

Structure of Data table_TRC

Summary:

One explains in this document how to exploit a structure of data table_TRC in an elementary routine of calculation te00ij.

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1 The structure of data table_TRC is one sd_table

The structure of data `tabl_TRC` is one by means of computer `sd_table` [D4.02.05]. It consists of columns of values (`SPEED`, `PARA_EQ`,...) cf [§5]. The goal of this document is not to describe one `SD` already described, but to show how one recovers in the routines `TE00IJ` values given by the user in the order `DEFI_TRC`.

The order `DEFI_TRC` built one `sd_table` "diagonal by blocks". This `sd_table` "is linearized" in the total orders of mechanics via the routine `tbexlr` [D6.06.01] called by the routine of construction of coded material (`rcmaco`) ; i.e. it is transformed into a list of realities which is then accessible in the routines `TE00IJ`.

2 Let us start from an example, the test `hsnv101a`

```
trc = DEFI_TRC (HIST_EXP: (VALE: (-1.106D+03  1.100D+01  8.563D+00  -2.760D-02
                                1.220D-04  -2.955D-07  3.402D-10  -1.517D-13
                                0.000D+00  0.000D+00  0.000D+00  8.360D+02
                                0.000D+00  0.000D+00  0.000D+00  6.001D+02
                                0.000D+00  0.000D+00  1.000D+00  3.450D+02)
                )
              (VALE: (-2.206D+03  1.100D+01  8.563D+00  -2.760D-02
                    1.220D-04  -2.955D-07  3.402D-10  -1.517D-13
                    0.000D+00  0.000D+00  0.000D+00  8.360D+02
                    0.000D+00  0.000D+00  0.000D+00  6.001D+02
                    0.000D+00  0.000D+00  1.000D+00  3.450D+02)
                )
              TEMP_MS: (P      : 1.100D+01
                       THRESHOLD: 4.500D-01
                       AKM      : -3.125D+01
                       BKM      : 1.406D+01
                       TPLM     : -3.497D+03
                       )
                ) ;
```

3 Explanations of the values given

3.1 Keyword factor `HIST_EXP`

The first 8 values of the keyword `VALE` under the keyword factor `HIST_EXP` define the thermal history:

- the first value is the value of the derivative of the function $T(T)$ speed of cooling,
- the second value is the parameter of equivalence `temps_temperature` defining the austenitization,
- the 6 following values define the coefficients of the students' rag processions of degree 0 to 5 such as the polynomial of a nature 5 thus built either the interpolation enters `AR3` and `TMF` within the meaning of least squares of the function $F(T)$ deduced from the thermal history and such as $F(T) = \ln(T(T))$.

The following values (necessarily by group of 4) define the respective proportions of ferrite, pearlite and bainite present at a temperature given for the experimental thermal history defined by the first 8 values.

3.2 Keyword factor TEMP_MS

These 5 values define the sizes intervening in the law of evolution of the temperature M_s according to conditions of austenitization and the quantities of ferrite, pearlite and bainite already formed. This law is associated with a diagram TRC.

4 Definition of the blocks

The table thus produced is "diagonal per blocks", i.e. the table breaks up into blocks.

- The first 8 values of the keyword VALE under the keyword factor HIST_EXP find themselves in block 1 with NB_POINT defining quadrupled,
- Block 2 defines the respective proportions of ferrite, pearlite and bainite, the following values of the keyword VALE under the keyword factor HIST_EXP,
- Block 3 defines the laws associated with each diagram TRC.

5 Impression of the table of the type tabl_trc

Block 1:

SPEED	PARA_EQ	COEF_0	COEF_1	COEF_2	COEF_3	COEF_4	COEF_5	NB_POINT
1.106E+03	1.100E+01	8.563E+00	-2.760E-02	1.220E-04	-2.955E-07	3.402E-10	-1.517E-13	3.
2.206E+03	1.100E+01	8.563E+00	-2.760E-02	1.220E-04	-2.955E-07	3.402E-10	-1.517E-13	3.

Block 2:

Z1	Z2	Z3	TEMP
0.00000E+00	0.00000E+00	0.00000E+00	8.36000E+02
0.00000E+00	0.00000E+00	0.00000E+00	6.00100E+02
0.00000E+00	0.00000E+00	1.00000E+00	3.45000E+02
0.00000E+00	0.00000E+00	0.00000E+00	8.36000E+02
0.00000E+00	0.00000E+00	0.00000E+00	6.00100E+02
0.00000E+00	0.00000E+00	1.00000E+00	3.45000E+02

Block 3:

P	THRESHOLD	AKM	BKM	TPLM
1.10000E+01	4.50000E-01	-3.12500E+01	1.40600E+01	-3.49700E+03

6 List of realities produced by linearization of the table

```
3.00000E+00
9.00000E+00  2.00000E+00
1.10600E+03  1.10000E+01  8.56300E+00 -2.76000E-02  1.22000E-04  2.95500E-
07  3.40200E-10
-1.51700E-13  3.00000E+00
2.20600E+03  1.10000E+01  8.56300E+00 -2.76000E-02  1.22000E-04  2.95500E-
07  3.40200E-10
-1.51700E-13  3.00000E+00
4.00000E+00  6.00000E+00
0.00000E+00  0.00000E+00  0.00000E+00  8.36000E+02
0.00000E+00  0.00000E+00  0.00000E+00  6.00100E+02
0.00000E+00  0.00000E+00  1.00000E+00  3.45000E+02
0.00000E+00  0.00000E+00  0.00000E+00  8.36000E+02
0.00000E+00  0.00000E+00  0.00000E+00  6.00100E+02
0.00000E+00  0.00000E+00  1.00000E+00  3.45000E+02
5.00000E+00  1.00000E+00
1.10000E+01  4.50000E-01 -3.12500E+01  1.40600E+01 -3.49700E+03
```

Decoding:

3.00000E+00 : the table is composed of 3 blocks

9.00000E+00 2.00000E+00 : the 1st block made up of 9 columns and 2 lines
... : values of the 1ier block line by line

4.00000E+00 6.00000E+00 : the 2nd block made up of 4 columns and 6 lines
... : values of the 2nd block line by line

5.00000E+00 1.00000E+00 : the 3rd block made up of 5 columns and 1 line
... : values of the 3rd block

7 Examples to recover a value in the list of realities

7.1 Example 1

If one wants to recover SPEED second keyword factor HIST_EXP, it is necessary to shift:

```
quickly = ListR8 (1 + 2 + 9 + 1)
                1           : HIST_EXP is stored in the 1st block
                2           : 2 numbers to dimension the 1ier block
                9           : 9 values to define a keyword factor
                1           : "SPEED" is in position 1
```

7.2 Example 2

2 quantities which one finds in te00ij :

NBHIST	many experimental thermal stories
	= number of keywords factors HIST_EXP
	= many lines of block 1

NBTRC	many laws of evolution of the temperature
	= number of keywords factors TEMP_Ms
	= many lines of block 3

in our example, we find these values:

$$\begin{aligned} \text{NBHIST} &= \text{ListR8} (1 + 2) = 2 \\ \text{NBTRC} &= \text{ListR8} (1 + 2 + 9*2 + 2 + 4*6 + 2) = 1 \end{aligned}$$