```
 PROC GLM DATA=tubes;
   CLASS  voltage exhaust;
   MODEL  pressure = voltage exhaust voltage*exhaust;
   RANDOM exhaust voltage*exhaust / TEST;
   RUN;
*-------------------------------------------------------------------------------;
```

The GLM Procedure

Class	Levels	Values
voltage	3	120 170 220
exhaust	3	60 90 120

Number of Observations Used 18

Dependent Variable: pressure

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	6532.444444	816.555556	50.34	<.0001
Error	9	146.000000	16.222222		
Corrected Total	17	6678.444444			

Source	DF	Type III SS	Mean Square	F Value	Pr > F
voltage	2	140.777778	70.388889	4.34	0.0479
exhaust	2	6044.111111	3022.055556	186.29	<.0001
voltage*exhaust	4	347.555556	86.888889	5.36	0.0174

Source	Type III Expected Mean Square
voltage	Var(Error) + 2 Var(voltage*exhaust) + Q(voltage)
exhaust	Var(Error) + 2 Var(voltage*exhaust) + 6 Var(exhaust)
voltage*exhaust	Var(Error) + 2 Var(voltage*exhaust)

Tests of Hypotheses for Mixed Model Analysis of Variance

Source	DF	Type III SS	Mean Square	F Value	Pr > F
voltage	2	140.777778	70.388889	0.81	0.5065
exhaust	2	6044.111111	3022.055556	34.78	0.0030
Error	4	347.555556	86.888889		
Error: MS(voltage*exhaust)					

Source	DF	Type III SS	Mean Square	F Value	Pr > F
voltage*exhaust	4	347.555556	86.888889	5.36	0.0174
Error: MS(Error)	9	146.000000	16.222222		

```
 PROC MIXED DATA=tubes;
    CLASS  voltage exhaust;
    MODEL  pressure = voltage ;
    RANDOM exhaust voltage*exhaust / TYPE=VC;
    RUN;
*-------------------------------------------------------------------------------;
```

For PROC MIXED the statistical model is: Y = X * Beta + Z * Gamma + Epsilon

where
- Y is the vector of observed data,
- Beta is an unknown vector of fixed effects with known model matrix X,
- Gamma is an unknown vector of random effects with known model matrix Z, and
- Epsilon is an unknown random error vector.

and the
- MODEL statement generates one or more columns in the model matrix X, and the
- RANDOM statement generates one or more columns in the model matrix Z.

*---;

The Mixed Procedure

Model Information

Data Set	WORK.TUBES
Dependent Variable	pressure
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class	Levels	Values
voltage	3	120 170 220
exhaust	3	60 90 120

Dimensions

Covariance Parameters	3
Columns in X	4
Columns in Z	12

Number of Observations Used 18

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	139.10271542	
1	1	106.90677851	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
exhaust	489.19
voltage*exhaust	35.3333
Residual	16.2222

Fit Statistics

-2 Res Log Likelihood	106.9
AIC (smaller is better)	112.9
AICC (smaller is better)	115.1
BIC (smaller is better)	110.2

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
voltage	2	4	0.81	0.5065