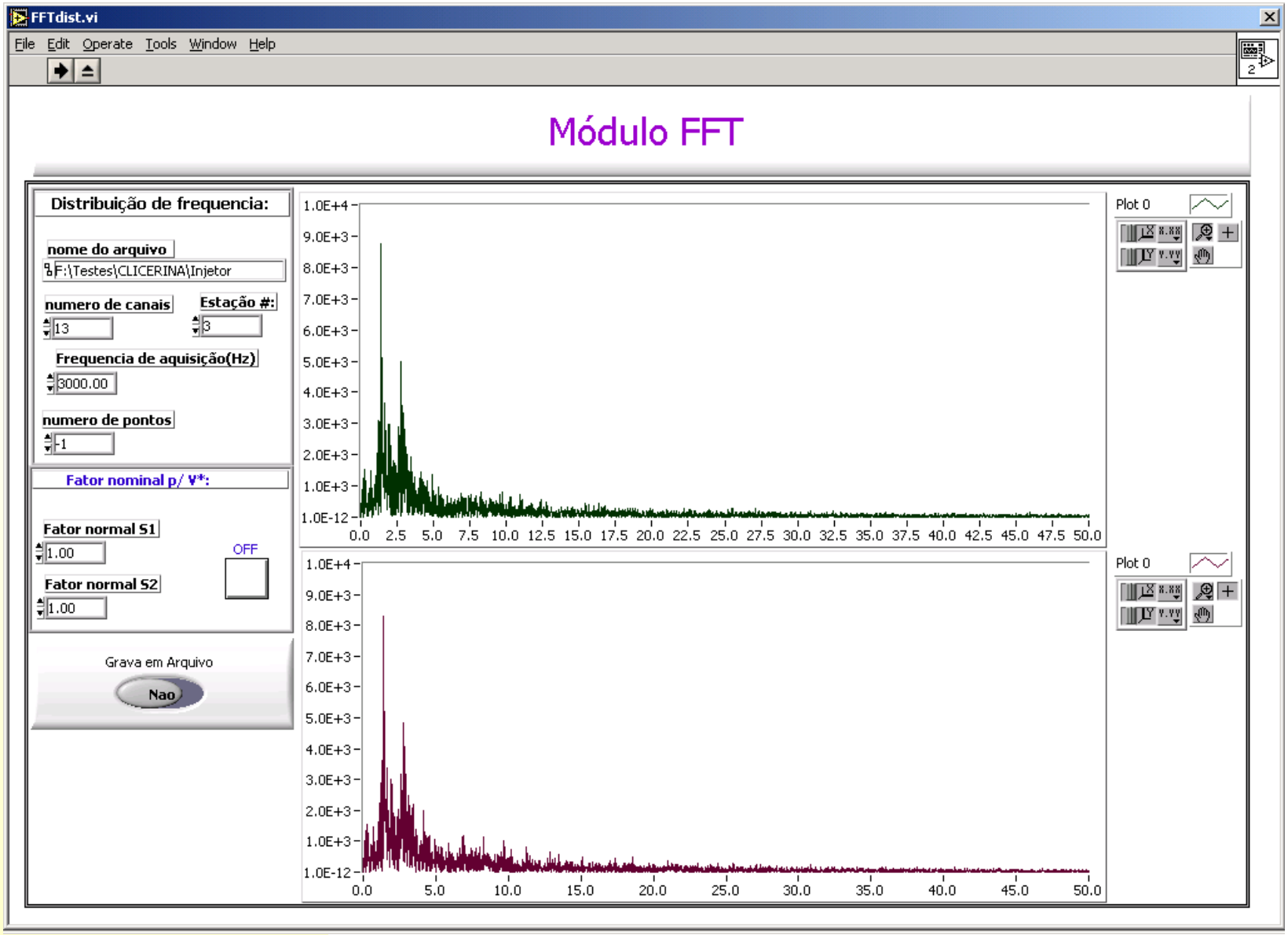




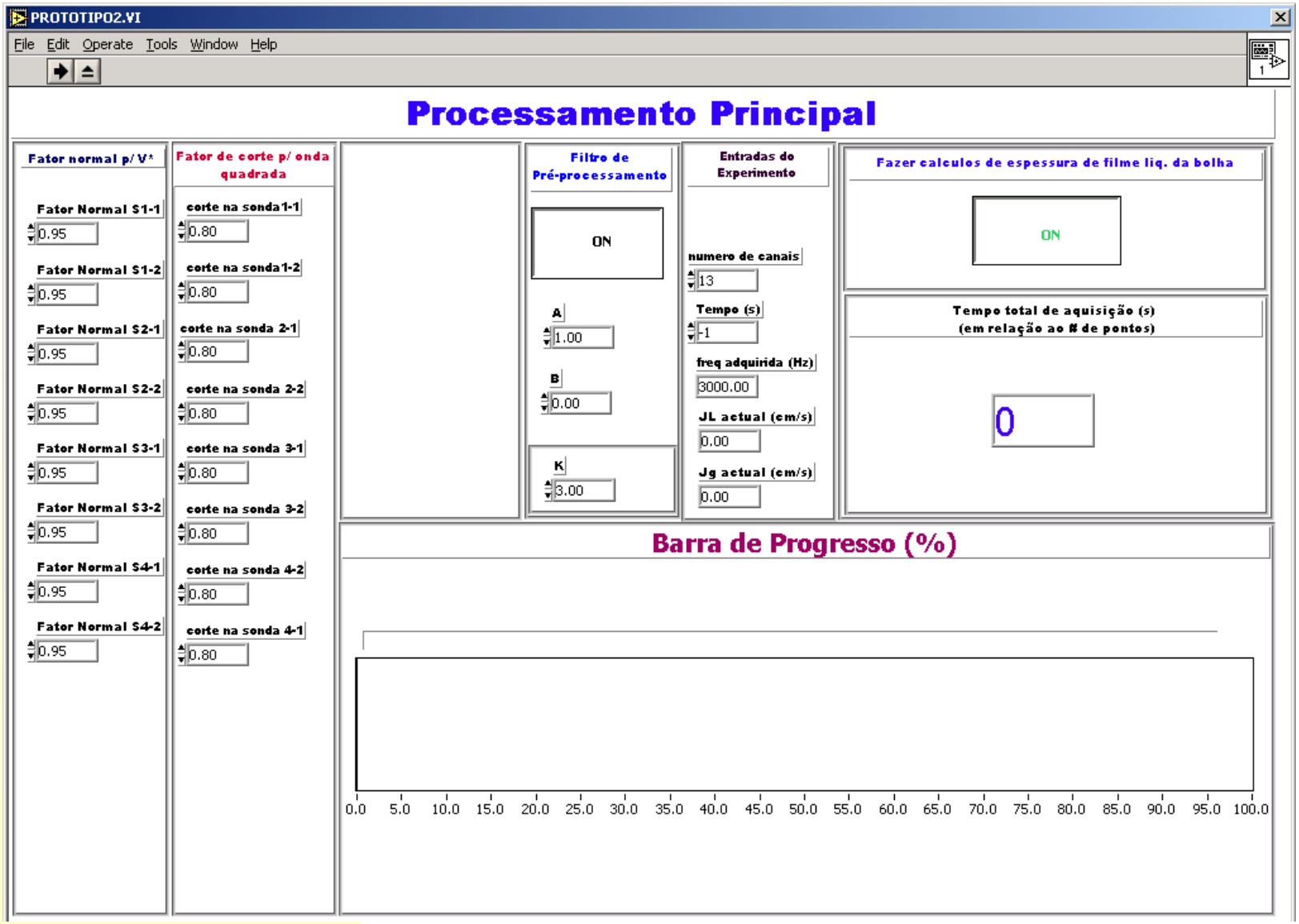



Visualiza
File Edit Operate Tools Window Help
Módulo Visualiza
numero de canais
13
tempo inicial(seg)
0
tempo final(seg)
10
Freq de aquisição(Hz)
3000.00
Estação.1 #:
4
Sonda.1 #:
1
Estação.2 #:
4
Sonda.2 #:
2
JLatual (cm/s)
32.00
JG atual (cm/s)
67.00
Tipos de visualização
Valores em voltagem
Escrever em Arquivo? (*.vis)
Estação E.1
Tipo acima
Onda 2
Onda SLG
ou Pressão
Estação E.2
Tipo acima
Onda 2
Onda SLG
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
0.000 0.250 0.500 0.750 1.000 1.250 1.500 1.750 2.000 2.250 2.500 2.750 3.000 3.250 3.500 3.750 4.000 4.250 4.500 4.750 5.000

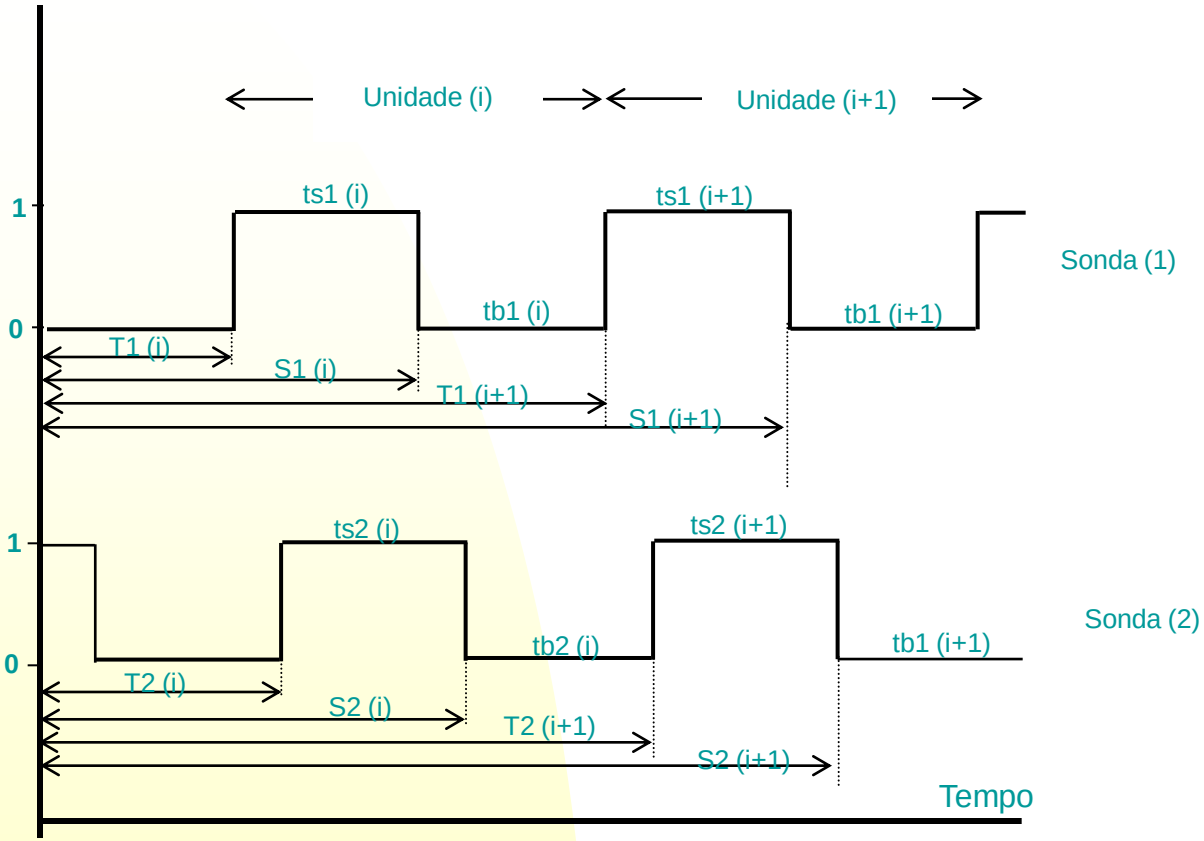

Visualiza
File Edit Operate Tools Window Help
Módulo Visualiza
numero de canais
13
tempo inicial(seg)
0
tempo final(seg)
10
Freq de aquisição(Hz)
3000.00
Estação.1 #:
4
Sonda.1 #:
1
Estação.2 #:
4
Sonda.2 #:
2
JLatual (cm/s)
32.00
JG atual (cm/s)
67.00
Tipos de visualização
Valores em voltagem
Escrever em Arquivo? (*.vis)
Estação E.1
Tipo acima
Onda 2
Onda SLG
ou Pressão
Estação E.2
Tipo acima
Onda 2
Onda SLG


FFTdist.vi
File Edit Operate Tools Window Help
Módulo FFT
Distribuição de frequencia:
nome do arquivo
F:\Testes\CLICERINA\Injetor
numero de canais
13
Estação #:
3
Frequencia de aquisição(Hz)
3000.00
numero de pontos
-1
Fator nominal p/ V*:
Fator normal S1
1.00
OFF
Fator normal S2
1.00
Grava em Arquivo
Nao
Plot 0
1.0E+4
9.0E+3
8.0E+3
7.0E+3
6.0E+3
5.0E+3
4.0E+3
3.0E+3
2.0E+3
1.0E+3
1.0E-12
0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0
Plot 0
1.0E+4
9.0E+3
8.0E+3
7.0E+3
6.0E+3
5.0E+3
4.0E+3
3.0E+3
2.0E+3
1.0E+3
1.0E-12
0.0 5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0 45.0 50.0

b) Processamento Principal



Cálculo das Variáveis



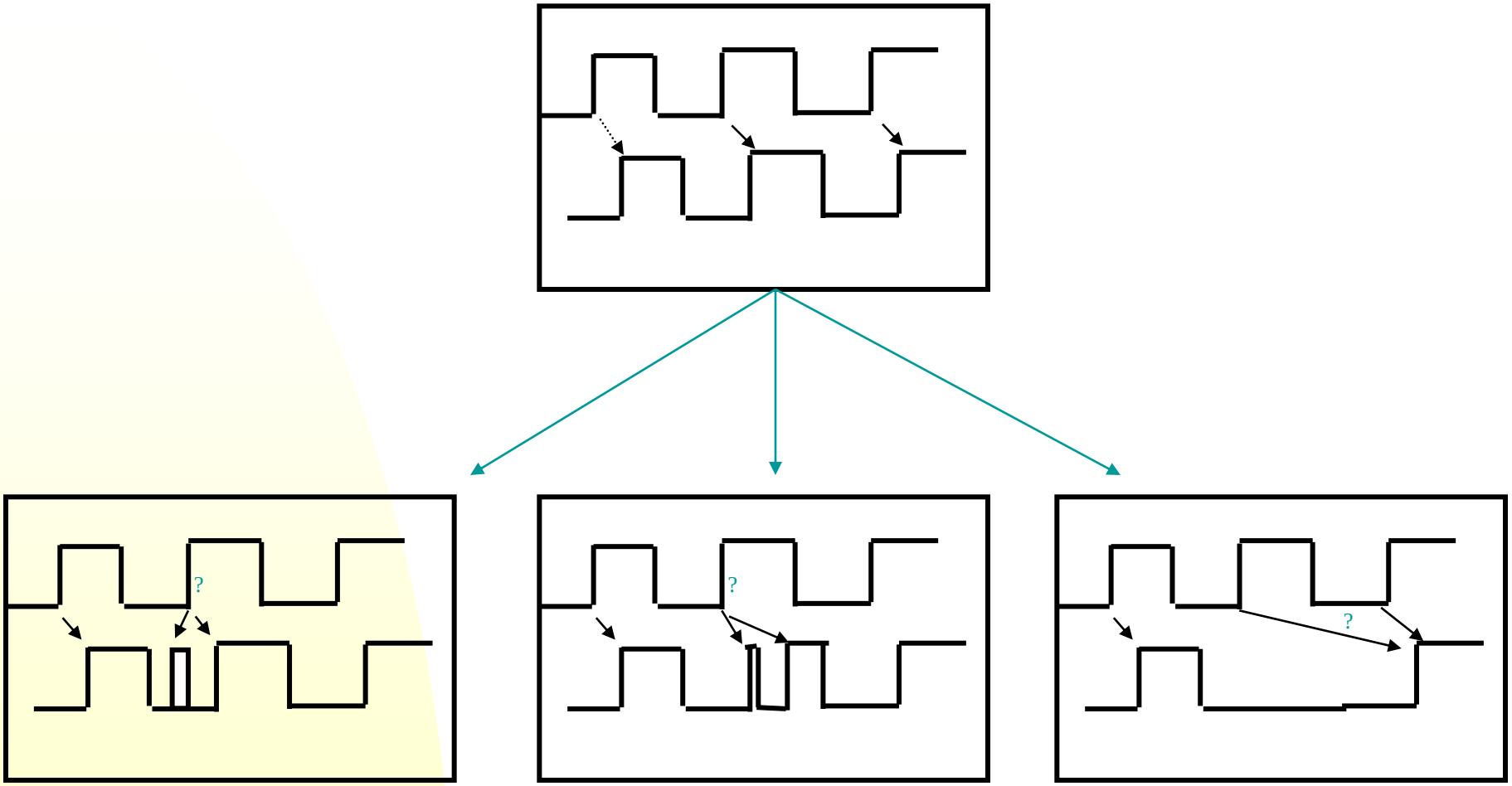
$$\Delta t_B = S2(i) - S1(i)$$

$$V_B = \frac{\Delta L_{sensor}}{\Delta t_B}$$

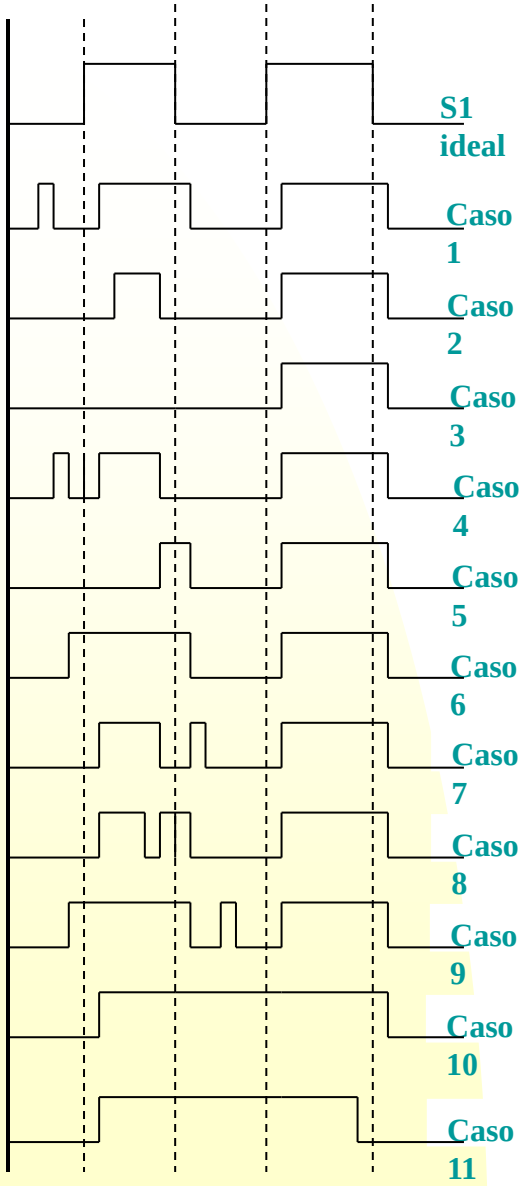
$$L_B = V_B \cdot tb$$

$$L_S = V_b \cdot ts$$

Identificação das Células Correspondentes

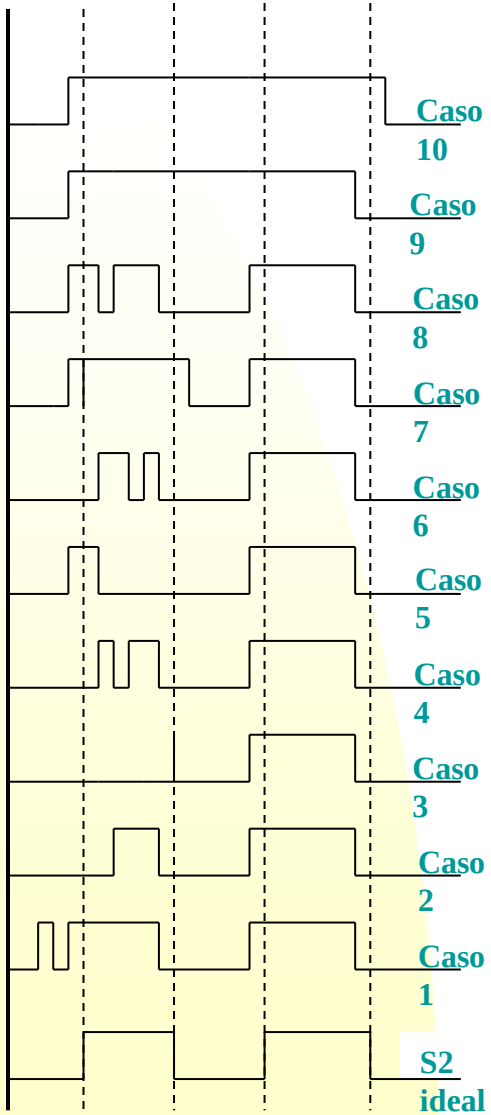


a) Sonda 1 como sonda ideal



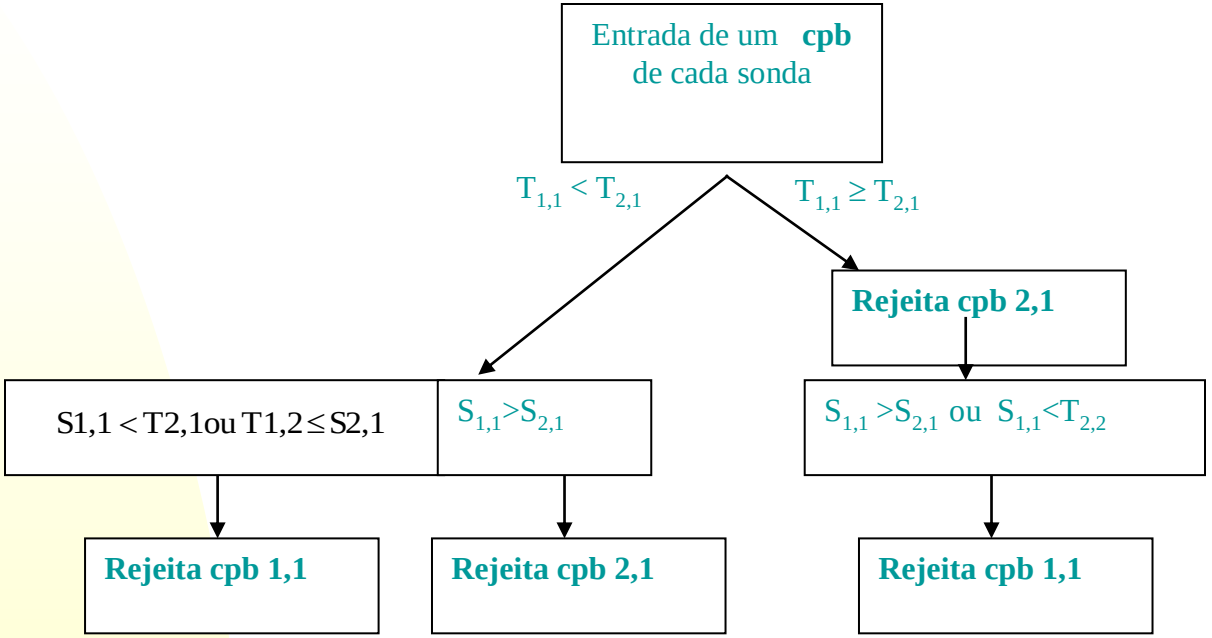
- **caso 1:** $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
- **caso 2:** $T_{1,1} < T_{2,1}$ e
  $S_{1,1} > S_{2,1}$ → rejeita cbp 1,1 e 2,1
- **caso 3:** $T_{1,1} < T_{2,1}$ e
  $S_{1,1} < T_{2,1}$ → rejeita cbp 1,1
- **caso 4:** $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
  $T_{1,1} < T_{2,2}$ e
  $S_{1,1} > S_{2,2}$ → rejeita cbp 1,1 e 2,2
- **caso 5:** Condição Temporal (CT)
  &
  essa condição retira o **cbp** que tiver o menor **tb** ou **ts**.
- **caso 6:** $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
  $S_{1,1} < S_{2,1}$ → rejeita cbp 1,1
- **caso 7:** $T_{1,1} < T_{2,1}$
  $S_{1,1} > S_{2,1}$ → rejeita cbp 2,1
- **caso 8:** $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
- **caso 9:** $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
  $S_{1,1} < T_{2,1}$ → rejeita cbp 1,1 e 2,2
- **caso 10:** $T_{1,1} < T_{2,1}$ e
  $T_{1,2} < S_{2,1}$ → rejeita cbp 1,1 e 2,2
  $T_{1,2} < T_{2,1}$ → rejeita cbp 1,2
- **caso 11:** $T_{1,1} < T_{2,1}$ e
  $T_{1,2} < S_{2,1}$ → rejeita cbp 1,1 e 2,2

b) Sonda 2 como sonda ideal



caso 1: $T_{1,1} < T_{2,1}$ e
$S_{1,1}$ $S_{1,1} < T_{2,2}$ → Rejeita cbp 1,1
CT → rejeita cbp 2,1 e 1,2

- caso 2: $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
  $S_{1,1} < T_{2,2}$ → rejeita cbp 1,1
- caso 3: $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
- caso 4: $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
  $S_{1,1} < T_{2,2}$ → rejeita cbp 1,1
  $T_{1,2} < T_{2,2}$ e
  $S_{1,2} < T_{2,2}$ → rejeita cbp 1,1
- caso 5: CT → rejeita cbp 1,1
- caso 6: $T_{1,1} > T_{2,1}$ → rejeita cbp 2,1
  $T_{1,1} < T_{2,2}$ e
  $S_{1,1} < T_{2,2}$ → rejeita cbp 1,1
  $T_{1,2} < T_{2,2}$ e
  $S_{1,2} < T_{2,2}$ → rejeita cbp 1,2
- caso 7: $T_{1,1} < T_{2,1}$ e
  $S_{1,1} > S_{2,1}$ → rejeita cbp 1,1 e 2,1
- caso 8: $T_{1,1} < T_{2,1}$ e
  $T_{1,2} < S_{2,1}$ → rejeita cbp 1,1 , 2,1 e 1,2
- caso 9: $T_{1,1} < T_{2,1}$ e
  $S_{1,1} > S_{2,1}$ → rejeita cbp 2,1
- caso 10: $T_{1,1} < T_{2,1}$ e
  $S_{1,1} < S_{2,1}$ → rejeita cbp 2,1
  $S_{1,1} > S_{2,2}$ → rejeita cbp 1,1 e 2,2


Entrada de um cpb de cada sonda
$T_{1,1} < T_{2,1}$
$T_{1,1} \geq T_{2,1}$
Rejeita cpb 2,1
$S1,1 < T2,1 ou\ T1,2 \leq S2,1$
$S_{1,1} > S_{2,1}$
$S_{1,1} > S_{2,1}$ ou $S_{1,1} < T_{2,2}$
Rejeita cpb 1,1
Rejeita cpb 2,1
Rejeita cpb 1,1

Condição Temporal

$$t = \frac{d}{(1{,}25.J).k}$$

$$f = A.t + B$$

- K=1

		(m/s)	(m/s)	(m/s)	(L/D)	(L/D)	(seg)	(mbar abs)	(---)	(---)	(m/s)	(# bolhas)	(# bolhas)
Estação	L/D	Vb	Vs	DVbs	LB	LS	T	P	H/D	Eb	Vcr	Nb1	Nb2
1.00E+00	1.27E+02	1.21E+00	1.11E+00	1.03E-01	2.90E+01	1.37E+01	9.42E-01	1.10E+03	4.04E-01	6.23E-01	1.74E+00	1.81E+02	1.01E+02
2.00E+00	2.65E+02	1.21E+00	1.13E+00	8.28E-02	3.85E+01	1.36E+01	1.14E+00	1.09E+03	5.87E-01	3.93E-01	1.32E+00	1.36E+02	1.03E+02
3.00E+00	4.95E+02	1.19E+00	1.22E+00	-2.90E-02	5.00E+01	1.14E+01	1.33E+00	1.07E+03	5.89E-01	3.88E-01	1.42E+00	1.38E+02	1.02E+02
4.00E+00	7.77E+02	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04	1.46E+00	1.54E+02	1.02E+02

(# bolhas)	(seg)	(Hz)	(---)	(---)	(---)	(---)	(cm/s)	(cm/s)	(cm/s)	(---)	(---)	(---)	(---)
Nb3	Taq	F	Sb/Vb	Ss/Vs	Slb/Lb	Sls/LS	JL	JG	J	Jg/J	JG/JL	Fr	Re
6.00E+00	1.20E+02	1.06E+00	1.20E-02	8.97E-02	5.38E-01	2.59E-01	3.20E+01	5.76E+01	8.96E+01	6.43E-01	1.80E+00	1.77E+00	1.09E+03
4.00E+00	1.20E+02	8.80E-01	1.64E-02	8.44E-03	3.39E-01	2.01E-01	3.20E+01	5.80E+01	9.00E+01	6.44E-01	1.81E+00	1.78E+00	1.09E+03
1.00E+00	1.20E+02	7.50E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.20E+01	5.95E+01	9.15E+01	6.50E-01	1.86E+00	1.81E+00	1.11E+03
0.00E+00	1.20E+02	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04	3.20E+01	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04	6.55E+04

- K=3

		(m/s)	(m/s)	(m/s)	(L/D)	(L/D)	(seg)	(mbar abs)	(---)	(---)	(m/s)	(# bolhas)	(# bolhas)
Estação	L/D	Vb	Vs	DVbs	LB	LS	T	P	H/D	Eb	Vcr	Nb1	Nb2
1.00E+00	1.27E+02	1.26E+00	1.32E+00	-6.29E-02	4.18E+01	1.69E+01	1.20E+00	1.10E+03	3.85E-01	6.46E-01	1.74E+00	1.81E+02	1.04E+02
2.00E+00	2.65E+02	1.26E+00	1.42E+00	-1.59E-01	4.18E+01	1.77E+01	1.19E+00	1.09E+03	5.98E-01	3.80E-01	1.32E+00	1.36E+02	1.03E+02
3.00E+00	4.95E+02	1.30E+00	1.46E+00	-1.61E-01	4.33E+01	1.80E+01	1.19E+00	1.06E+03	6.20E-01	3.50E-01	1.42E+00	1.38E+02	1.02E+02
4.00E+00	7.77E+02	1.31E+00	1.45E+00	-1.36E-01	4.49E+01	1.71E+01	1.20E+00	1.01E+03	5.87E-01	3.94E-01	1.46E+00	1.54E+02	1.03E+02

(# bolhas)	(seg)	(Hz)	(---)	(---)	(---)	(---)	(cm/s)	(cm/s)	(cm/s)	(---)	(---)	(---)	(---)
Nb3	Taq	F	Sb/Vb	Ss/Vs	Slb/Lb	Sls/LS	JL	JG	J	Jg/J	JG/JL	Fr	Re
9.80E+01	1.20E+02	8.37E-01	3.67E-02	1.72E-01	3.29E-01	2.93E-01	3.20E+01	5.77E+01	8.97E+01	6.43E-01	1.80E+00	1.78E+00	1.09E+03
1.00E+02	1.20E+02	8.42E-01	3.12E-02	1.16E-01	3.40E-01	2.44E-01	3.20E+01	5.80E+01	9.00E+01	6.45E-01	1.81E+00	1.78E+00	1.09E+03
1.00E+02	1.20E+02	8.43E-01	3.38E-02	2.00E-01	3.50E-01	2.92E-01	3.20E+01	5.96E+01	9.16E+01	6.51E-01	1.86E+00	1.81E+00	1.11E+03
9.90E+01	1.20E+02	8.36E-01	3.58E-02	1.12E-01	3.40E-01	2.09E-01	3.20E+01	6.29E+01	9.49E+01	6.63E-01	1.97E+00	1.88E+00	1.15E+03

Arquivo SLG

unidade	s	s	s	s	s	s	s	s	s	s	m/s	m/s	L/D	L/D	s	sequência	mBar(abs)	---	---
variável	**tb1**	**ts1**	**tb2**	**ts2**	**T1**	**S1**	**T2**	**S2**	**DT1**	**DT2**	**VB**	**VS**	**LB**	**LS**	**T**	**SEQ**	**P**	**hf/D(1)**	**aB(1)**
1.00E+00	6.32E-01	4.15E-01	6.32E-01	4.12E-01	1.09E+00	1.50E+00	1.13E+00	1.54E+00	3.90E-02	4.23E-02	1.28E+00	1.18E+00	3.11E+01	1.89E+01	1.05E+00	0.00E+00	1.10E+03	4.06E-01	6.20E-01
2.00E+00	5.24E-01	3.27E-01	5.32E-01	3.24E-01	2.14E+00	2.46E+00	2.17E+00	2.50E+00	3.73E-02	3.97E-02	1.34E+00	1.26E+00	2.70E+01	1.58E+01	8.51E-01	1.00E+00	1.10E+03	3.82E-01	6.51E-01
3.00E+00	5.47E-01	2.25E-01	5.38E-01	2.21E-01	2.99E+00	3.21E+00	3.03E+00	3.25E+00	4.13E-02	4.53E-02	1.21E+00	1.10E+00	2.54E+01	9.56E+00	7.72E-01	1.00E+00	1.11E+03	3.84E-01	6.47E-01
4.00E+00	1.05E+00	2.27E-01	1.06E+00	2.35E-01	3.76E+00	3.98E+00	3.79E+00	4.02E+00	4.03E-02	3.23E-02	1.24E+00	1.55E+00	5.01E+01	1.35E+01	1.28E+00	1.00E+00	1.11E+03	3.55E-01	6.82E-01

s	s	s	s	s	s	s	s	s	s	m/s	m/s	L/D	L/D	s	sequência	mBar(abs)	---	---
tb1	**ts1**	**tb2**	**ts2**	**T1**	**S1**	**T2**	**S2**	**DT1**	**DT2**	**VB**	**VS**	**LB**	**LS**	**T**	**SEQ**	**P**	**hf/D(2)**	**aB(2)**
9.04E-01	2.29E-01	9.02E-01	2.35E-01	6.50E-02	2.94E-01	9.80E-02	3.33E-01	3.93E-02	3.30E-02	1.27E+00	1.52E+00	4.42E+01	1.33E+01	1.13E+00	0.00E+00	1.10E+03	5.68E-01	4.15E-01
2.24E-01	2.70E-01	2.19E-01	2.74E-01	1.20E+00	1.47E+00	1.23E+00	1.51E+00	4.17E-02	3.70E-02	1.20E+00	1.35E+00	1.03E+01	1.40E+01	4.94E-01	1.00E+00	1.10E+03	6.45E-01	3.27E-01
9.94E-01	2.03E-01	9.87E-01	2.09E-01	1.69E+00	1.89E+00	1.73E+00	1.94E+00	4.20E-02	3.63E-02	1.19E+00	1.38E+00	4.55E+01	1.08E+01	1.20E+00	1.00E+00	1.10E+03	5.70E-01	4.13E-01
1.12E+00	2.73E-01	1.12E+00	2.76E-01	2.89E+00	3.16E+00	2.92E+00	3.20E+00	3.80E-02	3.47E-02	1.32E+00	1.44E+00	5.67E+01	1.51E+01	1.39E+00	1.00E+00	1.10E+03	5.46E-01	4.43E-01

s	s	s	s	s	s	s	s	s	s	m/s	m/s	L/D	L/D	s	sequência	mBar(abs)	---	---
tb1	**ts1**	**tb2**	**ts2**	**T1**	**S1**	**T2**	**S2**	**DT1**	**DT2**	**VB**	**VS**	**LB**	**LS**	**T**	**SEQ**	**P**	**hf/D(3)**	**aB(3)**
6.88E-01	3.21E-01	6.82E-01	3.02E-01	1.38E+00	1.70E+00	1.44E+00	1.74E+00	3.87E-02	5.77E-02	1.29E+00	8.67E-01	3.42E+01	1.07E+01	1.01E+00	0.00E+00	1.07E+03	6.30E-01	3.38E-01
5.03E-01	2.77E-01	4.92E-01	2.83E-01	2.39E+00	2.66E+00	2.42E+00	2.70E+00	3.90E-02	3.23E-02	1.28E+00	1.55E+00	2.48E+01	1.65E+01	7.80E-01	1.00E+00	1.07E+03	6.32E-01	3.36E-01
1.21E+00	3.38E-01	1.21E+00	3.49E-01	3.17E+00	3.51E+00	3.19E+00	3.54E+00	3.80E-02	2.77E-02	1.32E+00	1.81E+00	6.12E+01	2.35E+01	1.55E+00	1.00E+00	1.07E+03	6.02E-01	3.72E-01
2.13E-01	2.75E-01	2.02E-01	2.77E-01	4.71E+00	4.99E+00	4.75E+00	5.03E+00	3.93E-02	3.77E-02	1.27E+00	1.33E+00	1.04E+01	1.41E+01	4.88E-01	1.00E+00	1.06E+03	6.77E-01	2.83E-01

s	s	s	s	s	s	s	s	s	s	m/s	m/s	L/D	L/D	s	sequência	mBar(abs)	---	---
tb1	**ts1**	**tb2**	**ts2**	**T1**	**S1**	**T2**	**S2**	**DT1**	**DT2**	**VB**	**VS**	**LB**	**LS**	**T**	**SEQ**	**P**	**hf/D(4)**	**αB(4)**
1.01E+00	2.77E-01	1.01E+00	2.82E-01	2.56E-01	5.33E-01	2.89E-01	5.71E-01	3.83E-02	3.33E-02	1.30E+00	1.50E+00	5.08E+01	1.60E+01	1.29E+00	0.00E+00	1.01E+03	0.580654	0.40097
1.01E+00	3.11E-01	1.01E+00	3.17E-01	1.54E+00	1.86E+00	1.58E+00	1.89E+00	3.87E-02	3.23E-02	1.29E+00	1.55E+00	5.02E+01	1.85E+01	1.32E+00	1.00E+00	1.01E+03	0.575463	0.406885
1.08E+00	2.86E-01	1.08E+00	2.93E-01	2.87E+00	3.15E+00	2.90E+00	3.19E+00	4.33E-02	3.57E-02	1.15E+00	1.40E+00	4.80E+01	1.54E+01	1.37E+00	1.00E+00	1.01E+03	0.541591	0.449322
5.53E-01	2.72E-01	5.60E-01	2.70E-01	4.23E+00	4.50E+00	4.27E+00	4.54E+00	3.60E-02	3.83E-02	1.39E+00	1.30E+00	2.96E+01	1.37E+01	8.26E-01	1.00E+00	1.01E+03	0.573429	0.410652

Arquivo SGR

		(m/s)	(m/s)	(m/s)	(L/D)	(L/D)	(seg)	(mbar abs)	(---)	(---)	(m/s)	(# bolhas)	(# bolhas)
Estação	L/D	Vb	Vs	DVbs	LB	LS	T	P	H/D	Eb	Vcr	Nb1	Nb2
1.00E+00	1.27E+02	1.26E+00	1.32E+00	-6.29E-02	4.18E+01	1.69E+01	1.20E+00	1.10E+03	3.85E-01	6.46E-01	1.74E+00	1.81E+02	1.04E+02
2.00E+00	2.65E+02	1.26E+00	1.42E+00	-1.59E-01	4.18E+01	1.77E+01	1.19E+00	1.09E+03	5.98E-01	3.80E-01	1.32E+00	1.36E+02	1.03E+02
3.00E+00	4.95E+02	1.30E+00	1.46E+00	-1.61E-01	4.33E+01	1.80E+01	1.19E+00	1.06E+03	6.20E-01	3.50E-01	1.42E+00	1.38E+02	1.02E+02
4.00E+00	7.77E+02	1.31E+00	1.45E+00	-1.36E-01	4.49E+01	1.71E+01	1.20E+00	1.01E+03	5.87E-01	3.94E-01	1.46E+00	1.54E+02	1.03E+02

(# bolhas)	(seg)	(Hz)	(---)	(---)	(---)	(---)	(cm/s)	(cm/s)	(cm/s)	(---)	(---)	(---)	(---)
Nb3	Taq	F	Sb/Vb	Ss/Vs	Slb/Lb	Sls/LS	JL	JG	J	Jg/J	JG/JL	Fr	Re
9.80E+01	1.20E+02	8.37E-01	3.67E-02	1.72E-01	3.29E-01	2.93E-01	3.20E+01	5.77E+01	8.97E+01	6.43E-01	1.80E+00	1.78E+00	1.09E+03
1.00E+02	1.20E+02	8.42E-01	3.12E-02	1.16E-01	3.40E-01	2.44E-01	3.20E+01	5.80E+01	9.00E+01	6.45E-01	1.81E+00	1.78E+00	1.09E+03
1.00E+02	1.20E+02	8.43E-01	3.38E-02	2.00E-01	3.50E-01	2.92E-01	3.20E+01	5.96E+01	9.16E+01	6.51E-01	1.86E+00	1.81E+00	1.11E+03

(cm/s)	(cm/s)	(mbar/m)	(bolha/bolha/D)
JL cell	JG cell	GP	R
6.90E+01	5.88E+01	-1.68E+00	6.98E-03
9.55E+01	3.48E+01	-4.85E+00	4.26E-03
1.01E+02	3.33E+01	-7.60E+00	-3.45E-03

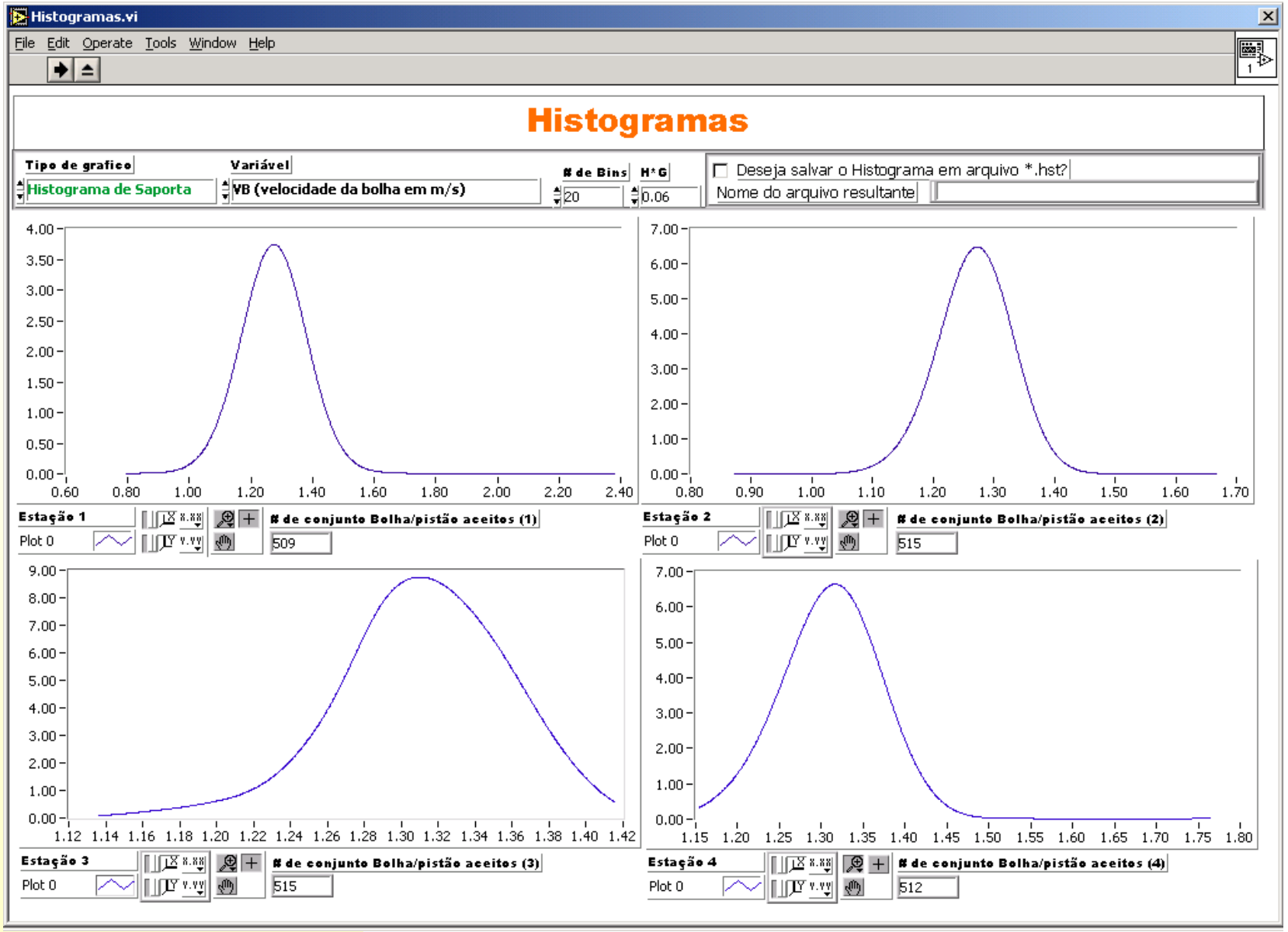
Tabela SMD

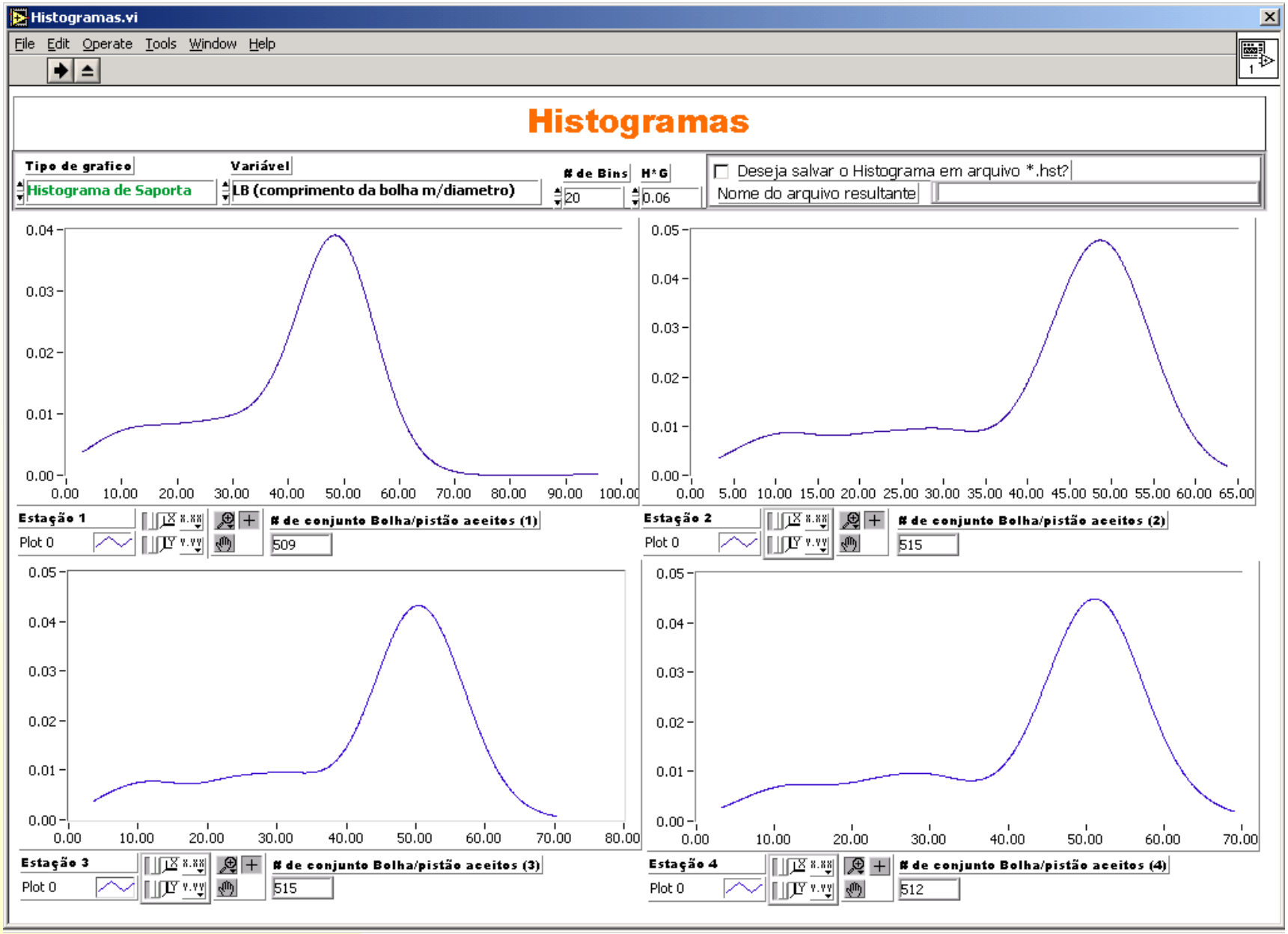
		m/s	m/s	m/s	L/D	L/D	s	mBar(abs)	---	---	m/s cross corr	#bolhas f corte	# bolhas f pré	# bolhas aceitas	s	taxa coalesc. bolhas/bolhas/D
indices	**Estações**	**VB**	**VS**	**DVbs**	**LB**	**LS**	**T**	**P**	**h/D**	**αB**	**Vcr**	**Nb1**	**Nb2**	**Nb3**	**Tt**	**R**
k=3																
Valores medios	**1**	1.262E+00	1.325E+00	-6.287E-02	4.182E+01	1.691E+01	1.195E+00	1.100E+03	3.8517E-01	6.4590E-01	1.744E+00	1.810E+02	1.040E+02	9.800E+01	1.2000E+02	6.978E-03
	2	1.259E+00	1.418E+00	-1.586E-01	4.177E+01	1.773E+01	1.187E+00	1.094E+03	5.9769E-01	3.8026E-01	1.316E+00	1.360E+02	1.030E+02	1.000E+02	1.2000E+02	4.256E-03
	3	1.297E+00	1.458E+00	-1.614E-01	4.333E+01	1.800E+01	1.186E+00	1.065E+03	6.1988E-01	3.5045E-01	1.415E+00	1.380E+02	1.020E+02	1.000E+02	1.2000E+02	-3.451E-03
	4	1.310E+00	1.446E+00	-1.363E-01	4.489E+01	1.705E+01	1.196E+00	1.009E+03	5.8672E-01	3.9438E-01	1.456E+00	1.540E+02	1.030E+02	9.900E+01	1.2000E+02	0.000E+00
Desvio Padrão	**1**	4.632E-02	2.283E-01	2.331E-01	1.376E+01	4.946E+00	3.051E-01	2.996E+00	3.5571E-02	4.2678E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	2	3.923E-02	1.644E-01	1.637E-01	1.420E+01	4.325E+00	3.087E-01	3.068E+00	3.7685E-02	4.3768E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	3	4.388E-02	2.912E-01	2.938E-01	1.518E+01	5.259E+00	3.096E-01	3.578E+00	2.4722E-02	2.9605E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	4	4.684E-02	1.617E-01	1.739E-01	1.525E+01	3.560E+00	3.037E-01	2.542E+00	3.3275E-02	3.8398E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
Valores Máximos	**1**	1.531E+00	1.899E+00	5.954E-01	6.318E+01	2.994E+01	1.727E+00	1.108E+03	6.1682E-01	6.9794E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	2	1.339E+00	1.899E+00	2.476E-01	6.369E+01	3.065E+01	1.718E+00	1.101E+03	8.0148E-01	4.4770E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	3	1.415E+00	2.885E+00	4.261E-01	7.029E+01	4.014E+01	1.670E+00	1.072E+03	7.2801E-01	4.0148E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	4	1.402E+00	1.875E+00	3.378E-01	6.896E+01	2.580E+01	1.696E+00	1.016E+03	7.9372E-01	4.4932E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
Valores Mínimos	**1**	1.181E+00	6.977E-01	-6.487E-01	4.111E+00	3.372E+00	4.263E-01	1.093E+03	3.4178E-01	3.6690E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	2	1.154E+00	1.034E+00	-5.944E-01	4.156E+00	9.177E+00	3.410E-01	1.088E+03	5.4253E-01	1.5404E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	3	1.190E+00	8.671E-01	-1.557E+00	4.363E+00	7.692E+00	3.303E-01	1.057E+03	5.7834E-01	2.2391E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00
	4	1.154E+00	1.014E+00	-6.145E-01	4.694E+00	9.583E+00	3.597E-01	1.005E+03	5.4159E-01	1.6221E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.0000E+00	0.000E+00

c) Pós-Processamento

- Junta SGR
- Junta SLG

Histogramas




Histogramas.vi
File Edit Operate Tools Window Help
Histogramas
Tipo de grafico
Histograma de Saporta
Variável
LB (comprimento da bolha m/diametro)
de Bins
20
H*G
0.06
Deseja salvar o Histograma em arquivo *.hst?
Nome do arquivo resultante
Estação 1
Plot 0
de conjunto Bolha/pistão aceitos (1)
509
Estação 2
Plot 0
de conjunto Bolha/pistão aceitos (2)
515
Estação 3
Plot 0
de conjunto Bolha/pistão aceitos (3)
515
Estação 4
Plot 0
de conjunto Bolha/pistão aceitos (4)
512

Correlações