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Procedure for the Use of the Code SAGAPØ-A and Auxiliary Programs

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Procedure for the use of the code SAGAPØ-A and auxiliary programs

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Abstract

This paper describes the procedure developed in order to optimize the use of the computer code SAGAPØ-A for the thermo-fluid-dynamic analysis of gas cooled fuel element bundles.

The first item of this procedure concerns the dynamic dimensioning of the code, having as target the optimization of the computer storage requirement.

The second item concerns the graphical output: the results of the calculation are plotted together with the experimental results, in order to allow an immediate evaluation of the calculation.

Prozedur zur Anwendung des Rechenprogramms SAGAPØ-A und Hilfsprogramme

Zusammenfassung

Dieser Bericht beschreibt die Prozeduren, die zur Optimierung des Rechenprogramms SAGAPØ-A für die thermo- und fluiddynamische Analyse von gasgekühlten Brennelementbündeln entwickelt worden sind.

Der erste Teil dieser Prozedur betrifft die dynamische Dimensionierung des Rechenprogramms, was zu einer Optimierung des erforderlichen Speicherplatzes führt.

Der zweite Teil betrifft die Herstellung einer graphischen Ausgabe: die berechneten Ergebnisse werden zusammen mit den experimentellen Ergebnissen gezeichnet, was einen unmittelbaren Vergleich zwischen Rechnungen und Meßergebnissen erlaubt.

Contents

1. Introduction

A group of subroutines was inserted in the computer code SAGAPØ /2/, which allows the indexing for a hexagonal rod bundle of any size. In spite of this possibility, the arrays of the code were defined with fixed dimensions, namely for a bundle of 19 rods.

As a consequence, the application of the code to symmetry sections (1/2 or 1/12 of the whole bundle) or to smaller bundles (7-rod or 12-rod) requires the same amount of storage as for a 19-rod bundle. Furthermore the application of the code to bundles with more than 19 rods is excluded. The code was applied to the 37-rod bundle AGATHE-HEX /3,4/, but the calculation was limited to 1/6 of the whole bundle, in case of uniform power distribution. Further calculations for the whole 37-rods bundle /5,6/ were allowed by the use of the procedure described here.

With the aim to optimize the computer storage requirement and to allow the adaptation of the code to large bundles, the code was slightly modified /1/, in order to be elaborated by a PL/1 program, which reduces the size of the arrays of the code to the size of the bundle to be analyzed.

The production of a graphical output was already allowed in the earlier version of SAGAPØ /2/. However, for several reasons, a new procedure has been developed. Actually the code supplies, in connexion with a FORTRAN program, the axial distribution of the total pressure drop and the axial distribution of the wall temperatures for a number of pin and shroud sectors. These sectors are selected in the input data for the FØRTRAN program.

In the second chapter a description of the general procedure is given, i.e. the adaptation of the code SAGAPØ-A to the size of the bundle, the running of the code and the generation of the graphical output.

In the third chapter the program SAGAU for the dynamic dimensioning of the code is described, while the fourth chapter is concerned with the generation of the graphical output, performed by means of the program DISEG.

In both cases the main characteristics of the programs and the required input data are described.
The listings of the programs are given as appendix.

A general description of the codes SAGAPØ and SAGAPØ-A is given in /1,2/. The description of the physical model has been presented in references /7,8/.

2. General procedure

The general procedure is schematically presented in Fig.1. It is subdivided in the following steps:

1. Adaptation of the size of the code arrays to the size of the bundle to be analyzed (AUTØ).
2. Run of the SAGAPØ-A code (RUN).
3. Generation of the graphical output (PLØT).

In SAGAPØ-A /1/ the size of the arrays has been kept fixed, as it was in the original version; i.e. the arrays are dimensioned for a 19-rod bundle. Therefore, if the calculation is performed for a 19-rod bundle, the first step in the procedure is not necessary.

By assuming that both the code (SAGAPØ-A) and the PL/1 program for the dynamic dimensioning (SAGAU) are stored on a disk (1) (see Fig.1), in the first step of the procedure the code is elaborated until the arrays are dimensioned to the required size; this size will be specified as input data in the form of cards.

As output this step supplies the elaborated version of the code (SAGAPØ-A*) and, if required, a listing of the performed modifications. The elaborated version will be stored on a disk (2).

In the second step the calculations are performed. The following input is requested:

a) the eleborated version of the code (SAGAPØ-A*)

b) the input data; it is supposed that they are stored on the disk (3)

c) the Block-Data, also supposed to be on the disk (3).

The output of this step is:

a) a listing of the results (see /1/)

b) cards for a possible restart (see /2/)

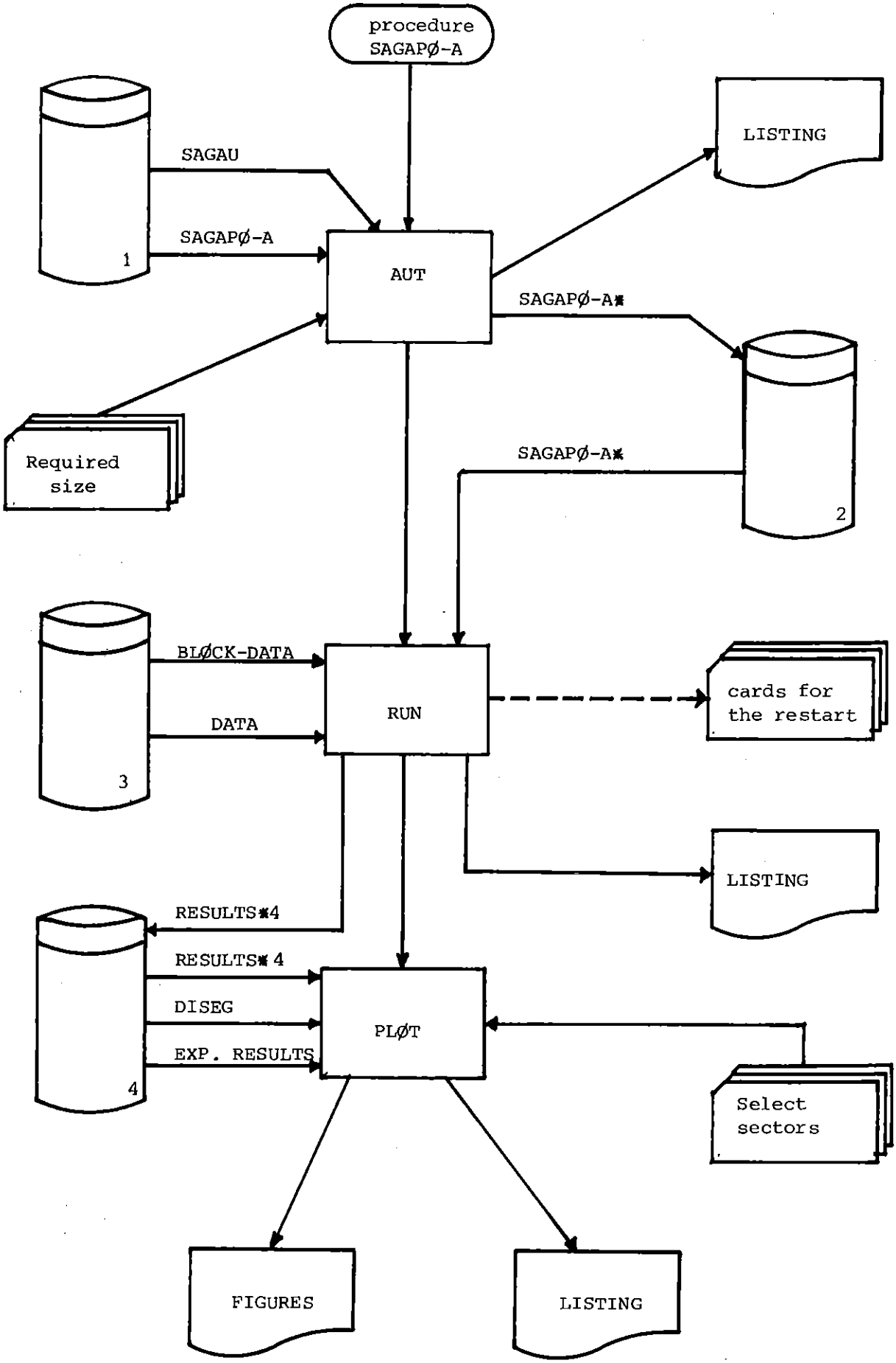

Fig. 1: Flow chart of the general procedure.

c) four files (RESULTS*4) in which the computed pressure drop and sector temperatures are written.

These files will be also stored on a disk (4).

The third step gets the plot-program DISEG from a disk (4) and the input data in cards. In the input data the sectors of pin and shroud are specified for which the temperature must be plotted.

Following the specifications of the input data, the computed values (RESULTS*4) and the measured ones (EXP. RESULTS) are plotted together (FIGURES). A listing supplies information about the numerical values of the plotted results.

It must be noticed that the procedure does not require, of course, the use of 4 disks: this distinction has been done in this paper just to simplify the schematic description of the procedure. Actually only one disk is to be used.

Furthermore, the three steps can be run independently, and this is really the normal procedure: for example, the automatic dimensioning is used just the first time in which a new bundle is computed; then the elaborated module SAGAPØ-A* is used in the further calculations.

In Appendixes A to D some examples of JCL are shown used to run the described procedure.

The Appendix A shows the JCL to run a calculation for 1/3 of the 12-rod bundle. In this case all three steps of the procedure are performed: in the first step (AUTØ) the source version of SAGAPØ-A, stored on the disk GFKO89 as PDS with the name TSØ432.ASD.FØRT (see later Ch.5), is read from SAGAU, the dimensions are elaborated and the new version SAGAPØ-A* is stored also on GFKO89 with the name FØTTA3.INR432. It must be pointed out that, for the 12-rod bundles, some subroutines are different from the case of the hexagonal bundles (cfr. ref.2): these subroutines (DSPDPF, INDEX, TØTGEØ,INGE,INGUA,HEATI,TØTSEC) are in this case taken from the

DS TSØ432.SA19D.FØRT and not from TSØ432.ASD.FØRT.

Then, after the compilation of the elaborated version, the RUN step performs the calculation. The BLØCK DATA, in this case stored as TSØ432.BD.FØRT(KE4HTL), is compiled each time because it contains the calculation specifications. The computed results are stored also on the disk GFKO89 with the names:

TSØ432.KE4.HEP(T6B14X)	pressures
TSØ432.KE4.HEW(T6B14X)	sector temperature of the pins
TSØ432.KE4.HEL(T6B14X)	sector temperatures of the liner
TSØ432.KE4.HET(T6B14X)	temperatures for the two parts of the wall sectors.

Each member refers to a single run: T6B14 is the name of the considered case, X(A,B,..X,Z) is the particular calculation.

In the third step (PLØT) the computed results are plotted together with the measurements. These are stored in the PDS's:

KE4.HEP (T6B14)	pressures
KE4.HET (T6B14)	temperatures

whose nomenclature is the same as the one used for the computed results.

The JCL shown here is stored on the disk GFKO89 with the name TSØ432.JØB.CNTL (B12T).

In Appendix B the JCL to run a calculation for the whole 12-rod bundle is shown . In this case no automatic dimensioning (step AUTØ) is performed, due to the small difference between a 12-rod and a 19-rod bundle. Therefore, apart from the compilation of the source program (TSØ432.ASD.FØRT and TSØ432.SA19D.FØRT), the procedure is composed only by the steps RUN and PLØT.
This JCL is stored on the disk GFKO89 with the name

TSØ432.JØB.CNTL(B12W).

Appendix C shows the JCL to run a calculation for the whole 19-rod bundle. In this case no AUTØ step is necessary. Once more, the program is supposed to be already compiled and stored on GFKO89

with the name: B19CØM5.INR432. This compiled version has been produced by the JCL stored on GFKO89 with the name

TSØ432.UT.CNTL(CS)

(see Appendix D) while the JCL presented in Appendix C has the name

TSØ432.JØB.CNTL(B19W)

It must be pointed out that the file B19SU1.FØRT, compiled together with the BLØCK DATA, contains some subroutines (DSPDPF, RHPLUS, GHPLUS) which was slightly modified with respect to the general form, for this particular run.

3. Dynamic Dimensioning

In the computer code SAGAPØ /2/ the largest part of the arrays is defined by means of CØMMØN statements.
This fact excludes the possibility to perform the automatic dimensioning of the code by means of the "dummy dimension" method, because, to use it, the arrays must be defined by means of DIMENSIØN statements.

The transformation of a code, of large size, from a CØMMØN - based to a DIMENSIØN - based system is relatively complex and very expensive (especially in terms of man-power). For these reasons it was decided to perform the automatization of the code by means of the following method. Referring to the fig.2, a PL/1 program (SAGAU) reads each statement of the SAGAPØ-A code and detects the CØMMØN, DIMENSIØN and REAL statements. In these statements the size of the arrays is changed from the standard size to the actual one. The actual size of the arrays is given by as an input.

The elaborated CØMMØN, DIMENSIØN and REAL statements, together with the unmodified other statements, are then written on a new file, generating also a version of the code adapted to the size of the bundle to be analyzed.

The essential difference between this method and the "dummy dimension" method consists in the fact that the code must be elaborated (and compiled) before its use for calculating a new bundle. Because, generally, the code will be applied for a relatively long time to the same bundle, the disadvantage with respect to the "dummy dimension" method is very small. Furthermore SAGAU needs a small amount of storage and runs in a very short time.

SAGAU needs the definition of the following files:

SØUMØD: SAGAPØ-A source module whose arrays are dimensioned at the standard size (input file).

EXEMØD: SAGAPØ-A* elaborated module: the arrays are dimensioned at the actual size (output file).

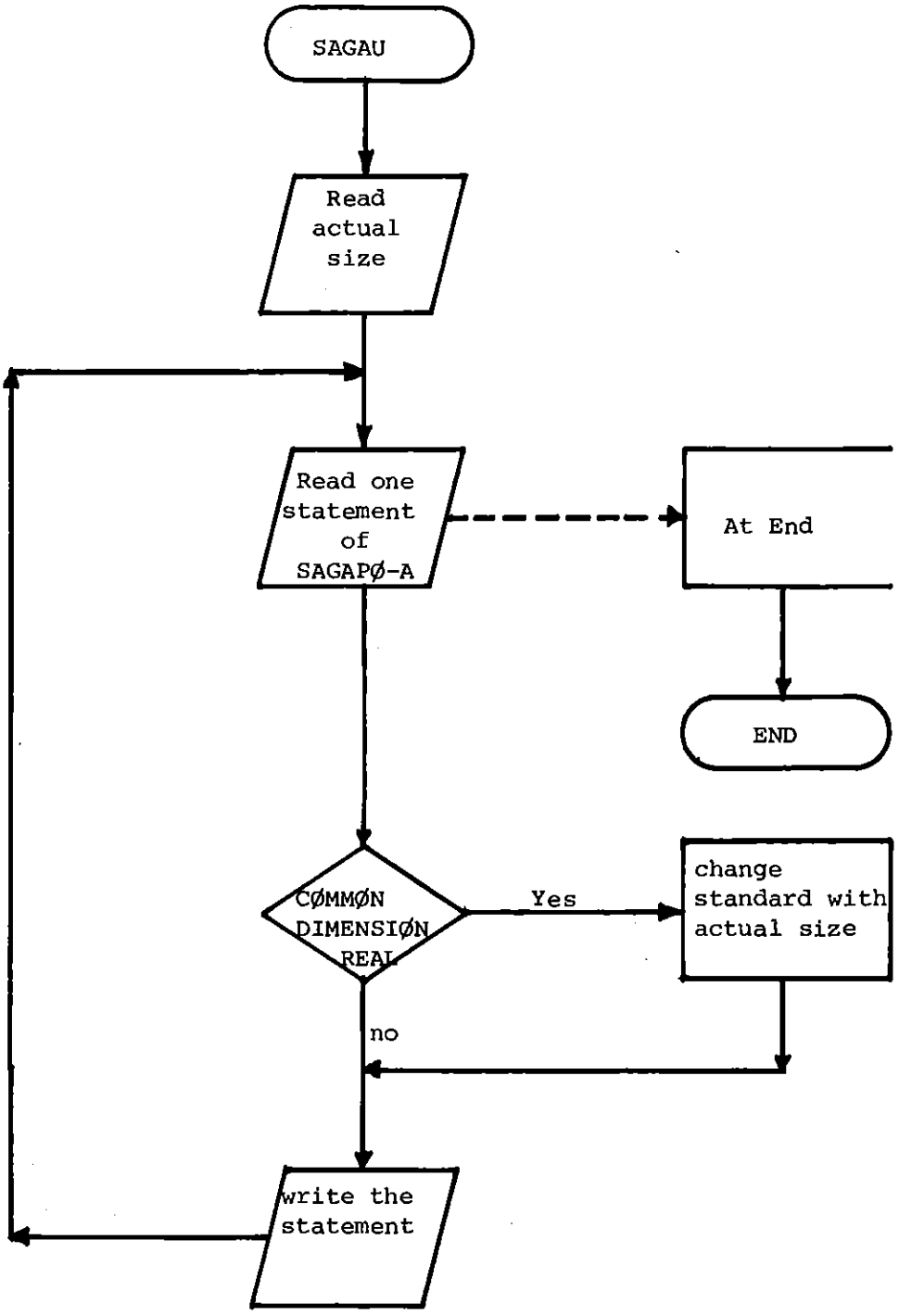

Fig. 2: Flow chart of the program SAGAU

VALUES: input file where the values referred to the actual size of the bundle are given.

The values to be specified in the file VALUES are shown in the Table 1.

For the definition of "channel" and "sector" cfr. /1,7/. In tab.1 the values of NSTØT,NWALL,... are displayed for several bundles. It must be emphasized that the real value for NLTØT in case of a 19-rod bundle is 30 instead of 34. This last value was chosen to avoid confusion with other arrays used in SAGAPØ-A. It must be noticed also that NRØDS remains the same (i.e. referred to the whole bundle) even when the analysis is limited to a section of the whole bundle(1/2,1/12,etc).

NSECT (total number of sectors, used for the radiation calculation) is set to 1 for all the cases where the calculation is performed for a symmetry section. This is due to the fact that no radiation calculation is allowed for symmetry sections (cfr. /1/). As pointed out in /1/, however, a model for 1/3 of the 12-rod bundle has been developed. For this case the value of NSECT is given.

The size of the arrays in SAGAPØ-A cannot exceed 999, even by the use of SAGAU. This limitation, however relatively easy to be removed, is due to the fact that SAGAPØ-A performs a very detailed analysis of the bundle. Therefore, the application of the code to a big bundle (for example 217 rods) would be too expensive.

The input preparation for the program is shown in table 1A.

If the value of IP is set equal to 1, a listing of the elaborated code is printed. In each elaborated statement, the card numeration (columns 73 to 80) will be filled by blank characters.

The text of the program SAGAU is presented in Appendix E.

Number of Rods	Type of Section	NSTØT	NWALL	NRODS	NSECT	NLTØT
7	Whole	18	12	7	54	18
	1/2	10	7	7	1	10
	1/6	4	3	7	1	4
	1/12	3	2	7	1	2
12	Whole	28	15	12	87	24
	1/3	11	5	12	30	8
19	Whole	42	18	19	132	34*
	1/2	22	10	19	1	16
	1/6	8	4	19	1	6
	1/12	5	2	19	1	3
37	Whole	78	24	37	1	22
	1/2	40	13	37	246	42
	1/6	14	5	37	1	8
	1/12	9	3	37	1	4

Tab.1 : Values for the input data for SAGAU depending on the size of the bundles (* see pg. 10)

Card Nr.	FORMAT	Name	Description
1	A(1)	IP	IP=1 a listing of the elaborated program is given IP≠1 no listing
2	3A(1)	NSTOT	actual number of channels
3	3A(1)	NWALL	actual number of external channels
4	3A(1)	NRØDS	actual number of rods
5	3A(1)	NSECT	Total number of sectors
6	3A(1)	NLTØT	number of sectors of the shroud

Tab. 1A: Input preparation for SAGAU.

4. Graphical output

The graphical output is generated by the program DISEG which plots the results supplied by the calculations together with the measurements.

In SAGAPØ-A, at each axial section, the results of the calculation are written in the following files:

File 1: Pressure drop with respect to the bundle inlet. The pressure drop is referred to the whole bundle cross section. The record is written in free format and is formed by the following data:
- axial distance from the bundle inlet to the middle of the axial section (cm)
- pressure drop (bar).

File 2: Wall temperature of each sector of each pin. The record is written in free format and contains the following data:
- axial distance from the bundle inlet to the middle of the axial section (cm)
- index of the channel adjacent to the sector (1 to NSTØT)
- subchannel index of the channel adjacent to the sector (1 to 3)
- temperature (^{o}C).

File 3: Wall temperature of each sector of the liner. The record is written in free format and contains the following data:
- axial distance (cm)
- index of the adjacent channel (1 to NWALL)
- subchannel index (1 to 2)
- temperature (^{o}C).

File 4: Wall temperature of the two parts of the sectors adjacent to the wall channels. The record is written in free format and contains the following data:
- axial distance (cm)
- index of the adjacent channel (1 to NWALL)
- subchannel index (1 to 2)

- index of the part of the adjacent subchannel (1 or 2)
- temperature (^{o}C).

The results of the experiment are written in the following files by the program SIEM /9/:

File 5: Experimental pressure drop between the bundle inlet and the considered axial section. The record is written in free format and contains the following data:
- axial distance (mm)
- pressure drop (bar)

It must be emphasized that in the first record of this file the average Re number and the average value of T_W/T_B are written.

File 6: Measured wall temperatures. The record is written in free format and contains the following data:
- axial distance (mm)
- index of the rod. This index is independent (and different) from the index used for the same purpose in SAGAPØ (see figures 3 and 4)
- radial angle at which the thermocouple is placed (see fig.3)
- temperature (^{o}C).

When the temperature is referred to the shroud, the "index of the rod" is set to 0 (zero).

The name of the files are shown in the table 2 for SAGAPØ-A and for DISEG:

File	Contents	File name for SAGAPØ-A	File name for DISEG
1	Computed Pressure drop	FTO2FOO1	FTO4FOO1
2	Computed pin temperature facing a channel	FTO3FOO1	FTO1FOO1
3	Computed shroud sector temperature	FTO4FOO1	FTO3FOO1
4	Computed pin temperature facing a part of wall subchannel	FTO9FOO1	FTO9FOO1
5	Measured pressure drop	-	FTO7FOO1
6	Measured temperature	-	FTO2FOO1

Table 2: File names for SAGAPØ-A and DISEG.

Because in the elaboration of the experimental results and in the calculation two different methods for the indexing are used, the correspondence between the experimental and the computed results must be given in input. For example, with respect to Fig.3 and Fig.4, the index in the different notations for the thermocouples A,B,C,D,E is as follows:

Thermocouple	SAGAPØ indexing			SIEM indexing	
	index of channel	index of the sub-channel	index of the part of subchan-nel	index of the rod	angle
A	4	2	-	97	90
B	14	2	-	97	315
C	15	1	-	97	270
D	16	1	1	97	210
E	18	2	-	0	150

Tab. 3: Correspondence between the different index notations.

Note that the thermocouples F and G (fig.4) correspond both to the same channel. In this case both the measured values are to be plotted together with the same computed temperature profile. In this case the input parameter NVER (Tab.4, card 6) must be set to NVER=2 and in card 7 of Tab.6 two couples of IRØD and IWIN values must be specified. In the plotted figure the measurements of the different thermocouples are distinguished by the use of different symbols (⊙ for the first thermocouple, ⊡ for the second and so on).

The same procedure will be used in the analogous case for the calculation of 1/3 (or 1/12 etc) of the whole bundle: the thermocouples M,N and P in this case are indeed referred to the same computed value.

Another particular case arises when the thermocouple (like H in fig.4) is placed at the boundary between two channels. In this case the measured temperature can be compared with the average of the temperatures of the adjacent channels (5 and 6, when referring to fig. 3). To use this procedure, the parameters MED (Tab.4, card 6) must be >0 and the index of the second channel will be specified in

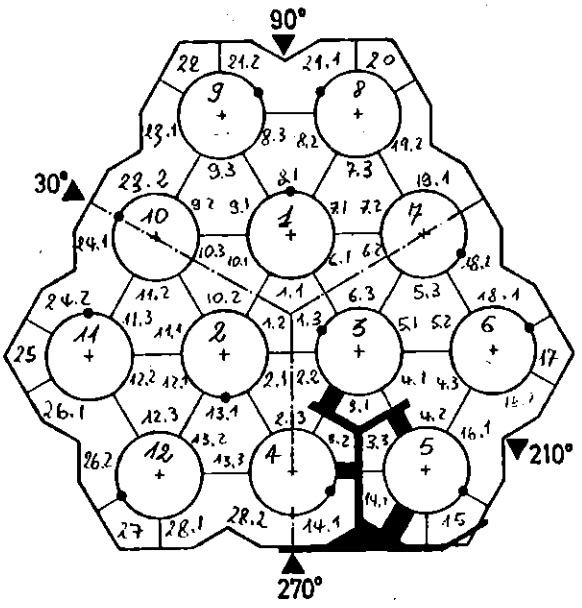

Fig. 3: Indexing for the 12-rod bundle: SAGAPØ-A notation

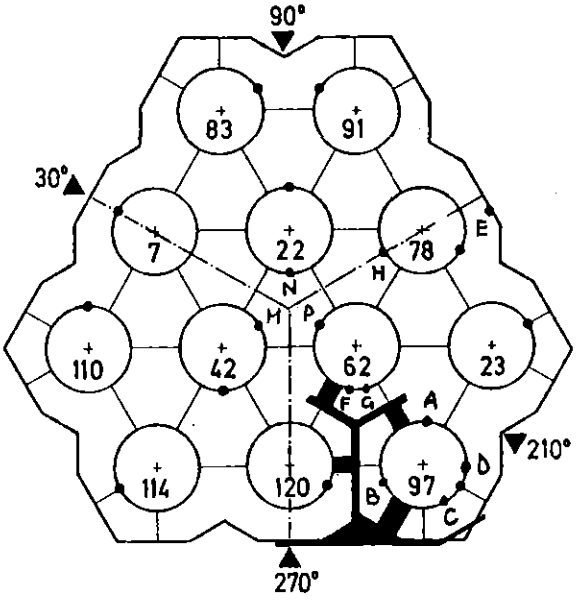

Fig. 4: Indexing for the 12-rod bundle: SIEM notation

card 7 (present only if MED>0). It must be emphasized that this assumption leads to some underestimation of the temperature (the plotted computed results are lower than the measurements), due to the fact that the local temperature at the gap between two channels is probably higher than the temperature of the sectors facing a channel, and also higher than the average of these.

The input preparation for DISEG is mainly concerned with the selection of the indices for the sectors to be plotted.
The input cards and their description is shown in the Tab.4. It must be pointed out that the cards 1 to 4 are always necessary. The successive cards (5_1,6_1,7_1,8_1,9_1,5_2,...) are not necessary in the following cases:

1) Only pressure drop plot (NTEMP=1)
2) If the results of calculation for the 19-rod bundle are plotted referring to 1/12 of the whole bundle (Program PLØT.FØRT(B5), cfr. Appendix H).

The limits for the pressure drop figures are fixed automatically by DISEG on the basis of the maximum computed pressure drop.

Put NVER=0 in the case where no measured temperatures are available.

Several versions of the program DISEG are available. They are slightly different from each other in order to adapt them to the characteristics of the bundle (KE4,AGATHE-HEX,B193D) or for operational purpose (plot of several pressure drops from isothermal calculations, etc). Nevertheless, the general structure of the program remains the same.

The listings of some DISEG-programs are presented in appendices F to H. In appendix F the program is shown to plot the results of the 12-rod bundle calculations.

Two versions for the 19-rod bundle are presented in appendix G and H. This last version plots the results of calculations performed for the whole bundle, referring them to 1/12 of the whole bundle, by assuming perfect radial symmetry.

This method reduces strongly the number of figures and increases the number of points referring to measured values plotted for each figure, thus allowing a better comparison between measured and computed results.

Examples of input preparation are presented in the appendices A to C, respectively, for the whole 12-rod bundle, for 1/3 of the 12-rod bundle and for the whole 19-rod bundle.

Some of the subroutines used by DISEG (Appendix I) were written by L. Meyer /10/.

Card Nr.	FØRMAT	Name	Description
1	6A4	TEXT1	Any string, case identification: this text will be written on each figure
2	7F10.5	FAC	Scale factor for the figures: the dimension of the figures are: base = 18 cm * FAC length = 13 cm * FAC
3	I4	NTEMP	> 0 only the pressure drop is plotted ≤ 0 both pressure drop and temperature are to be plotted
4	7F10.5	XMIN	minimum for the abscissa (cm) (referred to the bundle)
		XMAX	maximum for the abscissa (cm)
		YMIN	minimum for the temperature (^{o}C)
		YMAX	maximum for the temperature (^{o}C)
5_1	6A4	TEXT2	any string: text for the present figure
6_1	12I4	NS	SAGAPØ-A channel index
		M	SAGAPØ-A subchannel index
		NVER	number of thermocouples corresponding to the sector defined by NS,M
		NCØN	≥ 0 Last figure to be plotted < 0 other figures are requested
		MED	≤ 0 The measured temperatures are compared with the temperature computed for the sector corresponding to NS,M > 0 The measured temperatures are compared with the average between the temperatures of NS,M and NS1,M1 (see later card 7_1)

Tab. 4: Input preparation for DISEG.

Card Nr.	FØRMAT	Name	Description
6_1 (cont.)		NR	file where the computed temperature are stored (cfr. Tab.2):
7_1 only if MED>O	12I4	NS1	Index of the channel corresponding to the second sector for the temperature average
		M1	Subchannel index corresponding to the second sector
8_1 only if NVER $\geq$ 1	12I4	IRØD(1), IWIN(1), IRØD(2), IWIN(2), ... IRØD(I), IWIN(I), ... IRØD(NVER), IWIN(NVER)	I = 1, NVER Rod number and angle for the SIEM identification of the thermocouple(s) corresponding to the sector NS,M
9_1 only if NR=9	12I4	JWC	SAGAPØ-A index of the part of subchannel
5_2 6_2 7_2 8_2 9_2	Block of cards (analog to $5_1, 6_1, 7_1, 8_1, 9_1$) for the second figure; a further block of card for the third figure and so on.		

Tab. 4: Cont.

5. Storage of the programs

All the programs described here (the code SAGAPØ-A, SAGAU, DISEG etc) and the corresponding JCL have been stored on the disk GFKO89.

The code SAGAPØ-A is stored as Partitioned Data Set: each member contains a subroutine of the code. The name of the PDS is:

TSØ432.ASD.FØRT

The member TSØ432.ASD.FØRT(SUB12) contains the subroutines used for 12-rod bundle calculation (These subroutines are stored in the DS TSØ432.SA19D.FØRT too).
The program SAGAU, for the automatic dimensioning of the code SAGAPØ-A, is stored with the name:

TSØ432.SAGAU.PLI

The plotter software is stored in the PDS

TSØ432.PLØT.FØRT

The members contain the following programs:

TSØ432.PLØT.FØRT(KE4): program to plot the results of the calculations for the 12-rod bundle.

TSØ432.PLØT.FØRT(B2) : program to plot the results of the calculation for the whole 19-rod bundle (B193D bundle).

TSØ432.PLØT.FØRT(B5) : program to plot the results of the calculations for the whole 19-rod bundle (B193D bundle), but referring to a symmetry section of 1/12 of the whole bundle.

TSØ432.PLØT.FØRT(SUBR): subroutines used by the plot programs (ref. /10/).

TSØ432.PLØT.FØRT(PPLØT): program to plot several pressure drops from KE4 calculations.

TSØ432.PLØT.FØRT(B19ISØP): program to plot several pressure drops from B193D calculations.

In the PDS TSØ432.BD.FØRT several BLØCK DATA's used in the calculations performed up to now are stored. The members are the following:

TSØ432.BD.FØRT(B19WL): for the whole 19-rod bundle, Helium coolant, laminar flow, uniform heating.

TSØ432.BD.FØRT(B19WT): like B19WL but turbulent flow.

TSØ432.BD.FØRT(B19WTN): like B19WT but nitrogen as coolant.

TSØ432.BD.FØRT(B19WLP): for the whole 19-rod bundle, laminar flow, Helium coolant, power tilt.

TSØ432.BD.FØRT(B19WTP): like B19WLP but turbulent flow.

TSØ432.BD.FØRT(KE4HTL): for 1/3 of the 12-rod bundle, Helium coolant, laminar flow.

TSØ432.BD.FØRT(KE4HTT): like KE4HTL but turbulent flow.

TSØ432.BD.FØRT(Ke4HWL): for the whole 12-rod bundle, Helium coolant, laminar flow.

TSØ432.BD.FØRT(KE4HWT): like KE4HWL but for turbulent flow.

In the PDS TSØ432.JØB.CNTL are stored some JCL's for the run of the code (cfr. Appendices A to C). Some of these members are:

TSØ432.JØB.CNTL(B12T) : to run the code for 1/3 of the 12-rod bundle (cfr. Appendix A).

TSØ432.JØB.CNTL(B12W): to run the code for the whole 12-rod bundle (cfr. Appendix B).

TSØ432.JØB.CNTL(B19WL): to run the code for the whole 19-rod bundle (cfr. Appendix C).

TSØ432.JØB.CNTL(B37W): to run the code for the whole 37-rod bundle.

The PDS TSØ432.UT.CNTL contains many utilities useful for the code management. The most important, with respect to the present work, is TSØ432.UT.CNTL(CS) which allows the compilation of the code (cfr. Appendix D).

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SAGAPØ calculation for Benchmark Meeting VI, unpublished.

/7/ S. Cevolani
Thermo- und fluiddynamische Analyse von gasgekühlten Brennelement-bündeln bei Berücksichtigung von Wärmeleitung und Wärmestrahlung, KfK 3148, EUR 7051d, 1981.

/8/ A. Martelli
Thermo- und fluiddynamische Analyse von gasgekühlten Brennelement-bündeln, KfK 2436, EUR 5508d, 1977

/9/ K. Rehme
SIEM-program description, unpublished.

/10/ L. Meyer, unpublished.

Appendix A: JCL Example
(1/3 of the 12-rod bundle).

```
//INR432T4 JOB (0432,104,P0D7L),CEVOLANI,REGION=1000K,NOTIFY=INR432,
// MSGCLASS=A,TIME=10
//** ------------------------------------------------------------------
//**  S. CEVOLANI                                          JOB.CNTL(B12T)
//**            SAGAPO WITH AUTOMATIC DIMENSIONING
//**        VERSION FOR 1/3 OF THE WHOLE 12-ROD BUNDLE
//**                      CASE : T6B14X
//**
//**  WRITTEN : 23.04.1980                    LAST VERSION :22.04.1981
//** ------------------------------------------------------------------
//*MAIN SYSTEM=M3033
//*MAIN LINES=19
//*FORMAT PR,DDNAME=FT06F001,OVFL=ON
//*FORMAT PU,DDNAME=RUN.G.FT01F001,FORMS=STANZ
//** ------------------------------------------------------------------
//SCRATCH EXEC PGM=IEHPROGM
//SYSPRINT DD SYSOUT=*
//DEVICE DD UNIT=2314,VOL=SER=GFK089,DISP=SHR
//SYSIN DD *
 SCRATCH VOL=2314=GFK089,DSNAME=FOTTA3.INR432
 SCRATCH VOL=2314=GFK089,DSNAME=COMP3I.INR432
//**-----------------------------------------------------------------
//AUTO EXEC PLICKCG
//C.SYSPRINT DD DUMMY
//C.SYSIN DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.SAGAU.PLI
//G.SOUMOD DD UNIT=2314,DISP=SHR,DSN=TS0432.ASD.FORT(MAIN),
//          VOL=SER=GFK089
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(AKA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(ALFAC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(ANGCA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(ASSE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(AXSEC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(BALA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(BETAF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(BOTH)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CCLAD)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CCLAD3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CEWA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CEWACO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFC1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFC2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFC3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFC4)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFC5)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFC9)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFUEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CFUEL3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF11)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF12)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF14)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF15)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF17)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF18)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF24)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CF32)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CONNIJ)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CONSHR)
```

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// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CONTRO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CORKA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CORRTE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CRFL1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(CSFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(DAREA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(DDONNE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(DECP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(DELIP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(DPIN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(EINF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(ENFRCO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(ENFRC1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(ENTRFR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(EPS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(ETA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(EXPCL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(EXPCO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FFA31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FFS13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FFS16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FFS24)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FF31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FF32)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FGEO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FINDA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FINDF1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FINDF3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FINDF4)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FINDF5)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FINDW2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FKAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FQDEV)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FSA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FS1112)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FS2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FW1112)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FW13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FW16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FW1718)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FW7)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(FW8)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(GAUDEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(GAUSS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(GAUSS1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(GHPLUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(GKAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(GRIFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(GSTAR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(HEATBA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(HEATR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(INLCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(JELLA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(JELLB)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(JELLC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(JZURU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(KAPCOR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(KAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(KFUEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(KGAP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(KINF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(KMET)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(LEIST)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TS0432.ASD.FORT(LINPOW)
```

```
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MATBUI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MATBUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MEZZI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MODFQ)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NEWTON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NORMA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NORMT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PIVOT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PIVOT1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PSTAR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QCOC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QDEFI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QDEFIS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RADIA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECANG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECCA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECCA2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RELAM)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RHO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RHPLUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RTRI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RTSI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SELAWA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SIMLA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SMFUN1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANUG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANUR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBBAL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBDH)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUFCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUPCEN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SYSOL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TARRAY)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TAU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TBFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TBRTBS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TELIN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEMCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEMLAM)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTB)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEST1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TIS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TLINE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TMCF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TME)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TMPUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNEW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNEWS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TORG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TRICA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TTOT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TUBENU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TURBWC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TWCTEP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TWFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(UA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFCAL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFCTR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFDET)
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// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFDE1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(WALLTE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.SA19D.FORT
//G.EXEMOD DD UNIT=2314,VOL=SER=GFK089,DISP=(NEW,KEEP),
//    DSN=FOTTA3.INR432,SPACE=(TRK,(10,10),RLSE),
//    DCB=(LRECL=80,BLKSIZE=3120,RECFM=FB)
//G.VALUES DD *
0
 11
  5
 12
 30
  8
/*
//**-------------------------------------------------------------------
//COMPILE EXEC FGC
//C.SYSLIN DD UNIT=2314,VOL=SER=GFK089,DISP=(NEW,KEEP),
//    DSN=COMP3I.INR432,SPACE=(TRK,(9,9),RLSE)
//C.SYSPRINT DD DUMMY
//C.SYSIN DD UNIT=2314,VOL=SER=GFK089,DISP=(SHR),DSN=FOTTA3.INR432
//** -------------------------------------------------------------------
//EBCDIC EXEC EBCDIC,PARM.S=NOCO
//S.FT06F001 DD DUMMY
//S.LISTE DD SYSOUT=*
//S.SYSIN DD DSN=TSO432.DATA.DATA(T6B14),DISP=SHR,
//        UNIT=2314,VOL=SER=GFK089
//** -------------------------------------------------------------------
//RUN EXEC FGCLG,COND.C=(4,LT,COMPILE.C)
//**SYSPRINT DD DUMMY
//C.SYSIN DD DISP=SHR,DSN=TSO432.BD.FORT(KE4HTL),
//        UNIT=2314,VOL=SER=GFK089
//L.OBJEC DD DISP=SHR,UNIT=2314,VOL=SER=GFK089,DSN=COMP3I.INR432
//L.SYSIN DD *
 INCLUDE OBJEC
 ENTRY MAIN
/*
//G.FT01F001 DD SYSOUT=B,DCB=(BLKSIZE=1680,LRECL=80,RECFM=FB)          0076002
//G.FT02F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),              0077002
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HEP(T6B14X)              0078002
//G.FT03F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),              0079002
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HEW(T6B14X)              0080002
//G.FT04F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),              0081002
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HEL(T6B14X)              0082002
//G.FT09F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),              0083002
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HET(T6B14X)              0084002
//G.SYSIN DD DISP=(OLD,DELETE),DSN=&&EBCDIC                            0085002
//**-------------------------------------------------------------------0086000
//PLOT EXEC FGCG,PLOT=STATOS,SPACE=25,COND.G=(4,LT,RUN.G)              0088000
//**OT EXEC FGCG,PLOT=CALCOMP,SPACE=25,COND.G=(4,LT,RUN.G)             0089000
//**OT EXEC FGCG,PLOT=XYNETICS,SPACE=25,COND.G=(4,LT,RUN.G)            0090000
//C.SYSPRINT DD DUMMY                                                  0091000
//C.SYSIN DD DISP=SHR,DSN=TSO432.PLOT.FORT(KE4),                       0092000
//        UNIT=2314,VOL=SER=GFK089                                     0092000
//        DD DISP=SHR,DSN=TSO432.PLOT.FORT(SUBR),                      0093000
//        UNIT=2314,VOL=SER=GFK089                                     0092000
//**SYSIN DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.KE4PLOT.FORT 0092000
//**      DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.PLOP.FORT    0093000
//G.FT01F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,                     0094000
//      DSN=TSO432.KE4.HEW(T6B14X)                                     0095002
//G.FT02F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,                     0096000
//      DSN=KE4.HET(T6B14)                                             0097002
//G.FT03F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,                     0098000
//      DSN=TSO432.KE4.HEL(T6B14X)                                     0099002
//G.FT04F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,                     0100000
//      DSN=TSO432.KE4.HEP(T6B14X)                                     0101002
```

```
//G.FT07F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,                      0102000
//      DSN=KE4.HEP(T6B14)                                              0103002
//G.FT09F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,                      0104000
//      DSN=TSO432.KE4.HET(T6B14X)                                      0105002
//G.PLOTTAPE DD UNIT=TAPE9,LABEL=(,NL),DCB=DEN=2,VOL=SER=S432T4         0106002
//**PLOTTAPE DD UNIT=TAPE9,LABEL=(,NL),DCB=DEN=2,VOL=SER=P432T4         0107000
//**PLOTTAPE DD UNIT=TAPE9,LABEL=(,NL),DCB=DEN=2,VOL=SER=Y432T4         0108000
//**PLOTTAPE DD DUMMY                                                   0109002
//G.SYSIN DD *                                                          0110000
CE4 HE T6B14X                                                           0155002
1.00                                                                    0156002
  -1                                                                    0157002
0.0       1000.0    0.000     900.0                                     0158002
PIN 22,90 (3,4)  C                                                      0159002
   4   3   1  -1   0   1                                               0160002
  22  90                                                                0161002
PIN 42,270 (3,5) C                                                      0162002
   5   3   1  -1   0   1                                               0163002
  42 270                                                                0164002
PIN 62,30 (3,1) C                                                       0165002
   1   1   1  -1   0   1                                               0166002
  62  30                                                                0167002
PIN 83,150 (6,9) WE                                                     0168002
   9   2   1  -1   0   9                                               0169002
  83 150                                                                0170002
   1                                                                    0171002
PIN 83,150 (6,9) WI                                                     0172002
   9   2   1  -1   0   9                                               0173002
  83 150                                                                0174002
   2                                                                    0175002
PIN 83,150 (6,9) W                                                      0176002
   9   2   1  -1   0   1                                               0177002
  83 150                                                                0178002
PIN 91,30 (5,9) WE                                                      0179002
   9   1   1  -1   0   9                                               0180002
  91  30                                                                0181002
   1                                                                    0182002
PIN 91,30 (5,9) WI                                                      0183002
   9   1   1  -1   0   9                                               0184002
  91  30                                                                0185002
   2                                                                    0186002
PIN 91,30 (5,9) W                                                       0187002
   9   1   1  -1   0   1                                               0188002
  91  30                                                                0189002
PIN 7,30 (4,7-7,11) W                                                   0190002
   7   1   1  -1   1   1                                               0191002
  11   2                                                               0192002
   7  30                                                               0193002
PIN 78,210 (7,11) WE                                                    0194002
  11   2   1  -1   0   9                                               0195002
  78 210                                                                0196002
   1                                                                    0197002
PIN 78,210 (7,11) WI                                                    0198002
  11   2   1  -1   0   9                                               0199002
  78 210                                                                0200002
   2                                                                    0201002
PIN 78,210 (7,11) W                                                     0202002
  11   2   1  -1   0   1                                               0203002
  78 210                                                                0204002
PIN 110,90 (5,7) WE                                                     0205002
   7   2   1  -1   0   9                                               0206002
 110  90                                                                0207002
   1                                                                    0208002
PIN 110,90 (5,7) WI                                                     0209002
   7   2   1  -1   0   9                                               0210002
```

```
 110  90                                                          0211002
   2                                                             0212002
PIN 110,90 (5,7) W                                               0213002
   7   2   1  -1   0   1                                        0214002
 110  90                                                         0215002
PIN 120,210 (4,7) WE                                             0216002
   7   1   1  -1   0   9                                        0217002
 120 210                                                         0218002
   1                                                             0219002
PIN 120,210 (4,7) WI                                             0220002
   7   1   1  -1   0   9                                        0221002
 120 210                                                         0222002
   2                                                             0223002
PIN 120,210 (4,7) W                                              0224002
   7   1   1  -1   0   1                                        0225002
 120 210                                                         0226002
PIN 23,150 (6,10-11) WA                                          0227002
  10   1   1  -1   1   1                                        0228002
  11   1                                                        0229002
  23 150                                                         0230002
PIN 114,330(6,9-10)WA                                            0231002
   9   2   1  -1   1   1                                        0232002
  10   1                                                        0233002
 114 330                                                         0234002
PIN 97,210 (5,8) A                                               0235002
   8   1   1  -1   0   1                                        0236002
  97 210                                                         0237002
LINER 0  (PIN 5) A                                               0238002
   8   1   1  -1   0   3                                        0239002
   0   0                                                        0240002
LINER 30 (PIN 4-7) W                                             0241002
   7   1   1  -1   1   3                                        0242002
  11   2                                                        0243002
   0  30                                                         0244002
LINER 30 (PIN 7) W                                               0245002
   7   1   1  -1   0   3                                        0246002
   0  30                                                         0247002
LINER 90 (PIN  5- 6) W                                           0248002
   9   1   1  -1   1   3                                        0249002
   9   2                                                        0250002
   0  90                                                         0251002
LINER 210 (PIN 5- 6) W                                           0252002
   9   1   1  -1   1   3                                        0253002
   9   2                                                        0254002
   0 210                                                         0255002
LINER 270 (PIN 4/7) W                                            0256002
   7   1   1   1   1   3                                        0257002
  11   2                                                        0258002
   0 270                                                         0259002
/*                                                               0260002
```

Appendix B: JCL Example (whole 12-rod bundle)

```
//INR432T5 JOB (0432,104,P0D7L),CEVOLANI,REGION=1000K,NOTIFY=INR432,
// TIME=99,MSGCLASS=A
//** ------------------------------------------------------------------
//**  S. CEVOLANI                                          JOB.CNTL(B12W)
//**           SAGAPO WITHOUT AUTOMATIC DIMENSIONS
//**           VERSION FOR THE WHOLE 12-ROD BUNDLE
//**            CASE: P702 (TURBULENT,POWER TILT)
//**
//**  WRITTEN : 15.01.1980                    LAST VERSION :23.04.1981
//** ------------------------------------------------------------------
//*MAIN SYSTEM=M3033
//*MAIN LINES=19
//**ORMAT PR,DDNAME=,FORMS=E
//**ORMAT PR,DDNAME=,DEST=RM003PR1
//*FORMAT PR,DDNAME=FT06F001,OVFL=ON
//*FORMAT PU,DDNAME=CALCOLO.G.FT01F001,FORMS=STANZ
//** ------------------------------------------------------------------
//SCRATCH EXEC PGM=IEHPROGM
//SYSPRINT DD SYSOUT=A
//DEVICE DD UNIT=2314,VOL=SER=GFK089,DISP=SHR
//SYSIN DD *
 SCRATCH VOL=2314=GFK089,DSNAME=C012W.INR432
//**-----------------------------------------------------------------
//COMPILE EXEC FGC
//C.SYSLIN DD UNIT=2314,VOL=SER=GFK089,DISP=(NEW,KEEP),
//    DSN=C012W.INR432,SPACE=(TRK,(9,9),RLSE)
//C.SYSPRINT DD DUMMY
//C.SYSIN DD DISP=SHR,DSN=TSO432.ASD.FORT(MAIN),
//        UNIT=2314,VOL=SER=GFK089
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(AKA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ALFAC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ANGCA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ASSE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(AXSEC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(BALA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(BETAF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(BOTH)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CCLAD)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CCLAD3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CEWA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CEWACO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC4)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC5)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC9)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFUEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFUEL3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF11)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF12)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF14)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF15)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF17)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF18)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF24)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF32)
```

```
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CONNIJ)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CONSHR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CONTRO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CORKA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CORRTE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CRFL1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CSFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DAREA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DDONNE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DECP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DELIP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DPIN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EINF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ENFRCO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ENFRC1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ENTRFR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EPS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ETA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EXPCL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EXPCO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFA31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFS13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFS16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFS24)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FF31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FF32)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FGEO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF4)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF5)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDW2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FKAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FQDEV)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FSA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FS1112)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FS2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW1112)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW1718)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW7)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW8)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GAUDEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GAUSS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GAUSS1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GHPLUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GKAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GRIFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GSTAR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(HEATBA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(HEATR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(INLCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JELLA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JELLB)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JELLC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JZURU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KAPCOR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KFUEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KGAP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KINF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KMET)
```

```
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(LEIST)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(LINPOW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MATBUI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MATBUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MEZZI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MODFQ)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NEWTON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NORMA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NORMT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PIVOT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PIVOT1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PSTAR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QCOC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QDEFI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QDEFIS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RADIA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECANG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECCA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECCA2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RELAM)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RHO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RHPLUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RTRI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RTSI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SELAWA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SIMLA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SMFUN1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANUG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANUR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBBAL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBDH)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUFCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUPCEN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SYSOL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SYSOL2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TARRAY)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TAU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TBFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TBRTBS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TELIN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEMCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEMLAM)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTB)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEST1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TIS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TLINE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TMCF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TME)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TMPUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNEW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNEWS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TORG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TRICA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TTOT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TUBENU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TURBWC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TWCTEP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TWFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(UA)
```

```
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFCAL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFCTR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFDET)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFDE1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(WALLTE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.SA19D.FORT
//** ------------------------------------------------------------------
//EBCDIC EXEC EBCDIC,PARM.S=NOCO
//S.FT06F001 DD DUMMY
//S.LISTE DD SYSOUT=*
//S.SYSIN DD UNIT=2314,VOL=SER=GFK089,DSN=TSO432.DATA.DATA(P702),
//        DISP=SHR
//** ------------------------------------------------------------------
//CALCOLO EXEC FGCLG,COND.C=(4,LT,COMPILE.C)
//**SYSPRINT DD DUMMY
//C.SYSIN DD UNIT=2314,DISP=SHR,DSN=TSO432.BD.FORT(KE4HWT),
//        VOL=SER=GFK089
//L.OBJEC DD DISP=SHR,UNIT=2314,VOL=SER=GFK089,DSN=CO12W.INR432
//L.SYSIN DD *
 INCLUDE OBJEC
 ENTRY MAIN
/*
//**FT06F001 DD SYSOUT=*,DCB=(BLKSIZE=133,LRECL=133,RECFM=FBA)
//G.FT01F001 DD SYSOUT=B,DCB=(BLKSIZE=1680,LRECL=80,RECFM=FB)
//G.FT02F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HEP(P702A)
//G.FT03F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HEW(P702A)
//G.FT04F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HEL(P702A)
//G.FT09F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.KE4.HET(P702A)
//G.SYSIN DD DISP=(OLD,DELETE),DSN=&&EBCDIC
//**------------------------------------------------------------------
//DISEGNA EXEC FGCG,PLOT=STATOS,SPACE=25,COND.G=(4,LT,CALCOLO.G)
//**SEGNA EXEC FGCG,PLOT=CALCOMP,SPACE=25,COND.G=(4,LT,CALCOLO.G)
//**SEGNA EXEC FGCG,PLOT=XYNETICS,SPACE=25,COND.G=(4,LT,CALCOLO.G)
//C.SYSPRINT DD DUMMY
//C.SYSIN DD DISP=SHR,DSN=TSO432.PLOT.FORT(KE4),
//        UNIT=2314,VOL=SER=GFK089
//        DD DISP=SHR,DSN=TSO432.PLOT.FORT(SUBR),
//        UNIT=2314,VOL=SER=GFK089
//G.FT06F001 DD DUMMY
//G.FT01F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.KE4.HEW(P702A)
//G.FT02F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=KE4.HET(P702)
//G.FT03F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.KE4.HEL(P702A)
//G.FT04F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.KE4.HEP(P702A)
//G.FT07F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=KE4.HEP(P702)
//G.FT09F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.KE4.HET(P702A)
//G.PLOTTAPE DD UNIT=TAPE9,LABEL=(,NL),DCB=DEN=2,VOL=SER=S432T5
//**PLOTTAPE DD UNIT=TAPE9,LABEL=(,NL),DCB=DEN=2,VOL=SER=Y432T5
//**PLOTTAPE DD UNIT=TAPE9,LABEL=(,NL),DCB=DEN=2,VOL=SER=P432T5
//**PLOTTAPE DD DUMMY
//G.SYSIN DD *
CE4 HE P702A-A TURB
0.65
  -1
0.0       1000.0    000.0     800.00
PIN 22,90 (1,8)  C
```

```
   8   1   1  -1   0   1
  22  90
PIN 42,270 (2,13) C
  13   1   1  -1   0   1
  42 270
PIN 62,30 (3,1) C
   1   3   1  -1   0   1
  62  30
PIN 83,150 (9,21) WE
  21   2   1  -1   0   9
  83 150
   1
PIN 83,150 (9,21) WI
  21   2   1  -1   0   9
  83 150
   2
PIN 83,150 (9,21) W
  21   2   1  -1   0   1
  83 150
PIN 91,30 (8,21) WE
  21   1   1  -1   0   9
  91  30
   1
PIN 91,30 (8,21) WI
  21   1   1  -1   0   9
  91  30
   2
PIN 91,30 (8,21) W
  21   1   1  -1   0   1
  91  30
PIN 7,30 (10,23-10,24) W
  23   2   1  -1   1   1
  24   1
   7  30
PIN 78,210 (7,18) WE
  18   2   1  -1   0   9
  78 210
   1
PIN 78,210 (7,18) WI
  18   2   1  -1   0   9
  78 210
   2
PIN 78,210 (7,18) W
  18   2   1  -1   0   1
  78 210
PIN 110,90 (11,24) WE
  24   2   1  -1   0   9
 110  90
   1
PIN 110,90 (11,24) WI
  24   2   1  -1   0   9
 110  90
   2
PIN 110,90 (11,24) W
  24   2   1  -1   0   1
 110  90
PIN 120,210 (4,14) WE
  14   1   1  -1   0   9
 120 210
   1
PIN 120,210 (4,14) WI
  14   1   1  -1   0   9
 120 210
   2
PIN 120,210 (4,14) W
```

```
  14    1    1  -1    0    1
 120 210
PIN 23,150 (6,18-17) WA
  18    1    1  -1    1    1
  17    1
  23 150
PIN 114,330(12,26-27)WA
  26    2    1  -1    1    1
  27    1
 114 330
PIN 97,210 (5,15) A
  15    1    1  -1    0    1
  97 210
LINER 30 (PIN 10-11) W
  24    1    1  -1    1    3
  24    2
   0  30
LINER 90 (PIN  8- 9) W
  21    1    1  -1    1    3
  21    2
   0  90
LINER 210 (PIN 5- 6) W
  16    1    1  -1    1    3
  16    2
   0 210
LINER 270 (PIN 4) W
  14    1    1   1    1    3
  28    2
   0 270
/*
//
```

Appendix C: JCL Example (whole 19-rod bundle)

```
//INR432TG JOB (0432,104,POD7L),CEVOLANI,REGION=1000K,NOTIFY=INR432,
// TIME=(100)
//** ------------------------------------------------------------------
//**  S. CEVOLANI                                          JOB.CNTL(B19W)
//**               VERSION FOR THE WHOLE 19-ROD BUNDLE
//**        PLOT REFERRED TO 1/12 OF THE WHOLE 19-ROD BUNDLE
//**                          CASE : T7015A
//**  WRITTEN : 15.01.1980                    LAST VERSION :17.02.1981
//** ------------------------------------------------------------------
//*MAIN SYSTEM=M3033
//*MAIN LINES=30
//*FORMAT PR,DDNAME=FT06F001,OVFL=ON
//*FORMAT PU,DDNAME=CALCOLO.G.FT01F001,FORMS=STANZ
//** ------------------------------------------------------------------
//EBCDIC EXEC EBCDIC,PARM.S=NOCO
//S.FT06F001 DD DUMMY
//S.LISTE DD SYSOUT=A
//S.SYSIN DD DISP=SHR,DSN=TSO432.DATA.DATA(T7015),
//        UNIT=2314,VOL=SER=GFK089
//** ------------------------------------------------------------------
//CALCOLO EXEC FGCLG
//**SYSPRINT DD DUMMY
//C.SYSIN DD DISP=SHR,DSN=TSO432.BD.FORT(B19WL),
//        UNIT=2314,VOL=SER=GFK089
//        DD DISP=SHR,DSN=TSO432.B19SU1.FORT
//L.OBJEC DD DISP=SHR,UNIT=2314,VOL=SER=GFK089,DSN=B19COM5.INR432
//L.SYSIN DD *
 INCLUDE OBJEC
 ENTRY MAIN
/*
//**FT06F001 DD SYSOUT=*,DCB=(BLKSIZE=133,LRECL=133,RECFM=FBA)
//G.VECTR1 DD DUMMY
//G.VECTR2 DD DUMMY
//G.FT01F001 DD SYSOUT=B,DCB=(BLKSIZE=1680,LRECL=80,RECFM=FB)
//G.FT02F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.B193D4P(T7015A)
//G.FT03F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.B193D4W(T7015A)
//G.FT04F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.B193D4L(T7015A)
//G.FT09F001 DD UNIT=2314,VOL=SER=GFK089,DISP=(OLD,KEEP),
//      SPACE=(TRK,(20,20,20)),DSN=TSO432.B193D4T(T7015A)
//G.SYSIN DD DISP=(OLD,DELETE),DSN=&&EBCDIC
//**-----------------------------------------------------------------
//DISEGNA EXEC FGCG,PLOT=VERSATEC,SPACE=25
//C.SYSPRINT DD DUMMY
//C.SYSIN DD DISP=SHR,DSN=TSO432.PLOT.FORT(B5),
//        UNIT=2314,VOL=SER=GFK089
//        DD DISP=SHR,DSN=TSO432.PLOT.FORT(SUBR),
//        UNIT=2314,VOL=SER=GFK089
//G.FT06F001 DD DUMMY
//G.PLOTPARM DD *
 &PLOT XMAX=200.,SPACE=200. &END
//G.FT01F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.B193D4W(T7015A)
//G.FT02F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=B193DT(T7015)
//G.FT03F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.B193D4L(T7015A)
//G.FT04F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.B193D4P(T7015A)
//G.FT07F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
```

```
//      DSN=B193DP(T7015)
//G.FT09F001 DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,
//      DSN=TSO432.B193D4T(T7015A)
//G.SYSIN DD *
19-3D  T7015A (N)
1.00
 -1
0.0       1200.0    000.0     800.00
P1 C2    / R10 W 60 C
   2   3   1  -1   0   1
  10  60
P1 C1-2  / R10 W 90 C
   1   3   1  -1   1   1
   2   3
  10  90
P1 C6    / R10 W180 C
   6   3   1  -1   0   1
  10 180
P1 C5-6  / R10 W210 C
   6   3   1  -1   1   1
   5   3
  10 210
P1 C4    / R10 W300 C
   4   3   1  -1   0   1
  10 300
P1 C4-3  / R10 W330 C
   4   3   1  -1   1   1
   3   3
  10 330
P2 C6-23 / R15 W270 C
   6   2   1  -1   1   1
  23   2
  15 270
P2 C1    / R15 W345 C
   1   1   2  -1   0   1
  15 345  15  00
P2 C8    / R15 W 60 C
   8   1   1  -1   0   1
  15  60
P2 C7-24 / R15 W150 C
   7   3   1  -1   1   1
  24   3
  15 150
P3 C1-2  / R11 W270 C
   1   2   1  -1   1   1
   2   1
  11 270
P3 C10   / R11 W 60 C
   1   2   1  -1   0   1
  11  60
P3 C8-9  / R11 W150 C
   8   2   1  -1   1   1
   9   3
  11 150
P3 C1    / R11 W240 C
   1   2   1  -1   0   1
  11 240
P4 C12-13/ R 6 W 30 C
  12   3   1  -1   1   1
  13   3
   6  30
P4 C2-11 / R6 W150 C
   2   2   1  -1   1   1
  11   2
   6 150
```

```
P4 C2     / R 6 W180 C
   2   2    1  -1    0   1
   6 180
P4 C3 / R6 W225-240 C
   3   1    2  -1    0   1
   6 225    6 240
P4 C3-14 R6 W300    C
   3   1    1  -1    1   1
  14   1
   6 300
P5 C14-15 R5 W30     C
  15   3    1  -1    1   1
  14   2
   5  30
P5 C3      R5 W120    C
   3   2    1  -1    0   1
   5 120
P5 C3-4    R5 W150    C
   3   2    1  -1    1   1
   4   1
   5 150
P5 C4  R5 W180-195   C
   4   1    2  -1    0   1
   5 180    5 195
P5 C16-17 R5 W300   C
  16   3    1  -1    1   1
  17   1
   5 300
P6 C4-17  R9 W30   C
   4   2    1  -1    1   1
  17   2
   9  30
P6 C4      R9 W60   C
   4   2    1  -1    0   1
   9  60
P6 C5/R9 W105-120 C
   5   1    2  -1    0   1
   9 105    9 120
P6 C20  R9 W180    C
  20   1    1  -1    0   1
   9 180
P6 C18-19 R9 W270 C
  18   3    1  -1    1   1
  19   3
   9 270
P7 C5      R14 W00 C
   5   2    1  -1    0   1
  14  00
P7 C5-6    R14 W30 C
   5   2    1  -1    1   1
   6   1
  14  30
P7 C6-23  R14 W60 C
   6   1    1  -1    1   1
  23   1
  14  60
P7 C6      R14 W75 C
   6   1    1  -1    0   1
  14  75
P7 C22     R14 W180 C
  22   3    1  -1    0   1
  14 180
P7 C20-21 R14 W270 C
  20   2    1  -1    1   1
  21   3
  14 270
```

```
P8 C7      R19 W15  C
   7   1    1  -1   0   1
  19  15
P8 C26     R19 W90  W
  26   1    1  -1   0   1
  19  90
P8 C25 R19 W135-150 A
  25   1    2  -1   0   1
  19 135  19 150
P8 C25-42 R19 W180 WA
  25   1    1  -1   1   1
  42   2
  19 180
P8 C24-42 R19 W270 CW
  24   2    1  -1   1   1
  42   2
  19 270
P9C26-27 R16W105-120 WW
  26   2    2  -1   1   1
  27   1
  16 105  16 120
P9 C26     R16 W150  W
  26   2    1  -1   0   1
  16 150
P9 C26-7   R16 W210  CW
  26   2    1  -1   1   1
   7   2
  16 210
P9 C8      R16 W285  C
   8   3    1  -1   0   1
  16 285
P9 C8-9    R16 W330  CC
   8   3    1  -1   1   1
   9   1
  16 330
P10 C29    R12 W15   W
  29   1    2  -1   0   1
  12  15   12  30
P10 C28    R12 W90   A
  28   1    1  -1   0   1
  12  90
P10 C9     R12 W240  C
   9   2    1  -1   0   1
  12 240
P10 C9-10 R12 W270  CC
   9   2    1  -1   1   1
  10   1
  12 270
P11 C10-29 R7 W150  CW
  10   2    1  -1   1   1
  29   2
   7 150
P11 C10    R7 W165  C
  10   2    1  -1   0   1
   7 165
P11 C12-30 R7 W330  CW
  12   1    1  -1   1   1
  30   1
   7 330
P12 C31 R3 W15-30-45 A
  31   1    3  -1   0   1
   3  15    3  30   3  45
P12 C31-30 R3 W60  AW
  31   1    1  -1   1   1
  30   2
```

```
   3  60
P12 C30-12 R3 W150 CW
  30   2   1  -1   1   1
  12   1
   3 150
P12 C13    R3 W255 C
  13   1   1  -1   0   1
   3 255
P12 C32    R3 W330 W
  32   1   1  -1   0   1
   3 330
P13 C32-33 R2 W0  WW
  32   1   1  -1   1   1
  33   1
   2   0
P13 C32    R2 W30 W
  32   2   1  -1   0   1
   2  30
P13 C14    R2 W165 C
  14   3   1  -1   0   1
   2 165
P13 C14-15 R2 W210 CC
  14   3   1  -1   1   1
  15   1
   2 210
P14 C15    R1 W120 C
  15   2   1  -1   0   1
   1 120
P14 C16-15 R1 W150 CC
  16   1   1  -1   1   1
  15   2
   1 150
P14 C35 R1 W255-279 W
  35   1   2  -1   0   1
   1 255   1 270
P14 C34 R1 W330     A
  34   1   1  -1   0   1
   1 330
P15 C16 R4 W45      C
  16   2   1  -1   0   1
   4  45
P15 C18-36 R4 W210 CW
  18   1   1  -1   1   1
  36   1
   4 210
P15 C35-36 R4 W300 WW
  35   2   1  -1   1   1
  36   1
   4 300
P16 C18-36 R8 W30  CW
  18   2   1  -1   1   1
  36   2
   8  30
P16 C19    R8 W135 C
  19   1   1  -1   0   1
   8 135
P16 C38    R8 W210 W
  38   1   1  -1   0   1
   8 210
P16 C37 R8 W255-270 A
  37   1   2  -1   0   1
   8 255   8 270
P16 C36-37 R8 W300 WA
  37   1   1  -1   1   1
  36   2
```

```
   8 300
P17 C20 R13 W45-60 C
  20   3   2  -1   0   1
  13  45  13  60
P17 C20-21 R13 W90 CC
  20   3   1  -1   1   1
  21   1
  13  90
P17 C38-39 R13 W240 WW
  38   2   1  -1   1   1
  39   1
  13 240
P17 C38    R13 W270 W
  38   2   1  -1   0   1
  13 270
P18 C21    R17 W0  C
  21   2   1  -1   0   1
  17   0
P18 C21-22 R17 W30 CC
  21   2   1  -1   1   1
  22   1
  17  30
P18 C41 R17 W135-150 W
  41   1   2  -1   0   1
  17 135  17 150
P18 C40 R17 W210     A
  40   1   1  -1   0   1
  17 210
P19 C23 R18 W000     C
  23   3   1  -1   0   1
  18 000
P19 C24-42 R18 W90  CW
  24   1   1  -1   1   1
  42   1
  18  90
P19 C22 R18 W285  C
  22   2   1  -1   0   1
  18 285
L32-33 W000 WW
  32   2   1  -1   1   3
  33   1
   0   0
L32    W7   W
  32   2   1  -1   0   3
   0   7
L32I   W26  W
  32   1   1  -1   0   3
   0  26
L31  W30-34 A
  31   1   2  -1   0   3
   0  30   0  34
L30    W54  W
  30   1   1  -1   0   3
   0  54
L29-30 W60 WW
  30   1   1  -1   1   3
  29   2   1  -1   1   3
   0  60
L26-27 W120 WW
  27   1   1  -1   1   3
  26   2
   0 120
L26  W126   W
  26   2   1  -1   0   3
   0 126
L25-26 W144 WA
```

```
  25    1    1  -1    1    3
  26    1
   0 144
L25  W150    A
  25    1    1  -1    0    3
   0 150
L25-42 W156 WA
  25    1    1  -1    1    3
  42    2
   0 156
L42  W173    W
  42    1    1  -1    0    3
   0 173
L41-42 W180 WW
  41    2    1  -1    1    3
  42    1
   0 180
L41  W187    W
  41    2    1  -1    0    3
   0 187
L40-41 W206 WA
  41    1    1  -1    1    3
  40    1
   0 206
L40  W210    A
  40    1    1  -1    0    3
   0 210
L39  W216    W
  39    2    1  -1    0    3
   0 216
L39I W234    W
  39    1    1  -1    0    3
   0 234
L38-39 W240 WW
  38    2    1  -1    1    3
  39    1
   0 240
L35-36 W300 WW
  35    2    1  -1    1    3
  36    1
   0 240
L35  W306    W
  35    2    1  -1    0    3
   0 306
L34-35 W324 WW
  35    1    1  -1    1    3
  34    1
   0 324
L34  W330    A
  34    1    1  -1    0    3
   0 330
L33-34 W336 WA
  33    2    1  -1    1    3
  34    1
   0 336
L33  W353    W
  33    1    1 999    0    3
   0 353
/*
//**-------------------------------------------------------------------
//DISVER EXEC SVPLOT,SPACE=25
//
```

Appendix D: JCL Example (code compilation)

```
//INR432CS JOB (0432,104,POD7L),CEVOLANI,REGION=999K,NOTIFY=INR432,
// TIME=(1,30),MSGCLASS=A
//** ------------------------------------------------------------------
//** S. CEVOLANI                                              UT.CNTL(CS)
//**     COMPILE SAGAPO-A  AND COPY THE OBJECT ON GFK089
//**             WITH THE NAME   B19COM5.INR432
//** WRITTEN : 19.03.1981                      LAST VERSION : 19.03.1981
//** ------------------------------------------------------------------
//**ORMAT PR,DDNAME=,DEST=RM003PR1
//** ------------------------------------------------------------------
//SCRATCH EXEC PGM=IEHPROGM
//SYSPRINT DD SYSOUT=*
//DEVICE DD UNIT=2314,VOL=SER=GFK089,DISP=SHR
//SYSIN DD *
 SCRATCH VOL=2314=GFK089,DSNAME=B19COM5.INR432
/*
//** ------------------------------------------------------------------
//COMPILE EXEC FGC
//C.SYSLIN DD UNIT=2314,VOL=SER=GFK089,DSN=B19COM5.INR432,
//  DISP=(NEW,KEEP),SPACE=(TRK,(9,9),RLSE)
//SYSPRINT DD DUMMY
//C.SYSIN DD DISP=SHR,DSN=TSO432.ASD.FORT(MAIN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(AKA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ALFAC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ANGCA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ASSE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(AXSEC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(BALA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(BETAF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(BOTH)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CCLAD)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CCLAD3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CEWA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CEWACO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC4)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC5)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFC9)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFUEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CFUEL3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF11)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF12)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF14)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF15)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF17)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF18)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF24)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CF32)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CONNIJ)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CONSHR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CONTRO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CORKA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CORRTE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CRFL1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(CSFUN)
```

```
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DAREA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DDONNE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DECP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DELIP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DPIN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(DSPDPF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EINF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ENFRCO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ENFRC1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ENTRFR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EPS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(ETA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EXPCL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(EXPCO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFA31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFS13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFS16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FFS24)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FF31)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FF32)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FGEO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF4)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDF5)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FINDW2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FKAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FQDEV)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FSA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FS1112)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FS2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW1112)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW13)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW16)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW1718)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW7)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(FW8)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GAUDEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GAUSS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GAUSS1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GHPLUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GKAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GRIFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(GSTAR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(HEATBA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(HEATI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(HEATR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(INDEX)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(INGE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(INLCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(INQUA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JELLA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JELLB)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JELLC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(JZURU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KAPCOR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KAPPA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KFUEL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KGAP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KINF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(KMET)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(LEIST)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(LINPOW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MATBUI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MATBUS)
```

```
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MEZZI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(MODFQ)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NEWTON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NORMA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(NORMT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PIVOT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PIVOT1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(PSTAR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QCOC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QDEFI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(QDEFIS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RADIA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECANG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECCA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RECCA2)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RELAM)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RHO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RHPLUS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RTRI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(RTSI)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SELAWA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SIMLA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SMFUN1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANUG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SPANUR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBBAL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUBDH)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUFCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SUPCEN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(SYSOL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TARRAY)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TAU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TBFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TBRTBS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TELIN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEMCON)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEMLAM)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTB)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TESTW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TEST1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TIS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TLINE)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TMCF)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TME)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TMPUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNEW)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNEWS)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TNU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TORG)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TOTGEO)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TOTSEC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TRICA1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TTOT)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TUBENU)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TURBWC)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TWCTEP)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(TWFUN)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(UA)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFCAL)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFCTR)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFDET)
```

```
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFDE1)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(VFD3)
// DD UNIT=2314,VOL=SER=GFK089,DISP=SHR,DSN=TSO432.ASD.FORT(WALLTE)
//** ------------------------------------------------------------------
// EXEC PGM=MAPDA,PARM=GFK089
//DISK DD UNIT=2314,VOL=SER=GFK089,DISP=SHR
//SYSPRINT DD SYSOUT=*
//
```

Appendix E: Text of SAGAU

```
/*                                                                      00000100
                                                                        00000200
                                                                        00000300
     S. CEVOLANI                                                        00000400
     **********                                                         00000500
                                                                        00000600
                                                                        00000700
     ================================================================   00000800
                                                                        00000900
     S A G A U                                                          00001000
                                                                        00001100
     PL/I PROGRAM FOR THE AUTOMATIZATION OF THE FORTRAN PROGRAM         00001200
     SAGAPO-A                                                           00001300
                                                                        00001400
     ================================================================   00001500
                                                                        00001600
                                                                        00001700
     FILES DEFINITION:                                                  00001800
                                                                        00001900
     SOUMOD: SAGAPO SOURCE MODULE WHOSE ARRAYS ARE DIMENSIONED          00002000
             AT THE STANDARD SIZE.                                      00002100
     EXEMOD: SAGAPO EXECUTABLE MODULE, ELABORATED BY SAGAU;             00002200
             THE ARRAYS ARE DIMENSIONED AT THE ACTUAL SIZE.             00002300
     VALUES: VALUES OF THE ACTUAL SIZE OF THE ARRAYS TO BE SOBSTI-      00002400
             TUED TO THE STANDARD SIZE IN THE SOURCE MODULE.            00002500
             ( THE STANDARD SIZE REPRESENTS A WHOLE 19-ROD BUNDLE)      00002600
                                                                        00002700
             NSTOT: ACTUAL NUMBER OF CHANNELS                           00002800
                    (STANDARD VALUE:  42)                               00002900
             NWALL: ACTUAL NUMBER OF EXTERNAL CHANNELS.                 00003000
                    (STANDARD VALUE:  18)                               00003100
             NRODS: ACTUAL NUMBER OF RODS.                              00003200
                    (STANDARD VALUE:  19)                               00003300
             NSECT: ACTUAL NUMBER OF SECTORS FOR RADIATION              00003400
                    (STANDARD VALUE: 132)                               00003500
             NLTOT: ACTUAL NUMBER OF SHROUD PARTS FOR CONDUCTION        00003600
                    (STANDARD VALUE:  34)                               00003700
                    (THE EFFECTIVE VALUE OF NLTOT FOR A WHOLE 19-ROD    00003800
                     BUNDLE IS 30: 34 IS CHOOSEN TO AVOID CONFUSION     00003900
                     WITH OTHER ARRAYS USED IN SAGAPO-A).               00004000
                                                                        00004100
     ================================================================   00004200
                                                                   */   00004300
AUTO:PROC OPTIONS(MAIN);                                                00004400
     DCL SOUMOD FILE INPUT,                                             00004500
         EXEMOD FILE OUTPUT,                                            00004600
         VALUES FILE INPUT;                                             00004700
                                                              /*  */    00004800
     DCL CARD          CHAR(80),                                        00004900
         MCARD(80)     CHAR(1)           DEFINED CARD;                  00005000
     DCL COMN          CHAR(12)          INIT ('      COMMON'),         00005100
         DIME          CHAR(15)          INIT ('      DIMENSION'),      00005200
         REAG          CHAR(10)          INIT ('      REAL'),           00005300
         NSTOT (3)     CHAR(1),                                         00005400
         NWALL (3)     CHAR(1),                                         00005500
         NRODS (3)     CHAR(1),                                         00005600
         NSECT (3)     CHAR(1),                                         00005700
         NLTOT (3)     CHAR(1),                                         00005800
         BLAN          CHAR(1)           INIT (' '),                    00005900
         IP            CHAR(1),                                         00006000
         K             BINARY FIXED (31),                               00006100
         JREAD         BINARY FIXED (31) INIT (0),                      00006200
```

```
        JELAB          BINARY FIXED (31)  INIT (0);                    00006300
                                                          /* */         00006400
ON ENDFILE (SOUMOD) GO TO FINE;                                         00006500
                                                          /* */         00006600
PUT FILE(SYSPRINT) SKIP EDIT('START OF SAGAU') (A);                     00006700
                                                          /* */         00006800
GET FILE(VALUES) SKIP EDIT(IP)    (  A(1));                             00006900
                                                          /* */         00007000
GET FILE(VALUES) SKIP EDIT(NSTOT) (3 A(1));                             00007100
GET FILE(VALUES) SKIP EDIT(NWALL) (3 A(1));                             00007200
GET FILE(VALUES) SKIP EDIT(NRODS) (3 A(1));                             00007300
GET FILE(VALUES) SKIP EDIT(NSECT) (3 A(1));                             00007400
GET FILE(VALUES) SKIP EDIT(NLTOT) (3 A(1));                             00007500
                                                          /* */         00007600
PUT FILE(SYSPRINT) SKIP EDIT('ACTUAL NSTOT = ',NSTOT) (A);              00007700
PUT FILE(SYSPRINT) SKIP EDIT('ACTUAL NWALL = ',NWALL) (A);              00007800
PUT FILE(SYSPRINT) SKIP EDIT('ACTUAL NRODS = ',NRODS) (A);              00007900
PUT FILE(SYSPRINT) SKIP EDIT('ACTUAL NSECT = ',NSECT) (A);              00008000
PUT FILE(SYSPRINT) SKIP EDIT('ACTUAL NLTOT = ',NLTOT) (A);              00008100
                                                          /* */         00008200
IF IP  = 1 THEN                                                         00008300
PUT FILE(SYSPRINT) SKIP EDIT('OPTION IP = PRINT') (A);                  00008400
IF IP ¬= 1 THEN                                                         00008500
PUT FILE(SYSPRINT) SKIP EDIT('OPTION IP = NOPRINT') (A);                00008600
                                                          /* */         00008700
LEGGI1: GET FILE(SOUMOD)   SKIP  EDIT(CARD) (A(80));                    00008800
        JREAD=JREAD+1;                                                  00008900
ESAMIN: IF SUBSTR(CARD,1,12) = COMN THEN DO;                            00009000
                  CALL ELABOR;                                          00009100
                  CALL INDICE;                                          00009200
                  PUT FILE(EXEMOD)   SKIP EDIT(CARD) (A(80));           00009300
                  IF IP = 1 THEN                                        00009400
                  PUT FILE(SYSPRINT) SKIP EDIT(CARD) (A(80));           00009500
                  CALL RIPETE;                                          00009600
                  GO TO ESAMIN;                                         00009700
                  END;                                                  00009800
        IF SUBSTR(CARD,1,15) = DIME THEN DO;                            00009900
                  CALL ELABOR;                                          00010000
                  CALL INDICE;                                          00010100
                  PUT FILE(EXEMOD)   SKIP EDIT(CARD) (A(80));           00010200
                  IF IP = 1 THEN                                        00010300
                  PUT FILE(SYSPRINT) SKIP EDIT(CARD) (A(80));           00010400
                  CALL RIPETE;                                          00010500
                  GO TO ESAMIN;                                         00010600
                  END;                                                  00010700
        IF SUBSTR(CARD,1,10) = REAG THEN DO;                            00010800
                  CALL ELABOR;                                          00010900
                  CALL INDICE;                                          00011000
                  PUT FILE(EXEMOD)   SKIP EDIT(CARD) (A(80));           00011100
                  IF IP = 1 THEN                                        00011200
                  PUT FILE(SYSPRINT) SKIP EDIT(CARD) (A(80));           00011300
                  CALL RIPETE;                                          00011400
                  GO TO ESAMIN;                                         00011500
                  END;                                                  00011600
SCRIVI: PUT FILE(EXEMOD)   SKIP EDIT(CARD) (A(80));                     00011700
        IF IP = 1 THEN                                                  00011800
        PUT FILE(SYSPRINT) SKIP EDIT(CARD) (A(80));                     00011900
        GO TO LEGGI1;                                                   00012000
                                                  /* */                 00012100
                                                  /* */                 00012200
RIPETE: PROCEDURE;                                                      00012300
LEGGI2: GET FILE(SOUMOD) SKIP EDIT(CARD) (A(80));                       00012400
        JREAD=JREAD+1;                                                  00012500
        IF MCARD(6) =  BLAN THEN GO TO RIPEND;                          00012600
        IF MCARD(1) ¬= BLAN THEN GO TO RIPEND;                          00012700
        CALL ELABOR;                                                    00012800
```

```
        CALL INDICE;                                                    00012900
        PUT FILE(EXEMOD)   SKIP EDIT(CARD) (A(80));                     00013000
        IF IP = 1 THEN                                                  00013100
        PUT FILE(SYSPRINT) SKIP EDIT(CARD) (A(80));                     00013200
        GO TO LEGGI2;                                                   00013300
RIPEND: END RIPETE;                                                     00013400
                                                  /* */               00013500
                                                  /* */               00013600
ELABOR: PROCEDURE;                                                      00013700
        JELAB=JELAB+1;                                                  00013800
CERCA1: IF NSTOT(1)=' ' & NSTOT(2)='4' & NSTOT(3)='2' THEN GOTO CERCA2;00013900
CERC11: K=INDEX(CARD,' 42');                                            00014000
        IF K = 0 THEN GO TO CERCA2;                                     00014100
                      MCARD(K)  = NSTOT(1);                             00014200
                      MCARD(K+1)= NSTOT(2);                             00014300
                      MCARD(K+2)= NSTOT(3);                             00014400
                      GO TO CERC11;                                     00014500
CERCA2: IF NWALL(1)=' ' & NWALL(2)='1' & NWALL(3)='8' THEN GOTO CERCA3;00014600
CERC22: K=INDEX(CARD,' 18');                                            00014700
        IF K = 0 THEN GO TO CERCA3;                                     00014800
                      MCARD(K)  = NWALL(1);                             00014900
                      MCARD(K+1)= NWALL(2);                             00015000
                      MCARD(K+2)= NWALL(3);                             00015100
                      GO TO CERC22;                                     00015200
CERCA3: IF NRODS(1)=' ' & NRODS(2)='1' & NRODS(3)='9' THEN GOTO CERCA4;00015300
CERC33: K=INDEX(CARD,' 19');                                            00015400
        IF K = 0 THEN GO TO CERCA4;                                     00015500
                      MCARD(K)  = NRODS(1);                             00015600
                      MCARD(K+1)= NRODS(2);                             00015700
                      MCARD(K+2)= NRODS(3);                             00015800
                      GO TO CERC33;                                     00015900
CERCA4: IF NLTOT(1)=' ' & NLTOT(2)='3' & NLTOT(3)='4' THEN GOTO CERCA5;00016000
CERC44: K=INDEX(CARD,' 34');                                            00016100
        IF K = 0 THEN GO TO CERCA5;                                     00016200
                      MCARD(K)  = NLTOT(1);                             00016300
                      MCARD(K+1)= NLTOT(2);                             00016400
                      MCARD(K+2)= NLTOT(3);                             00016500
                      GO TO CERC44;                                     00016600
CERCA5: IF NSECT(1)='1' & NSECT(2)='3' & NSECT(3)='2' THEN GOTO ELAEND;00016700
CERC55: K=INDEX(CARD,'132');                                            00016800
        IF K = 0 THEN GO TO ELAEND;                                     00016900
                      MCARD(K)  = NSECT(1);                             00017000
                      MCARD(K+1)= NSECT(2);                             00017100
                      MCARD(K+2)= NSECT(3);                             00017200
                      GO TO CERC55;                                     00017300
ELAEND: END ELABOR;                                                     00017400
                                                /* */                 00017500
INDICE: PROCEDURE;                                                      00017600
        MCARD(73)=BLAN;                                                 00017700
        MCARD(74)=BLAN;                                                 00017800
        MCARD(75)=BLAN;                                                 00017900
        MCARD(76)=BLAN;                                                 00018000
        MCARD(77)=BLAN;                                                 00018100
        MCARD(78)=BLAN;                                                 00018200
        MCARD(79)=BLAN;                                                 00018300
        MCARD(80)=BLAN;                                                 00018400
INDEND: END INDICE;                                                     00018500
                                                /* */                 00018600
FINE:   PUT FILE(SYSPRINT) SKIP EDIT('STATEMENTS INTERPRETED',JREAD)    00018700
                                (A);                                    00018800
        PUT FILE(SYSPRINT) SKIP EDIT('STATEMENTS ELABORATED ',JELAB)    00018900
                                (A);                                    00019000
        PUT FILE(SYSPRINT) SKIP EDIT('END OF SAGAU, REGULAR END') (A);  00019100
        END AUTO;                                                       00019200
```

Appendix F: Text of DISEG (12-rod bundle)

```
C
C     S. CEVOLANI
C     ===========
C
C
C     PLOT SAGAPO-A RESULTS AND PERFORM COMPARISON WITH EXPERIMENTAL
C     DATA.
C     THE PROGRAM IS WRITTEN TO PLOT THE RESULTS OF THE CALCULATIONS
C     PERFORMED FOR THE KE4 BUNDLE.
C
C
C
      DIMENSION X(200),Y(200),IBUF(1000),IROD(10),IWIN(10),NSYM(10),
     *          ALTE(10),WINK(10),PRESS(200),X1(200)
C
      REAL*4 TEXT1(6),TEXT2(6)
      REAL*4 REY    /'RE= '/
      REAL*4 TWT(3) /'  TW','/TB=','    '/
      DATA   EE     /'E   '/
C
C     ..................................................................
C     WRITE HEADING OF PROGRAM.
C
      WRITE(6,2)
    2 FORMAT (/5X,'D I S E G',/5X,
     1           '=========',///5X,
     2 'PLOT SAGAPO-A RESULTS ',/5X,
     3 'AND PERFORM COMPARISON WITH EXPERIMENTAL DATA.',///////)
C
C     ..................................................................
C     INITIALIZATION OF VARIABLES.
C
      ZOLL=2.539996
      XS=18.5/ZOLL
      XS1=XS+(0.7/ZOLL)
      XS2=XS+(1.8/ZOLL)
C
      AX = 2.
C
      NSYM(1)=1
      NSYM(2)=0
      NSYM(3)=9
      NSYM(4)=10
      NSYM(5)=11
      NSYM(6)=2
C
      ALTE(1)=0.14
      ALTE(2)=0.14
      ALTE(3)=0.14
      ALTE(4)=0.14
      ALTE(5)=0.14
      ALTE(6)=0.14
C
      WINK(1)=0.0
      WINK(2)=0.0
      WINK(3)=0.0
      WINK(4)=0.0
      WINK(5)=0.0
      WINK(6)=0.0
C
C
C     ..................................................................
```

```
C     READ THE GENERAL TEXT OF THE FIGURES.
C
      READ (5,120) TEXT1
      READ (7)     RE,TWB
C
C     ..................................................................
C     READ SCALA FACTOR.
C
      READ (5,100) FAC
C
C     ..................................................................
C     PLOT INITIALIZATION.
C
      CALL PLOTS (IBUF,1000,0)
      CALL PLOT (2.,2.,-3)
      CALL FACTOR(FAC)
C
C     ..................................................................
C     READ THE INDEX THAT DECIDES IF BOTH TEMPERATURES AND PRESSURES
C     ARE TO BE PLOTTED OR ONLY PRESSURES.
C     NTEMP <= 0    :  TEMPERATURES AND PRESSURES
C     NTEMP >  0    :  ONLY PRESSURES
C
      READ (5,5) NTEMP
    5 FORMAT(I4)
      READ (5,100) XMIN,XMAX,YMIN,YMAX
  100 FORMAT (7F10.5)
      IF (NTEMP .GT. 0) GO TO 3800
C
C     ##################################################################
C     WALL AND LINER TEMPERATURES
C     ##################################################################
C
C     PRINT ALL EXPERIMENTAL POINTS.
C
      WRITE (6,20)
   20 FORMAT(5X,'WALL AND LINER TEMPERATURES        '//5X,
     >          'EXPERIMENTAL POINTS ARE :'//,
     *' ROD    ANGLE    ABSCISSA     TEMPERATURE'//)
   25 READ (2,END=50) IR,IW,XV,YV
      WRITE (6,30) IR,IW,XV,YV
   30 FORMAT(I4,4X,I4,4X,F10.5,4X,F10.5)
      GO TO 25
   50 REWIND 2
C
C     ..................................................................
C     WRITE INPUT DATA
C
      WRITE(6,105) XMIN,XMAX,YMIN,YMAX,RE,TWB,FAC
  105 FORMAT (/////5X,'LIMITS OF THE FIGURES :'//5X,
     >            'ABSCISSA          ',F10.1,'    TO ',F10.1,' MM',
     *       /5X, 'TEMPERATURES      ',F10.1,'    TO ',F10.1,'  C',
     *      //5X, 'REYNOLDS NUMBER = ',E12.6,
     *       /5X, 'T.WALL / T.BULK = ',E12.6,
     *      //5X, 'SCALA FACTOR    = ',F10.3)
C
C     ..................................................................
C     LOOP FOR DESIDERED CHANNELS BEGINNS.
C
      NLOOP=0
C
  110 NLOOP=NLOOP+1
      YS=13.5
C
      READ (5,120) TEXT2
      READ (5,200) NSO,MO,NVER,NCON,MED,NR
```

```
      IF (MED  .GT. 0) READ (5,200) NSO1,MO1
      IF (NVER .GT. 0) READ (5,200) (IROD(I),IWIN(I),I=1,NVER)
      JWC=9
      IF (NR .EQ. 9 ) READ (5,200) JWC
  120 FORMAT (6A4)
  200 FORMAT (12I4)
C
C     ..................................................................
C     WRITE TITLE FOR THE PRESENT FIGURE.
C
      WRITE (6,250) NLOOP,NSO,MO
  250 FORMAT (1H1,4X,'FIGURE N. ',I2/5X,
     * 'CHANNEL              N.   ',I2,' ( SAGAPO INDEXING )'/5X,
     1 'SUBCHA.              N.   ',I2,' ( SAGAPO INTERNAL INDEXING )')
      IF ( NR .EQ. 9) WRITE (6,252) JWC
  252 FORMAT ( 5X,
     1 'PART OF WALL SUBCH.  N.   ',I2,' ( SAGAPO INTERNAL INDEXING )')
      WRITE (6,254) TEXT1,TEXT2
  254 FORMAT (/5X,
     2 'TEXT PROPOSED :'//5X,6A4,/5X,6A4)
      IF (MED .GT. 0)      WRITE(6,260) NSO,MO,NSO1,MO1
  260 FORMAT (/5X,' DUE TO THE POSITION OF THE THERMOCOUPLE,',/5X,
     >         ' THE USED TEMPERATURE IS OBTAINED FROM THE MEDIA',/5X,
     >             ' BETWEEN THE TEMPERATURES OF CHANNEL ',2I3,
     >          /5X,'                           AND CHANNEL ',2I3)
      WRITE (6,280)
  280 FORMAT (/5X,'FOR THE PRESENT CASE, THE TEMPERATURES COMPUTED BY
     1SAGAPO ARE :'//5X,'N.       X       TEMPERATURE'/)
C
C     ..................................................................
C     READ AND CONTROL COMPUTED PIN TEMPERATURES FOR SELECTED CHANNEL.
C
      J=0
  300 CONTINUE
      JW =9
      IF ( NR .EQ. 9) READ (NR,END=400) NS,M,JW,XM,YM
      IF ( NR .NE. 9) READ (NR,END=400) NS,M,XM,YM
      IF ( NS.NE.NSO  .OR.  M.NE.MO  .OR.  JWC.NE.JW )  GO TO 300
      J=J+1
      XM=XM*10.
      X(J)=XM
      Y(J)=YM
C
      IF (XM .GE. XMAX) GO TO 9000
      IF (XM .LE. XMIN) GO TO 9000
      IF (YM .GE. YMAX) GO TO 9000
      IF (YM .LE. YMIN) GO TO 9000
C
      IF (MED .GT. 0  ) GO TO 300
      WRITE(6,310) J,X(J),Y(J)
  310 FORMAT ( 4X,I2,2X,F10.5,2X,F10.5)
      GO TO 300
C
  400 REWIND NR
      NTOT1=J
      NTOT=NTOT1
      IF (MED .LE. 0) GO TO 495
C
      J=0
  410 READ (NR,END=450) NS,M,XM,YM
      IF (NS .NE. NSO1 .OR. M .NE. MO1 )  GO TO 410
      XM=XM*10.
      IF (XM .GE. XMAX) GO TO 9000
      IF (XM .LE. XMIN) GO TO 9000
      IF (YM .GE. YMAX) GO TO 9000
      IF (YM .LE. YMIN) GO TO 9000
```

```
C
      J=J+1
      DELTAX=ABS(X(J)-XM)
      IF (DELTAX .LE. 0.10) GO TO 418
      WRITE(6,414)
  414 FORMAT (//5X,' DIFFICULT IN MEDIA CALCULATION.',/5X,
     >        ' CALCULATION STOPS.')
      STOP
C
  418 Y(J)=(Y(J) + YM)/2.
      WRITE(6,420) J,X(J),Y(J)
  420 FORMAT ( 4X,I2,2X,F10.5,2X,F10.5)
      GO TO 410
C
  450 REWIND NR
C
      NTOT2=J
      IF (NTOT1 .EQ. NTOT2) GO TO 490
      WRITE (6,460) NSO,MO,NTOT1,NSO1,MO1,NTOT2
  460 FORMAT (/5X,'NUMBER OF TEMPERATURE VALUES REFERRING TO CHANNEL :'
     *,I3,' ,SUBCHANNEL : ',I3,' , = ',I4,/5X,'IS NOT EQUAL TO THE NUMB
     *R OF VALUES OF CHANNEL :',I3,' , SUBCHANNEL :',I3,' THAT IS ',I4,
     *//5X, ' CALCULATION STOPS.')
      STOP
C
  490 NTOT=NTOT2
  495 WRITE (6,500) NTOT
  500 FORMAT (//5X,'NUMBER OF TEMPERATURE VALUES COMPUTED BY SAGAPO =',
     * I3)
C
      IF ( NTOT .LT. 198) GO TO 700
      WRITE (6,600)
  600 FORMAT (/////5X,' NUMBER OF VALUES GREATER THAN DIMENSION OF ARRA
     *.'/5X,' CALCULATION STOPS.')
      GO TO 9999
C
  700 IF (NTOT .NE. 0) GO TO 900
      WRITE (6,800) NLOOP
  800 FORMAT (/5X,'CORRISPONDENCE FOR THE DESIDERED CHANNEL/ROD NOT FOU
     1D.'/5X,'CONTROL INPUT DATA, PLEASE.',/5X,'CALCULATION PROCEEDING
     2ITH NEXT FIGURE, IF ANY.'//5X,'END OF LOOP N. ',I2)
      GO TO 3000
C
C     ..................................................................
C     DEFINITIONS FOR PLOTTER.
C
  900 PEX=18./(XMAX-XMIN)
      PEY=13.0/(YMAX-YMIN)
      DEX= ZOLL/PEX
      DEY=ZOLL/PEY
      X(NTOT+1)=XMIN
      X(NTOT+2)=DEX
      Y(NTOT+1)=YMIN
      Y(NTOT+2)=DEY
C
C     ..................................................................
C     PLOT TITLES AND THE COMPUTED CURVE.
C
      CALL DIAGRO (XMIN,XMAX,YMIN,YMAX,DEX,DEY,NZP,AX,2,3,FAC)
      CALL SYMBOL (0.5,4.60,0.14,16HFIG.            ,0.0,16)
      CALL EFORM  (RE,ZEZ,KEZ)
      XEZ=KEZ
      CALL SYMBOL (0.5,4.4,0.14,REY  ,0.0, 4)
      CALL NUMBER (999.,999.,0.14,ZEZ,0.0, 2)
      CALL SYMBOL (999.,999.,0.14,EE ,0.0, 1)
```

```
      CALL NUMBER (999.,999.,0.14,XEZ,0.0,-1)
      CALL SYMBOL (999.,999.,0.14,TWT,0.0, 9)
      CALL NUMBER (999.,999.,0.14,TWB,0.0, 2)
      CALL SYMBOL (0.5,4.2,0.14,TEXT2,0.0,24)
      CALL SYMBOL (0.5,4.0,0.14,TEXT1,0.0,24)
      CALL LINE (X,Y,NTOT,1,0,0)
C
      IF (NVER .LE. 0) GO TO 3000
C
C
C     ..................................................................
C     READ AND CONTROL A SET OF EXPERIMENTAL VALUES.
C
      DO 2000 K=1,NVER
C
      WRITE (6,990) K,IROD(K),IWIN(K)
  990 FORMAT (/5X,'LOOP N.',I2,' .     ',
     * 'COMPARISON WITH EXPERIMENTAL VALUES OF ROD N.',
     1 I3,'    ANGLE = ',I4)
C
      J=0
 1000 READ (2,END=1300) IR,IW,XV,YV
      IF ( IR .NE. IROD(K) .OR. IW .NE. IWIN(K) )  GO TO 1000
C
C
      IF ( XV .GT. XMAX ) GO TO 1100
      IF ( XV .LT. XMIN ) GO TO 1100
      IF ( YV .GT. YMAX ) GO TO 1100
      IF ( YV .LT. YMIN ) GO TO 1100
C
      J=J+1
      X(J)=XV
      Y(J)=YV
      GO TO 1000
 1100 WRITE (6,1200) XV,YV
 1200 FORMAT ( /40('*'),' VALUE OUT OF RANGE :',5X,
     1 'X = ',F10.5,5X,'TEMPERATURE = ',F10.5/)
C     GO TO 1000
C
 1300 REWIND 2
C
      NVP=J
      WRITE (6,1400) NVP
 1400 FORMAT (5X,'NUMBER OF EXPERIMENTAL VALUES = ',I3)
C
      IF (NVP .LT. 198) GO TO 1530
      WRITE (6,1500)
 1500 FORMAT (1H+,45X,'IS GREATER THAN ARRAY.',/5X,
     * 'CALCULATION STOPS.')
      GO TO 9999
C
 1530 IF (NVP .NE. 0) GO TO 1600
      WRITE (6,1550)
 1550 FORMAT (/5X,'CORRISPONDENCE FOR THE DESIDERED CHANNEL/ROD NOT FOU
     1D.'/5X,'CONTROL INPUT DATA, PLEASE.',/5X,'CALCULATION PROCEEDING
     2ITH NEXT SET OF EXPERIMENTAL DATA.')
      GO TO 1940
C
 1600 CONTINUE
C     ..................................................................
C     PLOT EXPERIMENTAL POINTS.
C
C     YS= (YS -1.)/ZOLL
C     YS1=YS+0.035
C
```

```
      DO 1900 I=1,NVP
      X(I)=(X(I) - XMIN) / DEX
      Y(I)=(Y(I) - YMIN) / DEY
 1900 CALL SYMBOL (X(I),Y(I),ALTE(K),NSYM(K),WINK(K),-1)
C
C     WRITES MEANING OF USED SYMBOLS.
C
C     ROD = IROD(K)
C     WIN = IWIN(K)
C
C     CALL SYMBOL (XS,YS1,ALTE(K),NSYM(K),WINK(K),-1)
C     CALL NUMBER (XS1,YS,0.14,ROD,0.0,-1)
C     CALL NUMBER (XS2,YS,0.14,WIN,0.0,-1)
C     YS= YS * ZOLL
C
 1940 WRITE (6,1950) K
 1950 FORMAT(5X,'END OF LOOP N.',I1)
C
 2000 CONTINUE
C
C     ..................................................................
C     IF OTHER FIGURES ARE NOT REQUESTED, PLOT THE PRESSURE DROP.
C
C
      WRITE (6,2500) NLOOP
 2500 FORMAT(///5X,'END OF FIGURE N.',I3)
C
 3000 IF (NCON .LT. 0) GO TO 110
C
      WRITE (6,3500)
 3500 FORMAT(///5X,'END OF TEMPERATURES PLOT.')
C
C     ##########################################################################
C     PRESSURE DROP.
C     ##########################################################################
C
 3800 WRITE(6,3900)
 3900 FORMAT(1H1,' PRESSURE DROP.'//)
C
C     INITIALIZATION.
C ----------------------------------------------------------------------
      J=0
      IND=NLOOP+1
      NLOOP=IND
C
      PMIN=0.0
      PMAX=0.00
C
C     READ COMPUTED PRESSURES.
C ----------------------------------------------------------------------
 4000 READ (4,END=4100) XM,YM
      J=J+1
      XM = XM*10.
      X1(J)    =XM
      PRESS(J) =YM
C
      IF (YM .GT. PMAX) PMAX=YM
      GO TO 4000
C
 4100 CALL EFORM(PMAX,XX,K)
      CALL ROUND (XX,XX1)
      PMAX=XX1*10.**K
C
      NPOT=J
      IF (J .LT. 198)   GO TO 4300
```

```
                                WRITE (6,4200) IND
 4200                           FORMAT(/5X,'NUMBER OF POINTS GREATER'
     *                          ' THAN ARRAY IN LOOP N.',I2,//5X,
     *                          ' CALCULATION STOPS.')
                                GO TO 9999
C
C     WRITE INPUT DATA.
C ---------------------------------------------------------------------
 4300 WRITE (6,4350) XMIN,XMAX,PMIN,PMAX,NPOT
 4350 FORMAT(//5X,'LIMITS OF THE FIGURE :',//5X,
     3 'ABSCISSA      ',F10.5,'    TO ',F10.5,' MM  '/5X,
     3 'PRESSURES     ',F10.5,'    TO ',F10.5,' BARS'//5X,
     6 'NUMBER OF COMPUTED PRESSURE VALUES  =',I3,/5X,
     4 'ALL THE COMPUTED POINTS ARE IN RANGE.'//5X,
     5 ' HEIGTH   PRESSURE DROP '//)
C
      DO 4700 J=1,NPOT
      WRITE(6,4600) X1(J),PRESS(J)
 4600 FORMAT(5X,2F10.5)
 4700 CONTINUE
C
C     COMPUTE VARIABLES FOR PLOTTER.
C ---------------------------------------------------------------------
      PEX=18./(XMAX-XMIN)
      P1Y=13./(PMAX-PMIN)
      DEX=ZOLL/PEX
      D1Y=ZOLL/P1Y
C
      X1(NPOT+1) = XMIN
      X1(NPOT+2) = DEX
C
      PRESS(NPOT+1) = PMIN
      PRESS(NPOT+2) = D1Y
C
C     DRAW THE FRAME.
C ---------------------------------------------------------------------
      CALL DIAGRO (XMIN,XMAX,PMIN,PMAX,DEX,D1Y,NZP,AX,2,2,FAC)
C
C
C     WRITE TITLES.
C ---------------------------------------------------------------------
      CALL SYMBOL (0.5,4.6,0.14,29HFIG.                          ,0.0,29
      CALL SYMBOL (0.5,4.4,0.14,29HPRESSURE LOSS                 ,0.0,29
      CALL SYMBOL (0.5,4.2,0.14,TEXT1,0.0,24)
      CALL EFORM  (RE,ZEZ,KEZ)
      XEZ=KEZ
      CALL SYMBOL (0.5,4.0,0.14,REY  ,0.0, 4)
      CALL NUMBER (999.,999.,0.14,ZEZ,0.0, 2)
      CALL SYMBOL (999.,999.,0.14,EE ,0.0, 1)
      CALL NUMBER (999.,999.,0.14,XEZ,0.0,-1)
      CALL SYMBOL (999.,999.,0.14,TWT,0.0, 9)
      CALL NUMBER (999.,999.,0.14,TWB,0.0, 2)
C
C
C     DRAW THE CURVE.
C ---------------------------------------------------------------------
      CALL LINE (X1,PRESS,NPOT,1,0,0)
C
C
C
C     READ AND CONTROL THE EXPERIMENTAL VALUES.
C ---------------------------------------------------------------------
C
      WRITE(6,4900)
 4900 FORMAT(//////5X, 'READS, CONTROLS AND PLOTS EXPERIMENTAL VALUES.'
C
```

```
      J=0
 5000 READ (7,END=7000) XV,YV
C
      IF ( XV .GT. XMAX ) GO TO 6200
      IF ( XV .LT. XMIN ) GO TO 6200
      IF ( YV .GT. PMAX ) GO TO 6200
      IF ( YV .LT. PMIN ) GO TO 6200
C
C     ..................................................................
C     WRITE EXPERIMENTAL VALUES.
C
      WRITE (6,5500) J,XV,YV
 5500 FORMAT (//5X,'EXPERIMENTAL POINT N. ',I2,'   ABSCISSA = ',F10.5,
     >             ' PRESSURE = ',F10.5)
C     ..................................................................
C     PLOT EXPERIMENTAL VALUES.
C
C
      XV1 =(XV   - XMIN) / DEX
      YV1 =(YV   - PMIN) / D1Y
      CALL SYMBOL (XV1,YV1,0.14,1,0.0,-1)
C
      J=J+1
      GO TO 5000
C
 6200 WRITE (6,6300) XV,YV
 6300 FORMAT ( /40('*'),' VALUE OUT OF RANGE :',5X,
     1 'X = ',F10.5,5X,'PRESSURE    = ',F10.5/)
      GO TO 5000
C
C
 7000 NVP=J
      WRITE (6,7400) NVP
 7400 FORMAT (//5X,'NUMBER OF EXPERIMENTAL VALUES = ',I3)
C
C
      WRITE (6,7450)
 7450 FORMAT (//5X,'END OF PRESSURE DROP PLOT.      ')
C
C
C     REGULAR OR ABNORMAL END MESSAGE.
C ------------------------------------------------------------------
      GO TO 9999
      WRITE(6,7500)
 7500 FORMAT (////5X,'REGULAR CALCULATION END.')
      STOP
C
 9000 WRITE (6,9100) J,NLOOP,XM,XMIN,XMAX, YM,YMIN,YMAX
 9100 FORMAT (//5X,'DATA OUT OF RANGE IN RECORD',I3,' OF LOOP ',I2,/5X,
     >   ' X-VALUE =',E12.6,' ( LIMITS ARE : ',E12.6,2X,E12.6,')',/5X,
     >   ' Y-VALUE =',E12.6,' ( LIMITS ARE : ',E12.6,2X,E12.6,')',/5X,
     >   ' ( COMPUTED POINT)' //5X,
     * 'CALCULATION STOPS.')
 9999 CALL PLOT (0.,0.0,999)
      STOP
      END
```

Appendix G: Text of DISEG (19-rod bundle)

```
                                                                      00000100
C     S. CEVOLANI                                                     00000200
                                                                      00000300
C     PLOT RESULTS OF SAGAPO AND PERFORM COMPARISON WITH EXPERIMENTAL  00000400
C     DATA FROM THE B19-3D BUNDLE.                                    00000500
                                                                      00000600
                                                                      00000700
                                                                      00000800
      DIMENSION X(200),Y(200),IBUF(1000),IROD(10),IWIN(10),NSYM(10),  00000900
     *          ALTE(10),WINK(10)                                     00001000
                                                                      00001100
      REAL*4 TEXT1(6),TEXT2(6)                                        00001200
      REAL*4 REY    /'RE= '/                                          00001300
      REAL*4 TWT(3) /'  TW','/TB=','    '/                            00001400
      REAL*4 EE     /'E   '/                                          00001500
                                                                      00001600
      DATA   ALTE /10*0.14/                                           00001700
      DATA   WINK /10*0.0/                                            00001800
      DATA   NSYM /1,0,9,10,11,2,4,5,6,7/                             00001900
                                                                      00002000
      LIM=198                                                         00002100
      L10=10                                                          00002200
      ZOLL=2.539996                                                   00002300
      AX=2.0                                                          00002400
C     .................................................................00002500
C     WRITE HEADING OF PROGRAM.                                       00002600
      WRITE(6,9001)                                                   00002700
C     .................................................................00002800
C     READ AND WRITE INPUT DATA                                       00002900
      READ (7)      RE,TWB                                            00003000
      READ (5,9019) TEXT1                                             00003100
      READ (5,9049) FAC                                               00003200
      READ (5,9050) NTEMP                                             00003300
      READ (5,9049) XMIN,XMAX,YMIN,YMAX                               00003400
                   (YMIN,YMAX ARE REFERRED TO THE TEMPERATURES:       00003500
                    FOR THE PRESSURE DROP THEY ARE AUTOMATHICAL       00003600
                    LY FIXED BY THE PROGRAM)                          00003700
      WRITE(6,9051) TEXT1                                             00003800
      WRITE(6,9018) XMIN,XMAX,YMIN,YMAX,RE,TWB,FAC                    00003900
      WRITE(6,9052)                                                   00004000
C     .................................................................00004100
C     PLOT INITIALIZATION                                             00004200
                                                                      00004300
      CALL PLOTS (IBUF,1000,0)                                        00004400
      CALL PLOT (2.,2.,-3)                                            00004500
      CALL FACTOR(FAC)                                                00004600
                                                                      00004700
C     ###################################################################00004800
C     PRESSURE DROP.                                                  00004900
C     ###################################################################00005000
                                                                      00005100
      WRITE(6,9002)                                                   00005200
C     .................................................................00005300
C     READ COMPUTED PRESSURES                                         00005400
      J=0                                                             00005500
  100 READ (4,END=300) XM,YM                                          00005600
          J=J+1                                                       00005700
          IF(J.LT.LIM.AND.J.GE.1) GO TO 200                           00005800
                                  WRITE(6,9003)                       00005900
                                  WRITE(6,9004) J                     00006000
                                  WRITE(6,9005)                       00006100
```

```
                                GOTO 9999                                00006200
200                             CONTINUE                                 00006300
          XM = XM*10.                                                    00006400
          X(J) =XM                                                       00006500
          Y(J) =YM                                                       00006600
          GO TO 100                                                      00006700
300       CONTINUE                                                       00006800
     NTOT=J                                                              00006900
     ....................................................................00007000
     DETERMINE PMAX                                                      00007100
     PMIN=0.0                                                            00007200
     PMAX=0.00                                                           00007300
     DO 500 L=1,NTOT                                                     00007400
            IF(L.LT.LIM.AND.L.GE.1) GO TO 400                            00007500
                                    WRITE(6,9003)                        00007600
                                    WRITE(6,9006) J                      00007700
                                    WRITE(6,9005)                        00007800
                                    GO TO 9999                           00007900
400                                 CONTINUE                             00008000
            IF (Y(L) .GT. PMAX) PMAX=Y(L)                                00008100
500         CONTINUE                                                     00008200
     ....................................................................00008300
     PMAX IS ROUNDED                                                     00008400
     CALL EFORM(PMAX,XX,K)                                               00008500
     CALL ROUND (XX,XX1)                                                 00008600
     PMAX=XX1*10.**K                                                     00008700
     ....................................................................00008800
     WRITE INPUT PARAMETERS                                              00008900
     WRITE (6,9007) XMIN,XMAX,PMIN,PMAX,NTOT                             00009000
     DO 700 J=1,NTOT                                                     00009100
            IF(J.LT.LIM.AND.J.GE.1) GO TO 600                            00009200
                                    WRITE(6,9003)                        00009300
                                    WRITE(6,9008) J                      00009400
                                    WRITE(6,9005)                        00009500
                                    GOTO 9999                            00009600
600                                 CONTINUE                             00009700
            WRITE(6,9008) X(J),Y(J)                                      00009800
700         CONTINUE                                                     00009900
     ....................................................................00010000
     DETERMINE THE PRESSURE AT 310.00 MM.                                00010100
     NP=1                                                                00010200
     DO 800 NN=1,100                                                     00010300
            ND=NN                                                        00010400
            IF(X(NN).GE.310.00) GO TO  900                               00010500
            NP=NN                                                        00010600
800         CONTINUE                                                     00010700
     WRITE(6,9003)                                                       00010800
     WRITE(6,9009) NN                                                    00010900
     WRITE(6,9005)                                                       00011000
     GO TO 9999                                                          00011100
900  CONTINUE                                                            00011200
     PST=Y(NP)+(310.-X(NP))*(Y(ND)-Y(NP))/(X(ND)-X(NP))                  00011300
     WRITE(6,9010) PST                                                   00011400
     ....................................................................00011500
     PLOT PREPARATION                                                    00011600
     PEX=18./(XMAX-XMIN)                                                 00011700
     P1Y=13./(PMAX-PMIN)                                                 00011800
     DEX=ZOLL/PEX                                                        00011900
     D1Y=ZOLL/P1Y                                                        00012000
     X(NTOT+1) = XMIN                                                    00012100
     X(NTOT+2) = DEX                                                     00012200
     Y(NTOT+1) = PMIN                                                    00012300
     Y(NTOT+2) = D1Y                                                     00012400
     ....................................................................00012500
     FRAME                                                               00012600
```

```
      CALL DIAGRO (XMIN,XMAX,PMIN,PMAX,DEX,D1Y,NZP,AX,2,2,FAC)          00012700
      ..................................................................00012800
      TITLES                                                            00012900
      CALL SYMBOL (0.5,4.6,0.14,29HFIG.                          ,0.0,29)00013000
      CALL SYMBOL (0.5,4.4,0.14,29HPRESSURE LOSS                 ,0.0,29)00013100
      CALL SYMBOL (0.5,4.2,0.14,TEXT1,0.0,24)                           00013200
      CALL EFORM  (RE,ZEZ,KEZ)                                          00013300
      XEZ=KEZ                                                           00013400
      CALL SYMBOL (0.5,4.0,0.14,REY  ,0.0, 4)                           00013500
      CALL NUMBER (999.,999.,0.14,ZEZ,0.0, 2)                           00013600
      CALL SYMBOL (999.,999.,0.14,EE ,0.0, 1)                           00013700
      CALL NUMBER (999.,999.,0.14,XEZ,0.0,-1)                           00013800
      CALL SYMBOL (999.,999.,0.14,TWT,0.0, 9)                           00013900
      CALL NUMBER (999.,999.,0.14,TWB,0.0, 2)                           00014000
      ..................................................................00014100
      CURVE                                                             00014200
      CALL LINE (X,Y,NTOT,1,0,0)                                        00014300
      ..................................................................00014400
      READ, CONTROL, WRITE AND PLOT EXPERIMENTAL VALUES                 00014500
      WRITE(6,9011)                                                     00014600
      J=0                                                               00014700
1000  READ (7,END=1200) XV,YV                                           00014800
           YV=YV+PST                                                    00014900
           IF ( XV .GT. XMAX ) GO TO 1100                               00015000
           IF ( XV .LT. XMIN ) GO TO 1100                               00015100
           IF ( YV .GT. PMAX ) GO TO 1100                               00015200
           IF ( YV .LT. PMIN ) GO TO 1100                               00015300
                                                                        00015400
           WRITE (6,9012) J,XV,YV,PST                                   00015500
                                                                        00015600
           XV1 =(XV   - XMIN) / DEX                                     00015700
           YV1 =(YV   - PMIN) / D1Y                                     00015800
           CALL SYMBOL (XV1,YV1,0.14,1,0.0,-1)                          00015900
           J=J+1                                                        00016000
           GO TO 1000                                                   00016100
           (POINT EXCEEDING THE LIMITS)                                 00016200
1100       WRITE (6,9013) XV,YV                                         00016300
           GO TO 1000                                                   00016400
                                                                        00016500
1200       NVP=J                                                        00016600
      WRITE (6,9014) NVP                                                00016700
      WRITE (6,9015)                                                    00016800
                                                                        00016900
                                                                        00017000
      ..................................................................00017100
      NTEMP <= 0   :  TEMPERATURES AND PRESSURES                        00017200
      NTEMP >  0   :  ONLY PRESSURES                                    00017300
                                                                        00017400
      IF (NTEMP .GT. 0) GO TO 9999                                      00017500
                                                                        00017600
      ##################################################################00017700
      WALL AND LINER TEMPERATURES                                       00017800
      ##################################################################00017900
                                                                        00018000
      ..................................................................00018100
      PRINT ALL EXPERIMENTAL POINTS AND THE INPUT PARAMETERS            00018200
      WRITE (6,9016)                                                    00018300
2000  READ (2,END=2100) IR,IW,XV,YV                                     00018400
            WRITE (6,9017) IR,IW,XV,YV,YV                               00018500
            GO TO 2000                                                  00018600
2100        CONTINUE                                                    00018700
      REWIND 2                                                          00018800
      ..................................................................00018900
      LOOP FOR SELECTED CHANNELS BEGINNS                                00019000
      NLOOP=0                                                           00019100
```

```
2200 NLOOP=NLOOP+1                                                    00019200
     YS=13.5                                                          00019300
     JWC=9                                                            00019400
     .................................................................00019500
     READ AND WRITE INPUT PARAMETERS FOR THE PRESENT FIGURE           00019600
                     READ (5,9019) TEXT2                              00019700
                     READ (5,9020) NSO,MO,NVER,NCON,MED,NR            00019800
     IF (MED  .GT. 0) READ (5,9020) NSO1,MO1                          00019900
     IF (NVER.LT.10)  GO TO 2300                                      00020000
         WRITE(6,9021) NVER                                           00020100
         GO TO 9999                                                   00020200
2300     CONTINUE                                                     00020300
     IF (NVER .GT. 0) READ (5,9020) (IROD(I),IWIN(I),I=1,NVER)        00020400
     IF (NR .EQ. 9 )  READ (5,9020) JWC                               00020500
                                                                      00020600
                     WRITE (6,9022) NLOOP,NSO,MO                      00020700
     IF ( NR .EQ. 9) WRITE (6,9023) JWC                               00020800
                     WRITE (6,9024) TEXT1,TEXT2                       00020900
     IF (MED .GT. 0) WRITE(6,9025) NSO,MO,NSO1,MO1                    00021000
     .................................................................00021100
     READ COMPUTED TEMPERATURES FOR THE REQUESTED CHANNEL             00021200
     J=0                                                              00021300
2400 CONTINUE                                                         00021400
     JW =9                                                            00021500
     IF ( NR .EQ. 9) READ (NR,END=2600) NS,M,JW,XM,YM                 00021600
     IF ( NR .NE. 9) READ (NR,END=2600) NS,M,XM,YM                    00021700
     IF ( NS.NE.NSO  .OR.  M.NE.MO  .OR.  JWC.NE.JW )  GO TO 2400     00021800
     J=J+1                                                            00021900
           IF(J.LT.LIM .AND. J.GE.1) GO TO 2500                       00022000
           WRITE(6,9003)                                              00022100
           WRITE(6,9026) J,LIM                                        00022200
           WRITE(6,9005)                                              00022300
           GO TO 9999                                                 00022400
2500       CONTINUE                                                   00022500
     XM=XM*10.                                                        00022600
     X(J)=XM                                                          00022700
     Y(J)=YM                                                          00022800
     IF (XM .GE. XMAX) GO TO 9000                                     00022900
     IF (XM .LE. XMIN) GO TO 9000                                     00023000
     IF (YM .GE. YMAX) GO TO 9000                                     00023100
     IF (YM .LE. YMIN) GO TO 9000                                     00023200
     GO TO 2400                                                       00023300
2600 CONTINUE                                                         00023400
     REWIND NR                                                        00023500
     NTOT1=J                                                          00023600
     IF (MED .LE. 0) GO TO 3100                                       00023700
     .................................................................00023800
     TEMPERATURE IS ASSUMED TO BE THE AVERAGE BETWEEN NSO AND NSO1    00023900
     J=0                                                              00024000
2700 READ (NR,END=3000) NS,M,XM,YM                                    00024100
     IF (NS .NE. NSO1 .OR. M .NE. MO1 )  GO TO 2700                   00024200
     XM=XM*10.                                                        00024300
     IF (XM .GE. XMAX) GO TO 9000                                     00024400
     IF (XM .LE. XMIN) GO TO 9000                                     00024500
     IF (YM .GE. YMAX) GO TO 9000                                     00024600
     IF (YM .LE. YMIN) GO TO 9000                                     00024700
     J=J+1                                                            00024800
     DELTAX=ABS(X(J)-XM)                                              00024900
     IF (DELTAX .LE. 0.10) GO TO 2800                                 00025000
     WRITE(6,9034)                                                    00025100
     WRITE(6,9003)                                                    00025200
     WRITE(6,9005)                                                    00025300
     GO TO 9999                                                       00025400
2800 CONTINUE                                                         00025500
     IF(J.LT.LIM .AND. J.GE.1) GO TO 2900                             00025600
```

```
            WRITE(6,9028) J,LIM                                          00025700
            WRITE(6,9003)                                                00025800
            WRITE(6,9005)                                                00025900
            GO TO 9999                                                   00026000
2900 CONTINUE                                                            00026100
     Y(J)=(Y(J) + YM)/2.                                                 00026200
     GO TO 2700                                                          00026300
3000 CONTINUE                                                            00026400
     REWIND NR                                                           00026500
     NTOT2=J                                                             00026600
     IF (NTOT1 .EQ. NTOT2) GO TO 3100                                    00026700
                           WRITE (6,9036) NSO,MO,NTOT1,NSO1,MO1,NTOT2    00026800
                           WRITE(6,9003)                                 00026900
                           WRITE(6,9005)                                 00027000
                           GO TO 9999                                    00027100
     .....................................................................00027200
     CHEK POINT                                                          00027300
3100 CONTINUE                                                            00027400
     NTOT=NTOT1                                                          00027500
     IF ( NTOT .LT. 198) GO TO 3200                                      00027600
                         WRITE(6,9003)                                   00027700
                         WRITE (6,9037)                                  00027800
                         WRITE(6,9005)                                   00027900
                         GO TO 9999                                      00028000
3200 IF (NTOT .NE. 0) GO TO 3300                                         00028100
                      WRITE (6,9045) NLOOP                               00028200
                      GO TO 8000                                         00028300
3300 CONTINUE                                                            00028400
     .....................................................................00028500
     PRINT THE COMPUTED POINTS                                           00028600
     WRITE (6,9033) NTOT                                                 00028700
     DO 3500 J=1,NTOT                                                    00028800
            IF(J.LT.LIM.AND.J.GE.1) GO TO 3400                           00028900
                                    WRITE(6,9003)                        00029000
                                    WRITE(6,9038)                        00029100
                                    WRITE(6,9005)                        00029200
                                    GO TO 9999                           00029300
3400        CONTINUE                                                     00029400
            WRITE(6,9035) J,X(J),Y(J)                                    00029500
3500        CONTINUE                                                     00029600
     .....................................................................00029700
     PLOT THE FRAME                                                      00029800
     PEX=18./(XMAX-XMIN)                                                 00029900
     PEY=13.0/(YMAX-YMIN)                                                00030000
     DEX= ZOLL/PEX                                                       00030100
     DEY=ZOLL/PEY                                                        00030200
CCCCCCCCCCCCCCCCCCCCCCCCCCCC                                             00030300
     LJ=NTOT+2                                                           00030400
     JL=NTOT+1                                                           00030500
     IF(LJ.LT.LIM .AND. LJ.GE.1) GO TO 3600                              00030600
                                 WRITE(6,9031) J,LIM                     00030700
                                 WRITE(6,9003)                           00030800
                                 WRITE(6,9005)                           00030900
                                 GO TO 9999                              00031000
3600 CONTINUE                                                            00031100
     IF(JL.LT.LIM .AND. JL.GE.1) GO TO 3700                              00031200
                                 WRITE(6,9031) J,LIM                     00031300
                                 WRITE(6,9003)                           00031400
                                 WRITE(6,9005)                           00031500
                                 GO TO 9999                              00031600
3700 CONTINUE                                                            00031700
     X(NTOT+1)=XMIN                                                      00031800
     X(NTOT+2)=DEX                                                       00031900
     Y(NTOT+1)=YMIN                                                      00032000
     Y(NTOT+2)=DEY                                                       00032100
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      X(JL)=XMIN                                                        00032200
      X(LJ)=DEX                                                         00032300
      Y(JL)=YMIN                                                        00032400
      Y(LJ)=DEY                                                         00032500
CCCCCCCCCCCCCCCCCCCCCCCCCCCC                                            00032600
                                                                        00032700
      CALL DIAGRO (XMIN,XMAX,YMIN,YMAX,DEX,DEY,NZP,AX,2,3,FAC)          00032800
      ..................................................................00032900
      PLOT TITLES                                                       00033000
      CALL SYMBOL (0.5,4.60,0.14,16HFIG.            ,0.0,16)            00033100
      CALL EFORM  (RE,ZEZ,KEZ)                                          00033200
      XEZ=KEZ                                                           00033300
      CALL SYMBOL (0.5,4.4,0.14,REY  ,0.0, 4)                           00033400
      CALL NUMBER (999.,999.,0.14,ZEZ,0.0, 2)                           00033500
      CALL SYMBOL (999.,999.,0.14,EE ,0.0, 1)                           00033600
      CALL NUMBER (999.,999.,0.14,XEZ,0.0,-1)                           00033700
      CALL SYMBOL (999.,999.,0.14,TWT,0.0, 9)                           00033800
      CALL NUMBER (999.,999.,0.14,TWB,0.0, 2)                           00033900
      CALL SYMBOL (0.5,4.2,0.14,TEXT2,0.0,24)                           00034000
      CALL SYMBOL (0.5,4.0,0.14,TEXT1,0.0,24)                           00034100
      ..................................................................00034200
      PLOT THE COMPUTED CURVE                                           00034300
      CALL LINE (X,Y,NTOT,1,0,0)                                        00034400
                                                                        00034500
      ..................................................................00034600
      COMPARISON WITH THE MEASUREMENTS ( NVER>=0)                       00034700
      IF (NVER .LE. 0) GO TO 8000                                       00034800
      ..................................................................00034900
      READ AND CONTROL A SET OF EXPERIMENTAL VALUES                     00035000
      DO 5000 K=1,NVER                                                  00035100
              IF(K.LT.L10.AND.K.GE.1) GOTO 3800                         00035200
                                      WRITE(6,9027) K,NVER              00035300
                                      WRITE(6,9003)                     00035400
                                      WRITE(6,9005)                     00035500
                                      GO TO 9999                        00035600
3800          CONTINUE                                                  00035700
              WRITE (6,9046) K,IROD(K),IWIN(K)                          00035800
              J=0                                                       00035900
3900          READ (2,END=4200) IR,IW,XV,YV                             00036000
              IF ( IR .NE. IROD(K) .OR. IW .NE. IWIN(K) )  GO TO 3900   00036100
              IF ( XV .GT. XMAX ) GO TO 4100                            00036200
              IF ( XV .LT. XMIN ) GO TO 4100                            00036300
              IF ( YV .GT. YMAX ) GO TO 4100                            00036400
              IF ( YV .LT. YMIN ) GO TO 4100                            00036500
              J=J+1                                                     00036600
              IF(J.LT.LIM .AND. J.GE.1) GO TO 4000                      00036700
                                        WRITE(6,9029) J,LIM             00036800
                                        WRITE(6,9003)                   00036900
                                        WRITE(6,9005)                   00037000
                                        GO TO 9999                      00037100
4000          CONTINUE                                                  00037200
              X(J)=XV                                                   00037300
              Y(J)=YV                                                   00037400
              GO TO 3900                                                00037500
4100          WRITE (6,9039) XV,YV                                      00037600
              GO TO 3900                                                00037700
4200          CONTINUE                                                  00037800
              REWIND 2                                                  00037900
      ..................................................................00038000
       CHEK POINT                                                       00038100
              NVP=J                                                     00038200
              WRITE (6,9040) NVP                                        00038300
              IF (NVP .LT. 198) GO TO 4300                              00038400
                                WRITE (6,9047)                          00038500
                                WRITE(6,9003)                           00038600
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                              WRITE(6,9005)                                    00038700
                              GO TO 9999                                       00038800
4300          IF (NVP .NE. 0) GO TO 4400                                       00038900
                             WRITE (6,9041)                                    00039000
                              GO TO 4700                                       00039100
4400          CONTINUE                                                         00039200
     .....................................................................00039300
     PLOT EXPERIMENTAL VALUES                                                 00039400
             YS= (YS -1.)/ZOLL                                                00039500
             YS1=YS+0.035                                                     00039600
             DO 4600 I=1,NVP                                                  00039700
                     IF(I.LT.L10 .AND. I.GE.1) GO TO 4500                     00039800
                                               WRITE(6,9030) I,LIM            00039900
                                               WRITE(6,9003)                  00040000
                                               WRITE(6,9005)                  00040100
                                               GO TO 9999                     00040200
4500                 CONTINUE                                                 00040300
                     X(I)=(X(I) - XMIN) / DEX                                 00040400
                     Y(I)=(Y(I) - YMIN) / DEY                                 00040500
             CALL SYMBOL (X(I),Y(I),ALTE(K),NSYM(K),WINK(K),-1)               00040600
4600                 CONTINUE                                                 00040700
     .....................................................................00040800
     WRITE THE MEANING OF USED SYMBOLS.                                       00040900
     ROD = IROD(K)                                                            00041000
     WIN = IWIN(K)                                                            00041100
     CALL SYMBOL (XS,YS1,ALTE(K),NSYM(K),WINK(K),-1)                          00041200
     CALL NUMBER (XS1,YS,0.14,ROD,0.0,-1)                                     00041300
     CALL NUMBER (XS2,YS,0.14,WIN,0.0,-1)                                     00041400
     YS= YS * ZOLL                                                            00041500
                                                                              00041600
4700         WRITE (6,9042) K                                                 00041700
5000         CONTINUE                                                         00041800
     .....................................................................00041900
     IF OTHER FIGURES ARE NOT REQUESTED, END                                  00042000
     WRITE (6,9043) NLOOP                                                     00042100
8000 IF (NCON .LT. 0) GO TO 2200                                              00042200
     WRITE (6,9044)                                                           00042300
                                                                              00042400
     FINALIZATION ************************************************************00042500
                                                                              00042600
     .....................................................................00042700
     REGULAR END MESSAGE                                                      00042800
     WRITE(6,9048)                                                            00042900
     GO TO 9999                                                               00043000
                                                                              00043100
     .....................................................................00043200
     ABNORMAL END MESSAGE                                                     00043300
9000 WRITE (6,9100) J,NLOOP,XM,XMIN,XMAX, YM,YMIN,YMAX                        00043400
                                                                              00043500
     .....................................................................00043600
     CLOSE PLOT                                                               00043700
9999 CONTINUE                                                                 00043800
     CALL PLOT (0.,0.0,999)                                                   00043900
                                                                              00044000
     STOP                                                                     00044100
9001 FORMAT(1H1,5X,'D I S E G                  ',                             00044200
    1          /6X,'*********                                    ',           00044300
    2        ///5X,'PLOT SAGAPO RESULTS AND PERFORM COMPARISON WIT',           00044400
    3              'H EXPERIMENTAL DATA.                        ')            00044500
9002 FORMAT(1H1,5X,'PRESSURE DROP',/)                                         00044600
9003 FORMAT(5X,'************************************************')            00044700
9004 FORMAT(5X,'READ COMPUTED PRESSURES, J = ',I3)                            00044800
9005 FORMAT(5X,'CALCULATION STOPS')                                           00044900
9006 FORMAT(5X,'DETERMINE PMAX        , J = ',I3)                             00045000
9007 FORMAT(//5X,'LIMITS OF THE FIGURE :',//5X,                               00045100
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    3 'ABSCISSA      ',F10.5,'    TO ',F10.5,' MM  '/5X,                00045200
    3 'PRESSURES     ',F10.5,'    TO ',F10.5,' BARS'//5X,               00045300
    6 'NUMBER OF COMPUTED PRESSURE VALUES  =',I3,//5X,                  00045400
    5 ' HEIGTH   PRESSURE DROP '//)                                     00045500
9008 FORMAT(5X,2F10.5)                                                  00045600
9009 FORMAT(5X,'DETERMINE PRESSURE AT 310, J = ',I3)                    00045700
9010 FORMAT(1H1,5X 'COMPUTED PRESSURE LOSS AT 310.00 MM =',E12.6)       00045800
9011 FORMAT(//////5X, 'READ, CONTROL AND PLOT EXPERIMENTAL VALUES.')    00045900
9012 FORMAT (//5X,'EXPERIMENTAL POINT N. ',I2,'   ABSCISSA = ',F10.5,   00046000
    >             ' PRESSURE = ',F10.5,'  PST= ',F10.5)                 00046100
9013 FORMAT ( /40('*'),' VALUE OUT OF RANGE :',5X,                      00046200
    1 'X = ',F10.5,5X,'PRESSURE    = ',E12.6/)                          00046300
9014 FORMAT (//5X,'NUMBER OF EXPERIMENTAL VALUES = ',I3)                00046400
9015 FORMAT (//5X,'END OF PRESSURE DROP PLOT.      ')                   00046500
9016 FORMAT(1H1,5X,'WALL AND LINER TEMPERATURES        '//5X,           00046600
    >          'EXPERIMENTAL POINTS ARE :'//,                           00046700
    *' ROD    ANGLE    ABSCISSA     TEMPERATURE'//)                     00046800
9017 FORMAT(I4,4X,I4,4X,F10.5,4X,F10.5,10X,E12.6)                       00046900
9018 FORMAT (/////5X,'LIMITS OF THE FIGURES :'//5X,                     00047000
    >            'ABSCISSA          ',F10.1,'    TO ',F10.1,' MM',     00047100
    *       /5X, 'TEMPERATURES      ',F10.1,'    TO ',F10.1,'  C',     00047200
    *      //5X, 'REYNOLDS NUMBER = ',E12.6,                            00047300
    *       /5X, 'T.WALL / T.BULK = ',E12.6,                           00047400
    *      //5X, 'SCALA FACTOR    = ',F10.3)                           00047500
9019 FORMAT (6A4)                                                       00047600
9020 FORMAT (12I4)                                                      00047700
9021 FORMAT(5X,' NVER = ',I4,' TOO BIG, STOP')                          00047800
9022 FORMAT (1H1,4X,'FIGURE N. ',I3/5X,                                 00047900
    * 'CHANNEL              N.   ',I2,' ( SAGAPO INDEXING )'/5X,        00048000
    1 'SUBCHA.              N.   ',I2,' ( SAGAPO INTERNAL INDEXING )') 00048100
9023 FORMAT ( 5X,                                                       00048200
    1 'PART OF WALL SUBCH.  N.   ',I2,' ( SAGAPO INTERNAL INDEXING )') 00048300
9024 FORMAT (/5X,                                                       00048400
    2 'TEXT PROPOSED :'//5X,6A4,/5X,6A4)                                00048500
9025 FORMAT (/5X,' DUE TO THE POSITION OF THE THERMOCOUPLE,',/5X,       00048600
    >         ' THE USED TEMPERATURE IS OBTAINED FROM THE MEDIA',/5X,   00048700
    >             ' BETWEEN THE TEMPERATURES OF CHANNEL ',2I3,          00048800
    >          /5X,'                          AND CHANNEL ',2I3)       00048900
9026 FORMAT(5X,' DIMENSION EXC. (FIRST READ): J =',I4,' LIM = ',I4)     00049000
9027 FORMAT(5X,'DO K=1,NVER, K AND NVER, STOP',2I4)                     00049100
9028 FORMAT(5X,' DIMENSION EXC. (MED. READ): J =',I4,' LIM = ',I4)      00049200
9029 FORMAT(5X,' DIMENSION EXC. (EXP. READ): J =',I4,' LIM = ',I4)      00049300
9030 FORMAT(5X,' DIMENSION EXC. (WRI. EXP.): I =',I4,' LIM = ',I4)      00049400
9031 FORMAT(5X,' DIMENSION EXC. (NTOT+2)   : J =',I4,' LIM = ',I4)      00049500
9032 FORMAT(5X,'READ COMPUTED PRESSURES, J = ',I4,' STOP')              00049600
9033 FORMAT (/5X,'FOR THE PRESENT CASE, THE TEMPERATURES COMPUTED BY    00049700
    1SAGAPO (NTOT=',I4,') ARE :'//5X,'N.       X       TEMPERATURE'/)  00049800
9034 FORMAT (//5X,' DIFFICULT IN MEDIA CALCULATION.',/5X,               00049900
    >         ' CALCULATION STOPS.')                                    00050000
9035 FORMAT ( 4X,I2,2X,F10.5,2X,F10.5)                                  00050100
9036 FORMAT (/5X,'NUMBER OF TEMPERATURE VALUES REFERRED TO CHANNEL :'   00050200
    *,I3,' ,SUBCHANNEL : ',I3,' , = ',I4,/5X,'IS NOT EQUAL TO THE NUMBE00050300
    *R OF VALUES OF CHANNEL :',I3,' , SUBCHANNEL :',I3,' THAT IS ',I4, 00050400
    *//5X, ' CALCULATION STOPS.')                                        00050500
9037 FORMAT (/////5X,' NUMBER OF VALUES GREATER THAN DIMENSION OF ARRAY00050600
    *.'/5X,' CALCULATION STOPS.')                                       00050700
9038 FORMAT(5X,'PROBLEM BY WRITING THE TEMPERATURES, STOP')             00050800
9039 FORMAT ( /40('*'),' VALUE OUT OF RANGE :',5X,                      00050900
    1 'X = ',E12.6,5X,'TEMPERATURE = ',E12.6/)                          00051000
9040 FORMAT (5X,'NUMBER OF EXPERIMENTAL VALUES = ',I3)                  00051100
9041 FORMAT (/5X,'CORRISPONDENCE FOR THE DESIDERED CHANNEL/ROD NOT FOUN00051200
    1D.'/5X,'CONTROL INPUT DATA, PLEASE.',/5X,'CALCULATION PROCEEDING W00051300
    2ITH NEXT SET OF EXPERIMENTAL DATA.')                               00051400
9042 FORMAT(5X,'END OF LOOP N.',I1)                                     00051500
9043 FORMAT(///5X,'END OF FIGURE N.',I3)                                00051600
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9044 FORMAT(///5X,'END OF TEMPERATURES PLOT.')                          00051700
9045 FORMAT (/5X,'CORRISPONDENCE FOR THE DESIDERED CHANNEL/ROD NOT FOUN00051800
    1D.'/5X,'CONTROL INPUT DATA, PLEASE.',/5X,'CALCULATION PROCEEDING W00051900
    2ITH NEXT FIGURE, IF ANY.'//5X,'END OF LOOP N. ',I2)                00052000
9046 FORMAT (/5X,'LOOP N.',I2,' .     ',                                00052100
    * 'COMPARISON WITH EXPERIMENTAL VALUES OF ROD N.',                  00052200
    1 I3,'    ANGLE = ',I4)                                             00052300
9047 FORMAT (1H+,45X,'IS GREATER THAN ARRAY.',/5X,                      00052400
    * 'CALCULATION STOPS.')                                            00052500
9048 FORMAT ((///5X,'REGULAR CALCULATION END.')                         00052600
9049 FORMAT (7F10.5)                                                    00052700
9050 FORMAT (I4)                                                        00052800
9051 FORMAT (/5X,'CASE IDENTIFICATION:  ',6A4,                          00052900
    1        /5X,'*******************   ')                            00053000
9052 FORMAT (/5X,'THE LIMITS FOR THE PRESSURE DROP ARE COMPUTED',       00053100
    1 ' AUTOMATICALLY',                                                00053200
    2        /5X,'LENGTHS ARE EXPRESSED IN MM, TEMPERATURES IN ',       00053300
    3 'DEGREES CELTIUS, PRESSURES IN BARS.')                           00053400
9100 FORMAT (//5X,'DATA OUT OF RANGE IN RECORD',I3,' OF LOOP ',I2,/5X, 00053500
    1   ' X-VALUE =',E12.6,' ( LIMITS ARE : ',E12.6,2X,E12.6,')',/5X,  00053600
    2   ' Y-VALUE =',E12.6,' ( LIMITS ARE : ',E12.6,2X,E12.6,')',/5X,  00053700
    3   ' ( COMPUTED POINT)' //5X,                                     00053800
    4 'CALCULATION STOPS.')                                            00053900
     END                                                               00054000
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Appendix H: Text of DISEG (19-rod bundle, referred to 1/12 of the whole bundle).

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C                                                                       0000010
C     S. CEVOLANI                                                       0000020
C                                                                       0000030
C     PLOT RESULTS OF SAGAPO AND PERFORM COMPARISON WITH EXPERIMENTAL   0000040
C     DATA FROM THE B19-3D BUNDLE.                                      0000050
C                                                                       0000060
C     PERFECT SYMMETRY IN RADIAL DIRECTION IS ASSUMED.                  0000070
C                                                                       0000080
C                                                                       0000090
      DIMENSION X(200),Y(200),IBUF(1000),IROD(10),IWIN(10),NSS(13),     0000100
     1          IP(13),IRA(500),IWA(500),XVA(500),YVA(500),IA(13),      0000110
     2          ICOR(13,12),MCOR(13,12),NCOR(13),ITYP(13),NE(13),       0000120
     3          INER(13,24),INEW(13,24),TW(100,42,3)                    0000130
C                                                                       0000140
      REAL*4 TEXT1(6),TEXT2(6)                                          0000150
      REAL*4 REY    /'RE= '/                                            0000160
      REAL*4 TWT(3) /'  TW','/TB=','    '/                              0000170
      REAL*4 EE     /'E   '/                                            0000180
      REAL*4 TIT1   /'JOB '/                                            0000190
      REAL*4 TIT3   /' AT '/                                            0000200
      REAL*4 TYP(3) /'CEN.','WALL','COR.'/                              0000210
      REAL*8 GIORNO,ORA,NOME                                            0000220
C                                                                       0000230
      DATA   NE   / 6,24, 9,10, 8,12,12,12,15,13,11, 9,11/              0000240
      DATA   NSS  / 1, 1, 3, 2, 3, 2, 5, 2, 5, 4, 4, 5, 5/              0000250
      DATA   IP   / 1, 2, 2, 2, 9, 9, 9, 8, 8, 8, 8, 8, 9/              0000260
      DATA   IA   / 0, 1, 2, 5, 6, 7,10, 3, 4, 9,11,12, 8/              0000270
      DATA   ITYP / 1, 1, 1, 1, 1, 1, 2, 1, 2, 3, 3, 2, 2/              0000280
      DATA   NCOR / 6,12,12,12, 6,12,12,12,12, 6, 6,12,12/              0000290
      DATA   ICOR / 1, 1, 8, 7, 8, 7,26, 7,26,25,25,26,26,              0000300
     2              2, 1, 8, 9,11, 9,27, 9,27,28,28,27,27,              0000310
     3              3, 2,11,10, 8,10,29,10,29,31,31,29,29,              0000320
     4              4, 2,11,12,11,12,30,12,30,34,34,30,30,              0000330
     5              5, 3,14,13,14,13,32,13,32,37,37,32,32,              0000340
     6              6, 3,14,15,17,15,33,15,33,40,40,33,33,              0000350
     7              0, 4,17,16,20,16,35,16,35, 0, 0,35,35,              0000360
     8              0, 4,17,18,23,18,36,18,36, 0, 0,36,36,              0000370
     9              0, 5,20,19, 0,19,38,19,38, 0, 0,38,38,              0000380
     A              0, 5,20,21, 0,21,39,21,39, 0, 0,39,39,              0000390
     B              0, 6,23,22, 0,22,41,22,41, 0, 0,41,41,              0000400
     C              0, 6,23,24, 0,24,42,24,42, 0, 0,42,42/              0000410
      DATA   MCOR / 3, 1, 1, 3, 3, 2, 2, 1, 1, 1, 1, 1, 2,              0000420
     2              3, 2, 2, 3, 3, 1, 1, 2, 1, 1, 1, 1, 1,              0000430
     3              3, 1, 1, 3, 3, 2, 2, 1, 2, 1, 1, 2, 2,              0000440
     4              3, 2, 2, 3, 3, 1, 1, 2, 2, 1, 1, 2, 1,              0000450
     5              3, 1, 1, 3, 3, 2, 2, 1, 1, 1, 1, 1, 2,              0000460
     6              3, 2, 2, 3, 3, 1, 1, 2, 1, 1, 1, 1, 1,              0000470
     7              0, 1, 1, 3, 0, 2, 2, 1, 2, 0, 0, 2, 2,              0000480
     8              0, 2, 2, 3, 3, 1, 1, 2, 2, 0, 0, 2, 1,              0000490
     9              0, 1, 1, 3, 0, 2, 2, 1, 1, 0, 0, 1, 2,              0000500
     A              0, 2, 2, 3, 0, 1, 1, 2, 1, 0, 0, 1, 1,              0000510
     B              0, 1, 1, 3, 0, 2, 2, 1, 2, 0, 0, 2, 2,              0000520
     C              0, 2, 2, 3, 0, 1, 1, 2, 2, 0, 0, 2, 1/              0000530
      DATA   INER /10,15,15,15,16,16,16,19,19,19, 0, 0, 0,              0000540
     2            10,15,15,11,16,16,16,19,19,19, 0, 0, 0,              0000550
     3            10,15,11,11, 2, 7,16,12,19,19, 0, 0, 0,              0000560
     4            10,11, 6, 6, 2, 7, 7,12,12,19, 0, 0, 0,              0000570
     5            10,11, 6, 6,13, 7, 7, 3,12,12, 0, 0, 0,              0000580
     6            10,11, 5, 5,13, 2, 2, 3, 3, 3, 0, 0, 0,              0000590
     7             0,11, 9, 5,13, 2, 2, 1, 3, 3, 0, 0, 0,              0000600
     8             0, 6, 9, 9,18, 4, 4, 1, 3, 3, 0, 0, 0,              0000610
     9             0, 6,14,14, 0, 4, 4, 8, 8, 1, 0, 0, 0,              0000620
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     A              0, 6, 0,14, 0,13,13, 8, 8, 8, 0, 0, 0,                0000630
     B              0, 6, 0, 0, 0,18,13,17,17, 8, 0, 0, 0,                0000640
     C              0, 5, 0, 0, 0,18,18,17,17,17, 0, 0, 0,                0000650
     D              0, 5, 0, 0, 0, 0, 0, 0, 1, 8, 0, 0, 0,                0000660
     E              0, 5, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,                0000670
     F              0, 5, 0, 0, 0, 0, 0, 0, 8, 0, 0, 0, 0,                0000680
     G              0, 9, 12*0,9,12*0,9,12*0,9,12*0,14,12*0,              0000690
     H              14,12*0,14,12*0,14,12*0,15,11*0/                      0000700
      DATA   INEW / 60,270, 60,150,330,210,150, 15, 90,180, 30, 26, 54,  0000710
     1              90,345,270, 60,285,330,210,270,180,150,150, 34, 60,  0000720
     2             180,300,150,150,210,150,120,240,270,180,210,156,126,  0000730
     3             210,315,150, 30,165,165,330,270, 30,135,330,144,120,  0000740
     4             300,270,300,150, 60,330,150,255, 15, 90, 26,206,180,  0000750
     5             330,240, 30,300, 90,165, 30,150,330, 30, 34,336,187,  0000760
     6               0,300, 30, 30, 45,210,  0,150,150, 15,206,324,173,  0000770
     7               0,225,180,270,  0, 45,300,120, 60, 60,156,216,240,  0000780
     8               0,150,270,270,  0,210,210,135,300,330,144,  7,234,  0000790
     9               0,180,  0,180,  0, 90,240, 30, 30,255,336,  0,300,  0000800
     A               0,240,  0,  0,  0,285,270,  0,135,300,324,  0,  7,  0000810
     B               0,195,  0,  0,  0, 90, 90, 30,150,210,  0,  0,  0,  0000820
     C               0,150,  0,  0,  0,  0,  0,  0,270,270,  0,  0,  0,  0000830
     D               0,120,  0,  0,  0,  0,  0,  0,255,  0,  0,  0,  0,  0000840
     E               0,180,  0,  0,  0,  0,  0,  0,210,  0,  0,  0,  0,  0000850
     F               0, 60, 12*0,105,12*0,30,12*0,120,12*0,30,12*0,75,   0000860
     G               12*0,60,12*0,012*0,0,11*0/                          0000870
C     ..................................................................0000880
      LIM=198                                                            0000890
      L10=10                                                             0000900
      ZOLL=2.539996                                                      0000910
      AX=2.0                                                             0000920
      NFIG=13                                                            0000930
      XS=7.29                                                            0000940
      YS=4.90                                                            0000950
      XS1=7.59                                                           0000960
      XS2=8.10                                                           0000970
C     ..................................................................0000980
C     JOBNAME,DATUM AND TIME                                             0000990
      CALL DATUM(GIORNO,ORA)                                             0001000
      CALL JOBNAM(NOME)                                                  0001010
C     ..................................................................0001020
C     WRITE THE HEADING OF THE PROGRAM.                                  0001030
      WRITE(6,9001)                                                      0001040
      WRITE(6,9053) NOME,GIORNO,ORA                                      0001050
C     ..................................................................0001060
C     READ AND WRITE INPUT DATA                                          0001070
      READ (7)      RE,TWB                                               0001080
      READ (5,9019) TEXT1                                                0001090
      READ (5,9049) FAC                                                  0001100
      READ (5,9050) NTEMP                                                0001110
      READ (5,9049) XMIN,XMAX,YMIN,YMAX                                  0001120
C                          (YMIN,YMAX ARE REFERRED TO THE TEMPERATURES:0001130
C                           FOR THE PRESSURE DROP THEY ARE AUTOMATHICAL0001140
C                           LY FIXED BY THE PROGRAM)                   0001150
      WRITE(6,9051) TEXT1                                                0001160
      WRITE(6,9018) XMIN,XMAX,YMIN,YMAX,RE,TWB,FAC                       0001170
      WRITE(6,9052)                                                      0001180
C     ..................................................................0001190
C     PLOT INITIALIZATION                                                0001200
C                                                                        0001210
      CALL PLOTS (IBUF,1000,0)                                           0001220
      CALL PLOT (2.,2.,-3)                                               0001230
      CALL FACTOR(FAC)                                                   0001240
C                                                                        0001250
C     ##################################################################0001260
C     PRESSURE DROP.                                                     0001270
C     ##################################################################0001280
```

```
C                                                                       0001290
      WRITE(6,9002)                                                     0001300
C     .....................................................................0001310
C     READ COMPUTED PRESSURES                                           0001320
      J=0                                                               0001330
  100 READ (4,END=300) XM,YM                                            0001340
            J=J+1                                                       0001350
            IF(J.LT.LIM.AND.J.GE.1) GO TO 200                           0001360
                                    WRITE(6,9003)                       0001370
                                    WRITE(6,9004) J                     0001380
                                    WRITE(6,9005)                       0001390
                                    GOTO 9999                           0001400
  200                               CONTINUE                            0001410
            XM = XM*10.                                                 0001420
            X(J) =XM                                                    0001430
            Y(J) =YM                                                    0001440
            GO TO 100                                                   0001450
  300       CONTINUE                                                    0001460
      NTOT=J                                                            0001470
C     .....................................................................0001480
C     DETERMINE PMAX                                                    0001490
      PMIN=0.0                                                          0001500
      PMAX=0.00                                                         0001510
      DO 500 L=1,NTOT                                                   0001520
             IF(L.LT.LIM.AND.L.GE.1) GO TO 400                          0001530
                                     WRITE(6,9003)                      0001540
                                     WRITE(6,9006) J                    0001550
                                     WRITE(6,9005)                      0001560
                                     GO TO 9999                         0001570
  400                                CONTINUE                           0001580
             IF (Y(L) .GT. PMAX) PMAX=Y(L)                              0001590
  500        CONTINUE                                                   0001600
C     .....................................................................0001610
C     PMAX IS ROUNDED                                                   0001620
      CALL EFORM(PMAX,XX,K)                                             0001630
      CALL ROUND (XX,XX1)                                               0001640
      PMAX=XX1*10.**K                                                   0001650
C     .....................................................................0001660
C     WRITE INPUT PARAMETERS                                            0001670
      WRITE (6,9007) XMIN,XMAX,PMIN,PMAX,NTOT                           0001680
      DO 700 J=1,NTOT                                                   0001690
             IF(J.LT.LIM.AND.J.GE.1) GO TO 600                          0001700
                                     WRITE(6,9003)                      0001710
                                     WRITE(6,9008) J                    0001720
                                     WRITE(6,9005)                      0001730
                                     GOTO 9999                          0001740
  600                                CONTINUE                           0001750
             WRITE(6,9008) X(J),Y(J)                                    0001760
  700        CONTINUE                                                   0001770
C     .....................................................................0001780
C     DETERMINE THE PRESSURE AT 310.00 MM.                              0001790
      NP=1                                                              0001800
      DO 800 NN=1,100                                                   0001810
             ND=NN                                                      0001820
             IF(X(NN).GE.310.00) GO TO  900                             0001830
             NP=NN                                                      0001840
  800        CONTINUE                                                   0001850
      WRITE(6,9003)                                                     0001860
      WRITE(6,9009) NN                                                  0001870
      WRITE(6,9005)                                                     0001880
      GO TO 9999                                                        0001890
  900 CONTINUE                                                          0001900
      PST=Y(NP)+(310.-X(NP))*(Y(ND)-Y(NP))/(X(ND)-X(NP))                0001910
      WRITE(6,9010) PST                                                 0001920
C     .....................................................................0001930
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C     PLOT PREPARATION                                                  0001940
      PEX=18./(XMAX-XMIN)                                               0001950
      P1Y=13./(PMAX-PMIN)                                               0001960
      DEX=ZOLL/PEX                                                      0001970
      D1Y=ZOLL/P1Y                                                      0001980
      X(NTOT+1) = XMIN                                                  0001990
      X(NTOT+2) = DEX                                                   0002000
      Y(NTOT+1) = PMIN                                                  0002010
      Y(NTOT+2) = D1Y                                                   0002020
C     ..................................................................0002030
C     FRAME                                                             0002040
      CALL DIAGRO (XMIN,XMAX,PMIN,PMAX,DEX,D1Y,NZP,AX,2,2,FAC)          0002050
C     ..................................................................0002060
C     TITLES                                                            0002070
      CALL SYMBOL (0.5,4.4,0.14,29HPRESSURE LOSS                ,0.0,29)0002080
      CALL SYMBOL (0.5,4.2,0.14,TEXT1,0.0,24)                           0002090
      CALL EFORM  (RE,ZEZ,KEZ)                                          0002100
      XEZ=KEZ                                                           0002110
      CALL SYMBOL (0.5,4.0,0.14,REY  ,0.0, 4)                           0002120
      CALL NUMBER (999.,999.,0.14,ZEZ,0.0, 2)                           0002130
      CALL SYMBOL (999.,999.,0.14,EE ,0.0, 1)                           0002140
      CALL NUMBER (999.,999.,0.14,XEZ,0.0,-1)                           0002150
      CALL SYMBOL (999.,999.,0.14,TWT,0.0, 9)                           0002160
      CALL NUMBER (999.,999.,0.14,TWB,0.0, 2)                           0002170
C     ..................................................................0002180
C     PLOT JOBNAME, DATUM AND TIME                                      0002190
      CALL SYMBOL (0.5,4.6,0.14,TIT1,0.0,4)                             0002200
      CALL SYMBOL (999.,999.,0.14,NOME,0.0,8)                           0002210
      CALL SYMBOL (999.,999.,0.14,1H ,0.0,1)                            0002220
      CALL SYMBOL (999.,999.,0.14,GIORNO,0.0,8)                         0002230
      CALL SYMBOL (999.,999.,0.14,TIT3,0.0,4)                           0002240
      CALL SYMBOL (999.,999.,0.14,ORA,0.0,8)                            0002250
C     ..................................................................0002260
C     PLOT THE POINT AT 310.0 MM                                        0002270
      XXX =(310.0- XMIN) / DEX                                          0002280
      YYY =(PST - PMIN) / D1Y                                           0002290
      CALL SYMBOL (XXX,YYY,0.14,1,0.0,-1)                               0002300
C     ..................................................................0002310
C     CURVE                                                             0002320
      CALL LINE (X,Y,NTOT,1,0,0)                                        0002330
C     ..................................................................0002340
C     READ, CONTROL, WRITE AND PLOT EXPERIMENTAL VALUES                 0002350
      WRITE(6,9011)                                                     0002360
      J=0                                                               0002370
 1000 READ (7,END=1200) XV,YV                                           0002380
           YV=YV+PST                                                    0002390
           IF ( XV .GT. XMAX ) GO TO 1100                               0002400
           IF ( XV .LT. XMIN ) GO TO 1100                               0002410
           IF ( YV .GT. PMAX ) GO TO 1100                               0002420
           IF ( YV .LT. PMIN ) GO TO 1100                               0002430
C                                                                       0002440
           WRITE (6,9012) J,XV,YV,PST                                   0002450
C                                                                       0002460
           XV1 =(XV   - XMIN) / DEX                                     0002470
           YV1 =(YV   - PMIN) / D1Y                                     0002480
           CALL SYMBOL (XV1,YV1,0.14,1,0.0,-1)                          0002490
           J=J+1                                                        0002500
           GO TO 1000                                                   0002510
C          (POINT EXCEEDING THE LIMITS)                                 0002520
 1100      WRITE (6,9013) XV,YV                                         0002530
           GO TO 1000                                                   0002540
C                                                                       0002550
 1200      NVP=J                                                        0002560
      WRITE (6,9014) NVP                                                0002570
      WRITE (6,9015)                                                    0002580
C                                                                       0002590
```

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C                                                                       0002600
C     .................................................................0002610
C     NTEMP <= 0   :  TEMPERATURES AND PRESSURES                        0002620
C     NTEMP >  0   :  ONLY PRESSURES                                    0002630
C                                                                       0002640
      IF (NTEMP .GT. 0) GO TO 9999                                      0002650
C                                                                       0002660
C                                                                       0002670
C     ##################################################################0002680
C     WALL AND LINER TEMPERATURES                                       0002690
C     ##################################################################0002700
C                                                                       0002710
C     .................................................................0002720
C     STORE ALL EXPERIMENTAL POINTS                                     0002730
      K=0                                                               0002740
      WRITE (6,9016)                                                    0002750
 2000 READ (2,END=2100) IR,IW,XV,YV                                     0002760
           K=K+1                                                        0002770
           IF(K.LE.500) GO TO 2080                                      0002780
                        WRITE(6,9101)                                   0002790
                        WRITE(6,9005)                                   0002800
                        GOTO 9999                                       0002810
 2080                   CONTINUE                                        0002820
           IRA(K)=IR                                                    0002830
           IWA(K)=IW                                                    0002840
           XVA(K)=XV                                                    0002850
           YVA(K)=YV                                                    0002860
           WRITE(6,9017) IRA(K),IWA(K),XVA(K),YVA(K),YVA(K)             0002870
           GO TO 2000                                                   0002880
 2100      CONTINUE                                                    0002890
      NEXP=K                                                            0002900
C     .................................................................0002910
C     DETECT THE HEATED AXIAL SECTIONS AND STORE THE COMPUTED RESULTS   0002920
      WRITE(6,9207)                                                     0002930
      NTOT=0                                                            0002940
      XXX=0.001                                                         0002950
 2200 READ(1,END=2300) NS1,M1,X1,Y1                                     0002960
          X1=X1*10.                                                     0002970
          DD=ABS(X1/XXX-1.0)                                            0002980
          IF(DD.LT.0.0001) GOTO 2250                                    0002990
                NTOT=NTOT+1                                             0003000
                     IF(NTOT.LT.100) GOTO 2225                          0003010
                          WRITE(6,9202)                                 0003020
                          WRITE(6,9005)                                 0003030
                          GOTO 9999                                     0003040
 2225                     CONTINUE                                      0003050
                XXX=X1                                                  0003060
                WRITE(6,*) XXX                                          0003070
                X(NTOT)=X1                                              0003080
 2250      TW(NTOT,NS1,M1)=Y1                                           0003090
           GOTO 2200                                                    0003100
 2300 CONTINUE                                                          0003110
C     .................................................................0003120
C     LOOP FOR THE SECTORS (THE TEMPERATURES ARE AVERAGED BY ASSUMING   0003130
C     PERFECT RADIAL SYMMETRY)                                          0003140
      DO 4000 IFIG=1,NFIG                                               0003150
C        ..............................................................0003160
C        ONLY AT THE FIRST LINER SECTOR: TW IS FILLED WITH THE LINER    0003170
C        TEMPERATURES.                                                  0003180
         IF(IFIG.NE.11) GOTO 2350                                       0003190
         NTOT=0                                                         0003200
         XXX=0.001                                                      0003210
 2310    READ(3,END=2350) NS1,M1,X1,Y1                                  0003220
              X1=X1*10.                                                 0003230
              DD=ABS(X1/XXX-1.0)                                        0003240
              IF(DD.LT.0.0001) GOTO 2330                                0003250
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                NTOT=NTOT+1                                              0003260
                IF(NTOT.LT.100) GOTO 2320                                0003270
                      WRITE(6,9202)                                      0003280
                      WRITE(6,9005)                                      0003290
                      GOTO 9999                                          0003300
 2320                 CONTINUE                                           0003310
                XXX=X1                                                   0003320
                X(NTOT)=X1                                               0003330
 2330          TW(NTOT,NS1,M1)=Y1                                        0003340
               GOTO 2310                                                 0003350
 2350     CONTINUE                                                       0003360
C         .....................................................          0003370
C         WRITES TITLE FOR THE PRESENT FIGURE.                           0003380
          BAR=IP(IFIG)                                                   0003390
          C  =NSS(IFIG)                                                  0003400
          IT=ITYP(IFIG)                                                  0003410
          NCA=NCOR(IFIG)                                                 0003420
          NR=1                                                           0003430
          IF(IFIG.GT.10) NR=3                                            0003440
          WRITE(6,9102) IFIG                                             0003450
          IF(NR.EQ.1) WRITE(6,9103)                                      0003460
          IF(NR.EQ.3) WRITE(6,9104)                                      0003470
          WRITE(6,9105) NSS(IFIG),IP(IFIG),TYP(IT)                       0003480
          WRITE(6,9108)                                                  0003490
C         .....................................................          0003500
C         LOOP ON THE AXIAL SECTIONS                                     0003510
          DO 2600 IX=1,NTOT                                              0003520
                  YY=0.0                                                 0003530
                  J=0                                                    0003540
C                 .....................................................  0003550
C                 LOOP ON THE CORRISPONDENT SECTORS                      0003560
                  DO 2500 ICA=1,NCA                                      0003570
                          NS=ICOR(IFIG,ICA)                              0003580
                          M =MCOR(IFIG,ICA)                              0003590
                          IF(IX.EQ.1) WRITE(6,9109) ICA,NS,M             0003600
                          WW=TW(IX,NS,M)                                 0003610
                          IF(WW.LT.YMAX .AND. WW.GT.YMIN) GOTO 2400      0003620
                                  WRITE(6,9203) IX,NS,M                  0003630
                                  WRITE(6,9005)                          0003640
                                  GOTO 9999                              0003650
 2400                             CONTINUE                               0003660
                          YY=YY+TW(IX,NS,M)                              0003670
 2500                     CONTINUE                                       0003680
                  XCA=NCA                                                0003690
                  Y(IX)=YY/XCA                                           0003700
 2600             CONTINUE                                               0003710
          WRITE(6,9200)                                                  0003720
C         .....................................................          0003730
C         PLOT THE FRAME                                                 0003740
          PEX=18./(XMAX-XMIN)                                            0003750
          PEY=13.0/(YMAX-YMIN)                                           0003760
          DEX= ZOLL/PEX                                                  0003770
          DEY=ZOLL/PEY                                                   0003780
          LJ=NTOT+2                                                      0003790
          JL=NTOT+1                                                      0003800
          X(JL)=XMIN                                                     0003810
          X(LJ)=DEX                                                      0003820
          Y(JL)=YMIN                                                     0003830
          Y(LJ)=DEY                                                      0003840
C                                                                        0003850
          CALL DIAGRO (XMIN,XMAX,YMIN,YMAX,DEX,DEY,NZP,AX,2,3,FAC)       0003860
C         .....................................................          0003870
C         PLOT TITLES                                                    0003880
          CALL EFORM  (RE,ZEZ,KEZ)                                       0003890
          XEZ=KEZ                                                        0003900
           CALL SYMBOL (0.5,4.4,0.14,REY   ,0.0, 4)                      0003910
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```
      CALL NUMBER (999.,999.,0.14,ZEZ,0.0, 2)                          0003920
      CALL SYMBOL (999.,999.,0.14,EE ,0.0, 1)                          0003930
      CALL NUMBER (999.,999.,0.14,XEZ,0.0,-1)                          0003940
      CALL SYMBOL (999.,999.,0.14,TWT,0.0, 9)                          0003950
      CALL NUMBER (999.,999.,0.14,TWB,0.0, 2)                          0003960
      CALL SYMBOL (0.5,4.2,0.14,TEXT1,0.0,24)                          0003970
      CALL SYMBOL (0.5,4.0,0.14,5HPIN= ,0.0, 5)                        0003980
      CALL NUMBER (999.,999.,0.14,BAR,0.0,-1)                          0003990
      CALL SYMBOL (999.,999.,0.14,11H  CHANNEL= ,0.0,11)               0004000
      CALL NUMBER (999.,999.,0.14,C  ,0.0,-1)                          0004010
      CALL SYMBOL (999.,999.,0.14,2H  ,0.0, 2)                         0004020
      IF(NR.EQ.1) CALL SYMBOL (999.,999.,0.14,TYP(IT),0.0, 4)          0004030
      IF(NR.EQ.3) CALL SYMBOL (999.,999.,0.14,5HLINER,0.0, 5)          0004040
C     .................................................................0004050
C     PLOT JOBNAME, DATUM AND TIME                                     0004060
      CALL SYMBOL (0.5,4.6,0.14,TIT1,0.0,4)                            0004070
      CALL SYMBOL (999.,999.,0.14,NOME,0.0,8)                          0004080
      CALL SYMBOL (999.,999.,0.14,1H ,0.0,1)                           0004090
      CALL SYMBOL (999.,999.,0.14,GIORNO,0.0,8)                        0004100
      CALL SYMBOL (999.,999.,0.14,TIT3,0.0,4)                          0004110
      CALL SYMBOL (999.,999.,0.14,ORA,0.0,8)                           0004120
C     .................................................................0004130
C     PLOT THE COMPUTED CURVE                                          0004140
      CALL LINE (X,Y,NTOT,1,0,0)                                       0004150
C                                                                      0004160
C     .................................................................0004170
C     COMPARISON WITH THE MEASUREMENTS                                 0004180
      WRITE(6,9110)                                                    0004190
      YS1=YS                                                           0004200
      AA=0.0                                                           0004210
      J=1                                                              0004220
      NEX=NE(IFIG)                                                     0004230
      DO 3500 L=1,NEX                                                  0004240
            WRITE(6,9111) L,INER(IFIG,L),INEW(IFIG,L)                  0004250
            ROD=INER(IFIG,L)                                           0004260
            WIN=INEW(IFIG,L)                                           0004270
            YS2=YS1+0.070                                              0004280
            IAA=IA(J)                                                  0004290
            CALL SYMBOL(XS,YS2,0.14,IAA,AA,-1)                         0004300
            CALL NUMBER(XS1,YS1,0.14,ROD,0.0,-1)                       0004310
            CALL NUMBER(XS2,YS1,0.14,WIN,0.0,-1)                       0004320
            DO 3200 K=1,NEXP                                           0004330
                  IF(INER(IFIG,L).NE.IRA(K)) GOTO 3200                 0004340
                  IF(INEW(IFIG,L).NE.IWA(K)) GOTO 3200                 0004350
                  IF(YVA(K).LT.YMAX) GOTO 3100                         0004360
                        WRITE(6,9205) IRA(K),IWA(K),YVA(K)             0004370
                        GOTO 3200                                      0004380
3100                    CONTINUE                                       0004390
                   XZZ=(XVA(K)-XMIN)/DEX                               0004400
                   YZZ=(YVA(K)-YMIN)/DEY                               0004410
                   CALL SYMBOL(XZZ,YZZ,0.14,IAA,AA,-1)                 0004420
3200               CONTINUE                                            0004430
            YS1=YS1-0.20                                               0004440
            IF(J.GT.7) GOTO 3300                                       0004450
            AA=AA+90.0                                                 0004460
            IF(AA.LT.300.0) GOTO 3400                                  0004470
3300        J=J+1                                                      0004480
            AA=0.0                                                     0004490
            IF(J.GT.13) J=13                                           0004500
3400        CONTINUE                                                   0004510
3500  CONTINUE                                                         0004520
C     .................................................................0004530
C     END OF FIG. IFIG                                                 0004540
      WRITE(6,9112) IFIG                                               0004550
4000 CONTINUE                                                          0004560
C                                                                      0004570
```

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C     FINALIZATION **********************************************************0004580
C                                                                             0004590
C     ........................................................................0004600
C     REGULAR END MESSAGE                                                     0004610
      WRITE(6,9044)                                                           0004620
      WRITE(6,9048)                                                           0004630
C     ........................................................................0004640
C     CLOSE PLOT                                                              0004650
 9999 CONTINUE                                                                0004660
      CALL PLOT (0.,0.0,999)                                                  0004670
C                                                                             0004680
      STOP                                                                    0004690
 9001 FORMAT(1H1,5X,'D I S E G                 ',                             0004700
     1          /6X,'*********                                    ',          0004710
     2        ///5X,'PLOT SAGAPO RESULTS AND PERFORM COMPARISON WIT',          0004720
     3              'H EXPERIMENTAL DATA. ',/5X,                               0004730
     4              'RADIAL SYMMETRY IS ASSUMED.                 ')           0004740
 9002 FORMAT(1H1,5X,'PRESSURE DROP',/)                                        0004750
 9003 FORMAT(5X,'**************************************************')         0004760
 9004 FORMAT(5X,'READ COMPUTED PRESSURES, J = ',I3)                           0004770
 9005 FORMAT(5X,'CALCULATION STOPS')                                          0004780
 9006 FORMAT(5X,'DETERMINE PMAX        , J = ',I3)                            0004790
 9007 FORMAT(//5X,'LIMITS OF THE FIGURE :',//5X,                              0004800
     3 'ABSCISSA      ',F10.5,'    TO ',F10.5,' MM  '/5X,                     0004810
     3 'PRESSURES     ',F10.5,'    TO ',F10.5,' BARS'//5X,                    0004820
     6 'NUMBER OF COMPUTED PRESSURE VALUES  =',I3,//5X,                       0004830
     5 ' HEIGTH   PRESSURE DROP '//)                                          0004840
 9008 FORMAT(5X,2F10.5)                                                       0004850
 9009 FORMAT(5X,'DETERMINE PRESSURE AT 310, J = ',I3)                         0004860
 9010 FORMAT(1H1,5X 'COMPUTED PRESSURE LOSS AT 310.00 MM =',E12.6)            0004870
 9011 FORMAT(//////5X, 'READ, CONTROL AND PLOT EXPERIMENTAL VALUES.')         0004880
 9012 FORMAT (//5X,'EXPERIMENTAL POINT N. ',I2,'   ABSCISSA = ',F10.5,        0004890
     >             ' PRESSURE = ',F10.5,'  PST= ',F10.5)                      0004900
 9013 FORMAT ( /40('*'),' VALUE OUT OF RANGE :',5X,                           0004910
     1 'X = ',F10.5,5X,'PRESSURE    = ',E12.6/)                               0004920
 9014 FORMAT (//5X,'NUMBER OF EXPERIMENTAL VALUES = ',I3)                     0004930
 9015 FORMAT (//5X,'END OF PRESSURE DROP PLOT.      ')                        0004940
 9016 FORMAT(1H1,5X,'WALL AND LINER TEMPERATURES        '//5X,                0004950
     >          'EXPERIMENTAL POINTS ARE :'//,                               0004960
     *' ROD    ANGLE    ABSCISSA     TEMPERATURE'//)                         0004970
 9017 FORMAT(I4,4X,I4,4X,F10.5,4X,F10.5,10X,E12.6)                            0004980
 9018 FORMAT (/////5X,'LIMITS OF THE FIGURES :'//5X,                          0004990
     >            'ABSCISSA          ',F10.1,'    TO ',F10.1,' MM',         0005000
     *       /5X, 'TEMPERATURES      ',F10.1,'    TO ',F10.1,'  C',         0005010
     *      //5X, 'REYNOLDS NUMBER = ',E12.6,                                 0005020
     *       /5X, 'T.WALL / T.BULK = ',E12.6,                                0005030
     *      //5X, 'SCALA FACTOR    = ',F10.3)                               0005040
 9019 FORMAT (6A4)                                                            0005050
 9020 FORMAT (12I4)                                                           0005060
 9021 FORMAT(5X,' NVER = ',I4,' TOO BIG, STOP')                               0005070
 9044 FORMAT(///5X,'END OF TEMPERATURES PLOT.')                               0005080
 9048 FORMAT (////5X,'REGULAR CALCULATION END.')                              0005090
 9049 FORMAT (7F10.5)                                                         0005100
 9050 FORMAT (I4)                                                             0005110
 9051 FORMAT (///5X,'CASE IDENTIFICATION:  ',6A4,                             0005120
     1          /5X,'*******************   ')                                0005130
 9052 FORMAT (/5X,'THE LIMITS FOR THE PRESSURE DROP ARE COMPUTED',            0005140
     1 ' AUTOMATICALLY',                                                      0005150
     2        /5X,'LENGTHS ARE EXPRESSED IN MM, TEMPERATURES IN ',            0005160
     3 'DEGREES CELTIUS, PRESSURES IN BARS.')                                 0005170
 9053 FORMAT (5X,'PLOT GENERATED BY THE JOB ',A8,/5X,                         0005180
     1              A8,' AT ',A8)                                            0005190
 9101 FORMAT(5X,' ERROR BETWEEN 2000 AND 2080: K.GT.500           ')          0005200
 9102 FORMAT(1H1,5X,'FIGURE N. ',I3,//5X,                                     0005210
     >              'SECTOR OF ')                                            0005220
```

```
 9103 FORMAT(1H+,18X,'PIN')                                                0005230
 9104 FORMAT(1H+,18X,'LINER')                                              0005240
 9105 FORMAT(5X,'ADJACENT TO THE CHANNEL ',I3,' ,PIN ',I3,'  TYPE: ',A4)0005250
 9106 FORMAT(5X,' ERROR BETWEEN 2400 AND 2500: THE READ GOES TO END',    0005260
     >          ' FOR CHANNEL=',I3,'    M= ',I2, 'X(IX) = ',E12.6,      0005270
     >          '     IX= ',I3)                                           0005280
 9107 FORMAT(5X,' ERROR BETWEEN 2400 AND 2500: NCA.NE.J            ')    0005290
 9108 FORMAT(//5X,'THE TEMPERATURE IS AVERAGED OVER THE FOLLOWING CHANNE0005300
     >LS:')                                                                0005310
 9109 FORMAT(  5X,I4,5X,'CHANNEL : ',I4,'   SUBCHANNEL: ',I4)              0005320
 9110 FORMAT(/5X,'COMPARISON  WITH THE MEASUREMENTS OF:')                  0005330
 9111 FORMAT(5X,I4,3X,'ROD INDEX:',I4,'   ANGLE: ',I4)                    0005340
 9112 FORMAT (/5X,' END FOR FIG. ',I3)                                     0005350
 9200    FORMAT(/5X,'END OF THE LOOP FOR THE COMPUTED TEMPERATURES')       0005360
 9202 FORMAT(/5X,'NTOT BECOMES GT 100 IN LOOP 2200-2300')                  0005370
 9203 FORMAT(/5X,'ERROR IN LOOP 2500, IX = ',I3,5X,'NS= ',I2,5X,'M= ',    0005380
     >           I2)                                                       0005390
 9205 FORMAT ( 30X,' MEASUREMENT AT ROD= ',I3,'  ANGLE= ',I3,              0005400
     >           ' OUT OF RANGE. T =',E12.6,/5X,                           0005410
     >           ' THE POINT IS NOT PLOTTED')                              0005420
 9207 FORMAT(/5X,' HEATED SECTIONS     ',/)                                0005430
C                                                                          0005440
      END                                                                  0005450
```

Appendix I: Subroutines for DISEG.

```
      SUBROUTINE DIAGRI(XMIN,XMAX,YMIN,YMAX,DEX,DEY,NR,NZP,I2,AX,A,    00000100
     $                  AXLX,AXLY)                                     00000200
C                                                                       00000300
C     ****  ZEICHNET Y-LINEAR, X-LOG-RAHMEN    ****                   00000400
C                                                                       00000500
      DIMENSION A(3)                                                    00000600
      REAL*8 NTXT(8) /'  Y+    ','  Y+    ',' YV/H   ',' YE/H   ','  H/00000700
     $   ','  H/Y   ','  RE-S  ',' H/Y-S  '/                           00000800
      REAL*8 NTYT(8) /'  U+    ','  U+    ',' U+     ',' U+     ','AR  00000900
     $  R','AS     B',' FS/F0-S','FS/F0-S '/                          00001000
      COMMON P(100),DAS(100),ZAHL(100),S(100)                           00001100
      ITL=1                                                             00001200
      IF(XMIN.LE.0.1) ITL=0                                             00001300
      F=1.                                                              00001400
      IF(DEY.GT.3.5)F=0.1                                               00001500
      IF(DEY.GT. 30.)F=0.01                                             00001600
      IF (DEY .LT..3) F=10.                                             00001700
      YMAX=YMAX*F                                                       00001800
      YMIN=YMIN*F                                                       00001900
      DEY=DEY*F                                                         00002000
      MINY=IFIX(YMIN+YMIN/100.)                                         00002100
      MAXY=IFIX(YMAX+YMAX/100.)                                         00002200
      LXY=1                                                             00002300
      AXLX=(ALOG10(XMAX)-ALOG10(XMIN))/DEX                              00002400
      AXLY=(MAXY-MINY)/DEY                                              00002500
      CALL VORSHA(NZP,AX,A,AXLX,AXLY,FAC)                               00002600
      CALL GRID(0.0,0.0,AXLX,AXLY,1,1)                                  00002700
      CALL GRID(.01,.01,AXLX,AXLY,1,1)                                  00002800
      CALL LGAXS(0.0,0.0,NTXT(I2),-8,AXLX,0.,XMIN,DEX)                  00002900
      CALL DEFLIG(NX,XMIN,XMAX,AXLY,DEX,I2,ITL)                         00003000
      DO 10 N=1,NX                                                      00003100
      CALL PLOT(P(N),0.,3)                                              00003200
   10 CALL PLOT(P(N),DAS(N),2)                                          00003300
      DO 11 N=1,NX                                                      00003400
      CALL PLOT (P(N),AXLY,3)                                           00003500
      DAYZ=AXLY-DAS(N)                                                  00003600
   11 CALL PLOT(P(N),DAYZ,2)                                            00003700
      CALL DEFLIN(NY,NYA,MINY,MAXY,AXLX,DEY)                            00003800
      AXL=AXLX+0.02                                                     00003900
      DO 20 N=1,NY                                                      00004000
      CALL PLOT (0.,P(N),3)                                             00004100
   20 CALL PLOT(DAS(N),P(N),2)                                          00004200
      DO 21 N=1,NY                                                      00004300
      CALL PLOT(AXLX,P(N),3)                                            00004400
      DAXZ=AXLX-DAS(N)                                                  00004500
   21 CALL PLOT(DAXZ,P(N),2)                                            00004600
      CALL XYZAHL(MINY,MAXY,DEY,NS,NSA,F)                               00004700
      NU=1                                                              00004800
      IF(ZAHL(NS).GE.10.) NU=-1                                         00004900
      DO 40 I=1,NS,NSA                                                  00005000
      XNUM=-.4                                                          00005100
      IF(ZAHL(I).LT.0.) XNUM=-.5                                        00005200
40    CALL NUMBER (XNUM, S(I),0.14, ZAHL(I),0.0,NU)                     00005300
      CALL LABEL(-0.7,.0,-0.7,AXLY,NTYT(I2),8,0.14,2,0.0,0.,0)          00005400
      DEY=DEY/F                                                         00005500
      YMAX=YMAX/F                                                       00005600
      YMIN=YMIN/F                                                       00005700
      RETURN                                                            00005800
      END                                                               00005900
```

```
                                                                      00006000
      SUBROUTINE DEFLIG (NMAX,PMIN,PMAX,TLN,DEL,I2,ITL)               00006100
C                                                                     00006200
C     ***   DEFINIERT  LOGARITHMISCHES NETZ        ******             00006300
C                                                                     00006400
      COMMON P(100),DAS(100),ZAHL(100),S(100)                         00006500
      IP=0                                                            00006600
      IF(PMIN .LT. 1.) IP=1                                           00006700
      D= 10**(ALOG10(PMIN)+IP-IFIX(ALOG10(PMIN)))                     00006800
      POT=PMIN/D                                                      00006900
      EZ=1.                                                           00007000
      DO 10 N=1,100                                                   00007100
      DAS(N)=0.07                                                     00007200
      D=D+1/EZ                                                        00007300
      IF (D .LT. 9.95) GOTO 20                                        00007400
      D=1.                                                            00007500
      POT=POT*10.                                                     00007600
      DAS(N)=.14                                                      00007700
      ITL=ITL+1                                                       00007800
      IF(I2.LT.3) GOTO 20                                             00007900
      IF(I2.GT.5) GOTO 20                                             00008000
      IF(ITL.NE.2)GOTO 20                                             00008100
        DAS(N)=TLN                                                    00008200
   20 POS= D*POT                                                      00008300
      P(N) =(ALOG10(POS)-ALOG10(PMIN))/DEL                            00008400
      IF (POS .GE. (PMAX-PMAX/100) ) GOTO 11                          00008500
   10 CONTINUE                                                        00008600
   11 NMAX=N                                                          00008700
      IF (DEL.GT. 0.12) GOTO 12                                       00008800
      NE=NMAX-5                                                       00008900
      DO 30 I=5,NE,5                                                  00009000
   30 DAS(I)=0.2                                                      00009100
   12 RETURN                                                          00009200
      END                                                             00009300
```

```
                                                                      00009400
      SUBROUTINE DIAGRO(XMIN,XMAX,YMIN,YMAX,DEX,DEY,NZP,AX,KTX,KTY,FAC)00009500
C                                                                     00009600
C     *****   ZEICHNET  X-Y-LINEAR - RAHMEN                 ******    00009700
C                                                                     00009800
      REAL*8 NTYT,NTXT                                                00009900
      REAL*8 NCX(3) /' -X (MM)',' X (MM) ',' Z (MM) '/                00010000
      REAL*8 NCY(3) /'T+K ( C)','DP (BAR)',' T ( C) '/                00010100
      COMMON P(100),DAS(100),ZAHL(100),S(100)                         00010200
      NTXT=NCX(KTX)                                                   00010300
      NTYT=NCY(KTY)                                                   00010400
      FX=1.                                                           00010500
      FY=1.                                                           00010600
      IF (DEY .GT. 3.5)          FY=0.1                               00010700
      IF (DEX .GT. 3.5)          FX=0.1                               00010800
      IF (DEY .GT. 30.)          FY=0.01                              00010900
      IF (DEX .GT. 30.)          FX=0.01                              00011000
      IF (DEY .GT. 300.)         FY=0.001                             00011100
      IF (DEX .GT. 300.)         FX=0.001                             00011200
      IF (DEY .GT. 3000.)        FY=0.0001                            00011300
      IF (DEX .GT. 3000.)        FX=0.0001                            00011400
      IF (DEY .GT. 30000.)       FY=0.00001                           00011500
      IF (DEX .GT. 30000.)       FX=0.00001                           00011600
      IF (DEY .GT. 300000.)      FY=0.000001                          00011700
      IF (DEX .GT. 300000.)      FX=0.000001                          00011800
      IF (DEY .GT. 3000000.)     FY=0.0000001                         00011900
      IF (DEX .GT. 3000000.)     FX=0.0000001                         00012000
      IF (DEY .LT. 0.3)          FY=10.                               00012100
      IF (DEX .LT. 0.3)          FX=10.                               00012200
      IF (DEY .LT. 0.03)         FY=100.                              00012300
      IF (DEX .LT. 0.03)         FX=100.                              00012400
      IF (DEY .LT. 0.003)        FY=1000.                             00012500
      IF (DEX .LT. 0.003)        FX=1000.                             00012600
      IF (DEY .LT. 0.0003)       FY=10000.                            00012700
      IF (DEX .LT. 0.0003)       FX=10000.                            00012800
      IF (DEY .LT. 0.00003)      FY=100000.                           00012900
      IF (DEX .LT. 0.00003)      FX=100000.                           00013000
      IF (DEY .LT. 0.000003)     FY=1000000.                          00013100
      IF (DEX .LT. 0.000003)     FX=1000000.                          00013200
      DEX=DEX*FX                                                      00013300
      DEY=DEY*FY                                                      00013400
      YMAX=YMAX*FY                                                    00013500
      XMAX=XMAX*FX                                                    00013600
      YMIN=YMIN*FY                                                    00013700
      XMIN=XMIN*FX                                                    00013800
      MINY=IFIX(YMIN+YMIN/100.)                                       00013900
      MINX=IFIX(XMIN+XMIN/100.)                                       00014000
      MAXY=IFIX(YMAX+YMAX/100.)                                       00014100
      MAXX=IFIX(XMAX+XMAX/100.)                                       00014200
      AXLX=(MAXX-MINX)/DEX                                            00014300
      AXLY=(MAXY-MINY)/DEY                                            00014400
      CALL VORSHA(NZP,AX,AXLX,AXLY,FAC)                               00014500
      CALL GRID(0.0,0.0,AXLX,AXLY,1,1)                                00014600
      CALL GRID(.01,.01,AXLX,AXLY,1,1)                                00014700
      NXT=NTXT                                                        00014800
      CALL DEFLIN(NX,NXA,MINX,MAXX,AXLY,DEX)                          00014900
      DO 10 N=1,NX                                                    00015000
      CALL PLOT(P(N),0.,3)                                            00015100
   10 CALL PLOT(P(N),DAS(N),2)                                        00015200
      DO 11 N=1,NX                                                    00015300
      CALL PLOT (P(N),AXLY,3)                                         00015400
```

```
      DAYZ=AXLY-DAS(N)                                                  00015500
   11 CALL PLOT(P(N),DAYZ,2)                                            00015600
      CALL DEFLIN(NY,NYA,MINY,MAXY,AXLX,DEY)                            00015700
      DO 20 N=1,NY                                                      00015800
      CALL PLOT (0.,P(N),3)                                             00015900
   20 CALL PLOT(DAS(N),P(N),2)                                          00016000
      DO 21 N=1,NY                                                      00016100
      CALL PLOT(AXLX,P(N),3)                                            00016200
      DAXZ=AXLX-DAS(N)                                                  00016300
   21 CALL PLOT(DAXZ,P(N),2)                                            00016400
      FA=0.07                                                           00016500
      CALL XYZAHL(MINY,MAXY,DEY,NS,NSA,FY,FA)                           00016600
      NU=3                                                              00016700
      IF(ZAHL(NS).GE.10.) NU=-1                                         00016800
C     IF(ZAHL(NS).LT. 0.01 .OR. ZAHL(1) .LT. 0.01) NU=3                 00016900
      XC=-0.6                                                           00017000
      XL=-0.8                                                           00017100
      IF(NU .EQ.3) XC=-0.7                                              00017200
      IF(NU .EQ.3) XL=-0.9                                              00017300
      DO 40 I=1,NS,NSA                                                  00017400
   40 CALL NUMBER (XC, S(I),0.14, ZAHL(I),0.0,NU)                       00017500
      CALL LABEL(XL,.0,XL,AXLY,NTYT,8,0.14,2,0.0,0.,0)                  00017600
      CALL LABEL(0.,-0.8,AXLX,-.8, NTXT,8,.14,2,0.,0.,0)                00017700
      FA=0.15                                                           00017800
      CALL XYZAHL(MINX,MAXX,DEX,NS,NSA,FX,FA)                           00017900
      NU=1                                                              00018000
      IF(ZAHL(NS).GE.10.) NU=-1                                         00018100
      DO 50 I=1,NS,NSA                                                  00018200
   50 CALL NUMBER (S(I),-0.4,0.14,ZAHL(I),0.,NU)                        00018300
      DEY=DEY/FY                                                        00018400
      DEX=DEX/FX                                                        00018500
      YMAX=YMAX/FY                                                      00018600
      XMAX=XMAX/FX                                                      00018700
      YMIN=YMIN/FY                                                      00018800
      XMIN=XMIN/FX                                                      00018900
      RETURN                                                            00019000
      END                                                               00019100
```

```
                                                                        00019200
      SUBROUTINE XYZAHL(MIN,MAX,DEL,NS,NSA,F,FA)                        00019300
C         *******          LIEFERT ACHSEN -ZIFFERN        ********      00019400
      COMMON P(100),DAS(100),ZAHL(100),XY(100)                          00019500
      NS=MAX-MIN+1                                                      00019600
      NSA=1                                                             00019700
      IF (DEL .GT. 2.) NSA=2                                            00019800
      IF(DEL .GT. 3.00) NSA=5                                           00019900
      ZAHL(1)=MIN /F                                                    00020000
      XY(1)=-FA                                                         00020100
      DO 1 I=2,NS                                                       00020200
      XY(I)=XY(I-1)+1./DEL                                              00020300
    1 ZAHL(I)=ZAHL(I-1)+1/F                                             00020400
      RETURN                                                            00020500
      END                                                               00020600
```

```
                                                                      00020700
      SUBROUTINE DEFLIN (NMAX,NA,MIN,MAX,TLN,DEL)                     00020800
C                                                                     00020900
C     *******     DEFINIERT LINEARE SKALENTEILUNG    ********         00021000
C                                                                     00021100
      COMMON P(100),DAS(100),ZAHL(100),S(100)                         00021200
        I=2                                                           00021300
      NMAX=(MAX-MIN)*I                                                00021400
      DO 10 N=1,NMAX                                                  00021500
      P(N)=(N-1)/DEL/I                                                00021600
   10 DAS(N)=0.07                                                     00021700
      AN=NMAX                                                         00021800
      M=IFIX(AN/I )                                                   00021900
      DO 20 N=1,M                                                     00022000
   20 DAS((N*I)+1)=.14                                                00022100
      NA=1                                                            00022200
      IF (DEL .GT. 2.54) NA=5                                         00022300
      RETURN                                                          00022400
      END                                                             00022500
```

```
                                                                      00022600
      SUBROUTINE VORSHA(N,XH,AX,AY,FA)                                00022700
      DIMENSION A(3)                                                  00022800
      CALL PAPIER(A)                                                  00022900
      A2=A(2)/FA                                                      00023000
      A3=A(3)/FA                                                      00023100
      IF(N.EQ.0) GOTO 1                                               00023200
      XE=-XN                                                          00023300
      YE=-YN                                                          00023400
      CALL PLOT(XE,YE,-3)                                             00023500
      GOTO 2                                                          00023600
    1 XH=0.                                                           00023700
      YH=0.                                                           00023800
      XH2=0.                                                          00023900
C                                                                     00024000
    2 XH1=(AX+2.5)*1.1                                                00024100
      YH1=(AY+2.5)*1.1                                                00024200
C                                                                     00024300
      XH=XH+XH1                                                       00024400
      IF(XH.GT.XH2) XH2=XH                                            00024500
      IF(XH2.GT.(A3-1.)) GOTO 99                                      00024600
      YH=YH+YH1                                                       00024700
      IF(YH.GT.(A2-1.0)) GOTO 3                                       00024800
      XN=XH-XH1+1.                                                    00024900
      YN=YH-YH1+1.                                                    00025000
      XH=XN-1.                                                        00025100
    5 CALL PLOT(XN,YN,-3)                                             00025200
      GOTO 4                                                          00025300
    3 XN=XH2+1.                                                       00025400
      IF((XN+XH1).GT.(A3-1.)) GOTO 99                                 00025500
      XH=XH2                                                          00025600
      YN=1.                                                           00025700
      YH=YH1                                                          00025800
      GOTO 5                                                          00025900
    4 CONTINUE                                                        00026000
      N=N+1                                                           00026100
      RETURN                                                          00026200
   99 CALL MESAGE(1,20HBITTE BLATT WECHSELN,20)                       00026300
      GOTO 1                                                          00026400
      END                                                             00026500
```

```
                                                                      00026600
      SUBROUTINE EFORM (X,Z,K)                                        00026700
C -------------------------------------------------------------------00026800
C     TRANSLATE X IN THE FORM Z * 10**K   ( 183.2 ==> 1.832 * 10**2 ) 00026900
C     ONLY FOR X >= 0.0  ( FOR X <= 1.E-50 Z IS SET TO 0.0)           00027000
C                                                                     00027100
      K=0                                                             00027200
      Z=X                                                             00027300
      IF ( X .GE. 1.0E-50) GO TO 20                                   00027400
      Z=0.0                                                           00027500
      GO TO 999                                                       00027600
   20 IF (X .GE. 1.0  ) GO TO 100                                     00027700
   50 Z=Z*10.                                                         00027800
      K=K-1                                                           00027900
      IF (Z .LT. 1.0  ) GO TO 50                                      00028000
      GO TO 999                                                       00028100
  100 IF ( X .LT. 10. ) GO TO 999                                     00028200
  150 Z=Z/10.                                                         00028300
      K = K+1                                                         00028400
      IF ( Z .GT. 10. ) GO TO 150                                     00028500
  999 RETURN                                                          00028600
      END                                                             00028700
```

```
                                                                      00028800
      SUBROUTINE ROUND (Z,X)                                          00028900
C -----------------------------------------------------------------   00029000
C     DETERMINES A 'ROUND' NUMBER X FROM Z ( 0.0 <= Z <= 1.0 )        00029100
C                                                                     00029200
      IF (Z .GE. 1.60) GO TO 100                                      00029300
      Z=Z*10.                                                         00029400
      Z=(AINT(Z)+2.0)*0.1                                             00029500
      GO TO 999                                                       00029600
  100 IF (Z.GE. 4.0) GO TO 200                                        00029700
      Z= AINT(Z)+1.0                                                  00029800
      GO TO 999                                                       00029900
  200 Z= AINT(Z)+2.0                                                  00030000
  999 X=Z                                                             00030100
      RETURN                                                          00030200
      END                                                             00030300
```