```
clearvars
close all
clc
```

tabella taratura

```
readtable('dataEs.xlsx')
```

ans = 5×5 table

	V	R1	R2	R3	R4
1	5	37.7600	37.9000	37.8300	37.7300
2	4	38.2500	38.1300	38.2100	38.0400
3	3	38.4900	38.5100	38.3300	38.4100
4	2	38.6200	38.7500	38.7900	38.7100
5	1	39.1200	38.9100	38.9900	39.0600

```
tar = table2array(readtable('dataEs.xlsx'));
Y=tar(:,1);
measure=tar(:,2:end);
```

curva tarature, incertezza assoluta, incertezza relativa

Calcolo il valore medio il valore massimo e il valore minimo per ogni valore dell'uscita (riga della matrice).

```
nrow=size(tar,1);
for i=1:nrow

    m=min(measure(i,:)) ; %valore massimo
    M=max(measure(i,:)) ; %valore minimo
    av=(min(measure(i,:))+max(measure(i,:)))/2;
    epsilon=M-m;
    espilonr=(M-m)/av;

    tarAnalysis(i,:)=[ m M av epsilon espilonr];
end

array2table(tarAnalysis,'VariableNames',{'min' 'max' 'average' 'epsilon' 'epsilonr'},'I
```

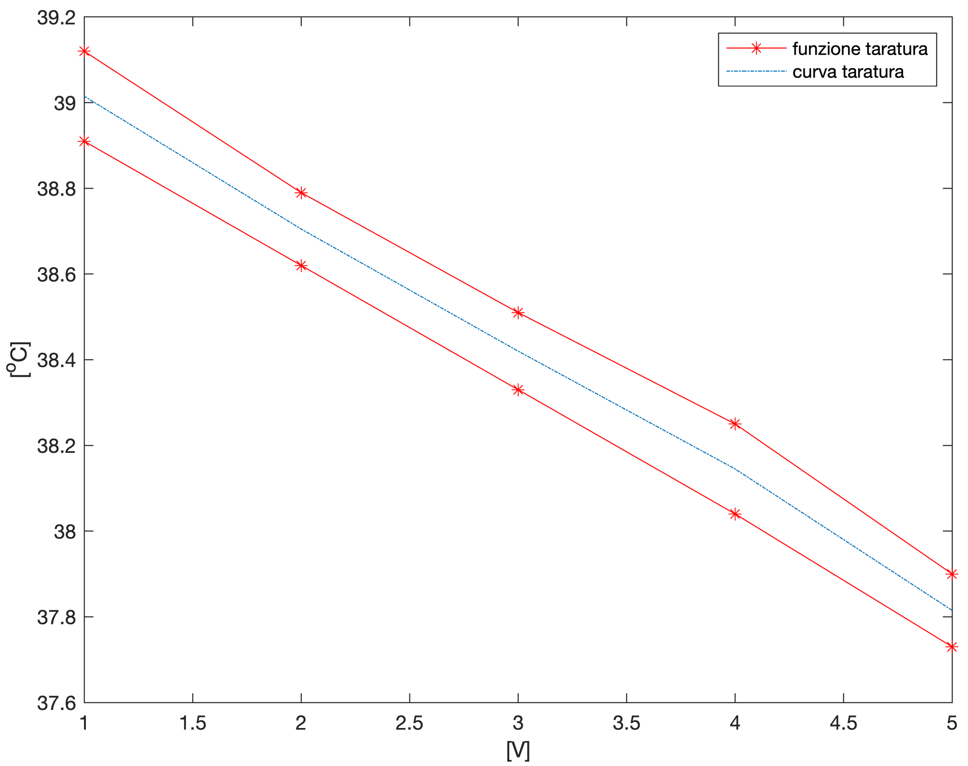
ans = 5×5 table

	min	max	average	epsilon	epsilonr
1 5V	37.7300	37.9000	37.8150	0.1700	0.0045
2 4V	38.0400	38.2500	38.1450	0.2100	0.0055

	min	max	average	epsilon	epsilonr
3 3V	38.3300	38.5100	38.4200	0.1800	0.0047
4 2V	38.6200	38.7900	38.7050	0.1700	0.0044
5 1V	38.9100	39.1200	39.0150	0.2100	0.0054

```
figure
plot(Y,tarAnalysis(:,1),'r-*') %minimo
hold on
plot(Y,tarAnalysis(:,3),'-.') %curva taratura
plot(Y,tarAnalysis(:,2),'r-*') %massimo

xlabel('[V]');
ylabel('[^oC]');
legend('funzione taratura', 'curva taratura');
```



calcolo incertezza assoluta

```
EPS = max(tarAnalysis(:,4))
```

```
EPS = 0.2100
```

```
EPSR = max(tarAnalysis(:,5))
```

```
EPSR = 0.0055
```

```

```

sensibilità e offset

x=c(y-o)

o=y-x/c

q=-o*c termine noto

approssimazione riferita agli estremi

```
c=(tarAnalysis(1,3)-tarAnalysis(end,3))/(Y(1)-Y(end))
```

```
c = -0.3000
```

```
s=1/c
```

```
s = -3.3333
```

```
o=Y(1)-tarAnalysis(1,3)/c
```

```
o = 131.0500
```

```
q=-o*c
```

```
q = 39.3150
```

```

```

punti dell'approssimazione lineare

```

x=c*(Y-o)
```

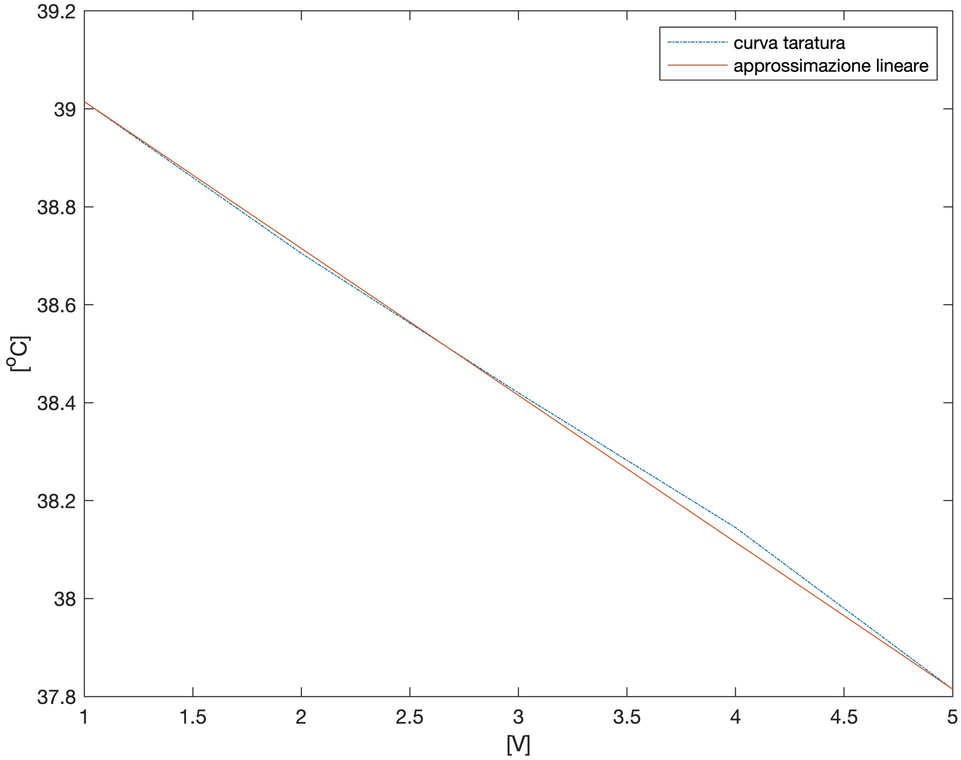
```
x = 5×1
   37.8150
   38.1150
   38.4150
   38.7150
   39.0150
```

```

figure

plot(Y,tarAnalysis(:,3),'-.') %curva taratura
hold on
plot(Y,x) %approssimazione lineare

xlabel('[V]');
ylabel('[^oC]');
legend( 'curva taratura','approssimazione lineare');
```



errore linearità

```
El=max(abs(x-tarAnalysis(:,3)))
```

```
El = 0.0300
```

errore di linearità massimo è per V=

```
Y(find((abs(x-tarAnalysis(:,3)))==El))
```

```
ans = 4
```

```
disp('Volt')
```

```
Volt
```

misurando per V= 4.5V

```
Yout=4.5;
X=c*(Yout-o)
```

```
X = 37.9650
```

```
disp('+-')
```

```
+-
```

```
Etot=(EPS/2+El)
```

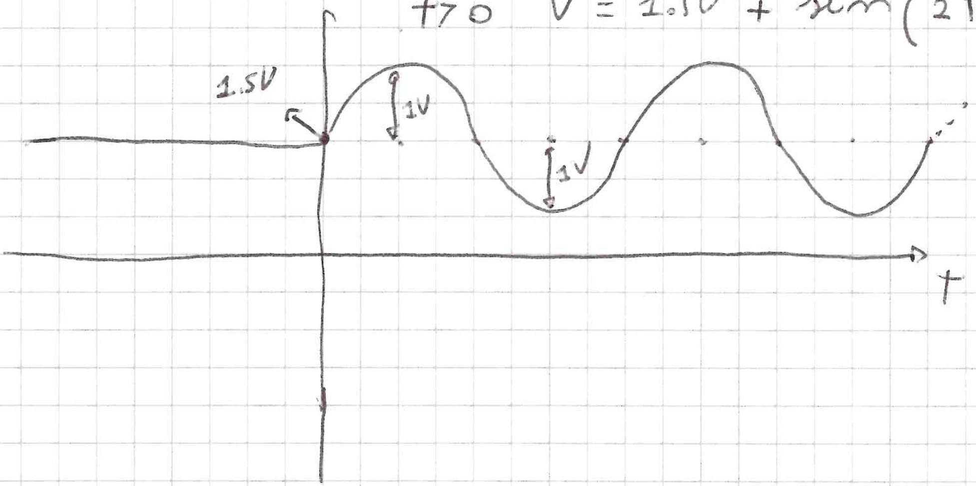
```
Etot = 0.1350
```

dinamico

vedi soluzione in pagina successiva

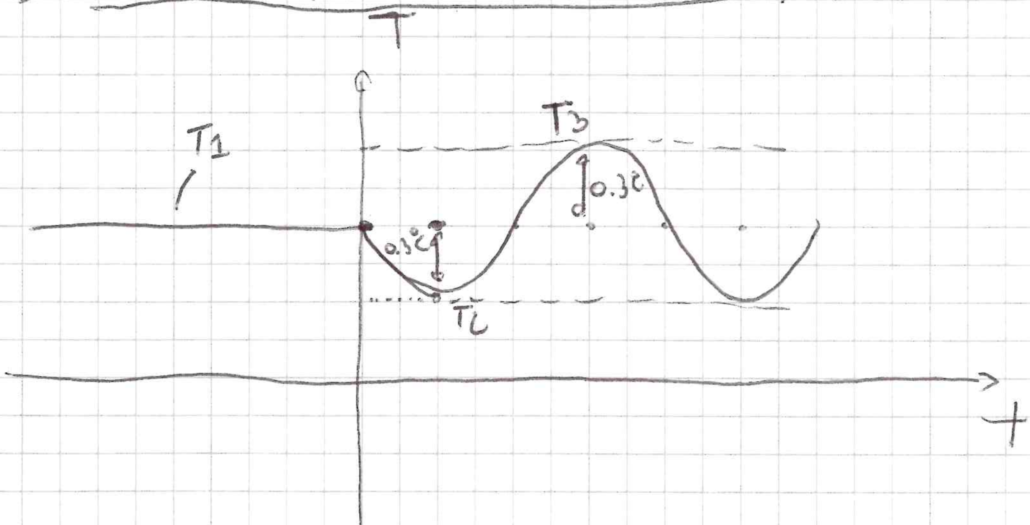
$t < 0 \quad V = 1.5V$

$t > 0 \quad V = 1.5V + \sin(2\pi f t) \quad \rightarrow f = 1\,Hz$



SE $2\pi f < \omega_p$ (ω_p = BANDA PASSANTE DEL SENSORE)

$\Rightarrow$ APPLICO PARAMETRI STATICI



$V = 1.5V \Rightarrow T_1 = 38.86\,°C$

AMPIEZZA SINUSOIDE $1V \Rightarrow$

$2.5V \rightarrow T_2 = 38.56\,°C$

$0.5V \rightarrow T_3 = 39.16\,°C$