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## EXFOR/CINDA Dictionary Manual

last revision edited by

Naohiko Otuka  
IAEA Nuclear Data Section, Vienna, Austria

on behalf of the  
International Network of Nuclear Reaction Data Centres

May 2023

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The IAEA-NDS-reports should not be considered as formal publications. When a nuclear data library is sent out by the IAEA Nuclear Data Section, it will be accompanied by an IAEA-NDS-report which should give the data user all necessary documentation on contents, format and origin of the data library.

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## **Abstract**

EXFOR and CINDA are the exchange formats for the transmission of experimental nuclear reaction data and associated bibliographic references between national and international nuclear data centres for the benefit of nuclear data users in all countries. This report contains the description of the format and contents of the dictionaries of keywords, codes and abbreviations used in the EXFOR and CINDA systems.

May 2023



## PREFACE

EXFOR is the database for experimental nuclear reaction data maintained by the International Network of Nuclear Reaction Data Centres (NRDC) co-ordinated by the IAEA Nuclear Data Section. This manual describes the EXFOR exchange format to be used by EXFOR compilers and software developers.

The various aspects of the EXFOR system are described in the following documents:

<b>Name</b>	<b>Report code</b>	<b>Topics</b>	<b>Intended readership</b>
EXFOR Formats Manual	IAEA-NDS-207	Description of EXFOR exchange formats	Compilers, software developers
LEXFOR	IAEA-NDS-208	Quantity definitions and compilation guidelines	Compilers
EXFOR/CINDA Dictionary Manual	IAEA-NDS-213	Description of dictionary formats	Compilers, software developers
NRDC Protocol	IAEA-NDS-215	Procedures for EXFOR exchange between NRDC centres	Compilers, centre heads
NRDC Network Document	INDC(NDS)-401	Scope of activities and cooperation of NRDC centres	Centre heads
EXFOR Basics Manual	IAEA-NDS-206	Explanation of basic formats	EXFOR users

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Rev. 2007/08	EXFOR/CINDA Dictionary Manual	Otto Schwerer (ed.), based on earlier work by Victoria McLane, NNDC, USA

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# INTRODUCTION

The nuclear reaction data dictionaries contain the keys (i.e., keywords and codes) used by the International Network of Nuclear Reaction Data Centres (NRDC) in the exchange and dissemination of nuclear reaction data and the associated bibliographic references. These dictionaries are central to the nuclear reaction database system with respect to compilation, checking, retrieval, plotting, conversion to computational formats, and most other applications. Therefore, their careful maintenance and the timely distribution of updates are essential tasks within the NRDC network.

The dictionaries are maintained by the Nuclear Data Section (NDS). All dictionary updates<sup>1</sup> are made on the Master Archive Dictionary Files at NDS, and are transmitted periodically to the other Nuclear Reaction Data Centres in one or more of the following forms: the complete Archive, DANIEL Backup or EXFOR Transmission dictionaries.

The formats of these files are described in this Manual. For certain applications (e.g. the EXFOR check program), additional, specially formatted versions of the dictionaries may be in use. These are produced automatically by special software from the standard dictionaries mentioned above, and are not described here.

This manual describes the format and contents of the dictionaries, as needed by compilers and software developers. As the dictionaries are maintained and updated only at NDS, the detailed updating procedures are not described here, but in an internal NDS document.

Also included in this manual is more detailed information for specific dictionaries of special interest.

The EXFOR/CINDA dictionaries contain explanations for all keywords and codes used in the EXFOR and CINDA systems. A **dictionary identification number** ranging between 1 and 999 is assigned to each dictionary.

## Contents of the different dictionary forms<sup>2</sup>

- The **Archive dictionaries** are the source of the contents of all forms of the dictionaries. They contain all keys, their expansions, additional codes, as well as free text explanations for compilers.

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<sup>1</sup> See NRDC Protocol for dictionary updating procedures.

<sup>2</sup> See Working Paper 11 of the NRDC 1994 meeting (INDC(NDS)-308) for development of the Archive dictionaries based on the EXFOR Transmission (IBM) dictionaries (in the originally agreed dictionary formats) and DANIEL Backup (VAX/VMS) dictionaries (developed at NNDC for an internal system).

- The **DANIEL Backup dictionaries** contain all keys, additional codes needed for programs, and most of the expansions, but no free text explanations. The dictionaries are for interfacing with computer programs.
- The **EXFOR Transmission dictionaries** (in a format similar to an EXFOR exchange file) contain all keys (except for Dictionary 26), their expansions, and the free text explanations, but not all additional codes needed for the checking and other programs.

These different dictionary formats developed historically and were modified several times. Some dictionaries which were in use earlier are no longer included in the distributions and are not described in this document. The **Table of Dictionaries** in Chapter 1.2 lists all dictionaries in use in **May 2023**.

### **Dictionary distribution**

The dictionaries are distributed in one or more of the following ways:

- in the NDS open area, subdirectory DICTS
- through the EXFOR backup web page <http://www-nds.iaea.org/exfor-master/backup/>

# Chapter 1

## DICTIONARIES GENERAL

### 1.1 Dictionary Contents

Each dictionary contains the following items of information:

1. Key (keyword or code): There are four keyword dictionaries; the remaining dictionaries define codes used within the BIB section under specific information-identifier keywords (see the 'Table of Dictionaries' below).

The keyword dictionaries are:

Dict. 1	System identifiers (see EXFOR Formats Manual Chapter 2)	
Dict. 2	Information identifiers (see EXFOR Formats Manual Chapter 3)	
Dict. 24	Data headings	Used in COMMON and DATA sections (see EXFOR Formats Manual Chapter 4)
Dict. 25	Data units	

2. Expansions<sup>3</sup> are provided in certain dictionaries, and are self-explanatory.
3. Free text explanation of the keyword or code.
4. Additional codes are included for many of the dictionaries (*e.g.*, the country of origin for journal codes, certain flags for checking purposes in the case of data-heading keywords). For details see the dictionaries themselves, and the 'Table of Dictionaries' below.

#### Status of dictionary keywords or codes

The validity of a dictionary keyword or code may have expired or be restricted. This is indicated by an *Obsolete flag* (**OBS** or **O**) or an *Extinct flag* (**EXT** or **X**):

An **Obsolete flag** indicates that the keyword or code is not permitted on new transmissions, although it may still exist in entries that were transmitted previously. An explanation as to why the code is obsolete and which code (if any) replaces it may be given in free text. Obsolete codes remain in the dictionary until all cooperating centres have removed them from their data files.

An **Extinct flag** indicates that the given code designates an extinct institute, journal, or report series. The code is still valid on transmissions, but will occur usually in entries of old works.

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<sup>3</sup> The expansion may be used to replace the code in an output format, so that the EXFOR user may read the entries without having to consult the dictionaries to find the meaning of the codes.

## 1.2 Table of Dictionaries

Dict. #	Name	Additional code <sup>4</sup>	Key length <sup>5</sup>
*1	System Identifiers		≤10
*2	Information Identifiers		≤10
3	Institutes	X	6 – 7
*4	Reference Type		1
5	Journals	X	≤6 <sup>6</sup>
6	Reports	X	≤11
7	Conferences	X	≤10
8	Elements		≤3
15	History		1
*16	Status		≤5
17	Related Reference		1
18	Facility		≤5
19	Incident Source		≤5
20	Additional Results		≤5
21	Method		≤5
22	Detectors		≤5
23	Analysis		≤5
*24	Data Headings	X	≤10
25	Data Units	X	≤10
26	Unit Family codes <sup>7</sup>		≤4
*30	Process (REACTION SF3)		≤3
*31	Branch (REACTION SF5)		≤5 <sup>8</sup>
*32	Parameter (REACTION SF6)		≤3
*33	Particles		≤6
*34	Modifiers (REACTION SF8)		≤5 <sup>5</sup>
*35	Data Type (REACTION SF9)		≤5
*37	Result		≤5
<b>38</b>	<b>Supplemental information</b>		<b>≤5</b>
43	NLIB for Evaluated Libraries		≤2
45	CINDA Quantities		≤3
47	<b>Old</b> CINDA Quantities		≤3
48	Spectrum Averaged Energy Codes		≤5
52	CINDA Reader Codes		≤2
113	Web Quantities		≤3
144	<b>Data Libraries</b>		≤13
207	Books	X	≤10
209	Chemical Compounds	X	7-10

<sup>4</sup> Additional code is given in Chapter 3.

<sup>5</sup> Key = keyword or code

<sup>6</sup> Normally limited to a four-character code. The rest two characters are reserved for subdivisions such as APPL/A.

<sup>7</sup> Only Archive and DANIEL Backup Dictionaries

<sup>8</sup> Normally limited to a three-character code. 5 characters are allowed for parenthesized codes such as (CUM).

Dict. #	Name	Additional code <sup>4</sup>	Key length <sup>5</sup>
213	REACTION Types		≤4
227	Nuclides	X	3-12
235	Work type		1
*236	Quantities	X	30
950	List of <b>Dictionaries</b> <sup>9</sup>		3

\*Additions to these dictionaries require NRDC approval.

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<sup>9</sup> Only EXFOR Transmission dictionaries.



## Chapter 2

### GENERAL FORMAT OF DICTIONARY FILES

#### 2.1 Archive Dictionaries

A set of the Archive dictionaries consists of an index file and a set of dictionary files, one for each dictionary, and contains all information necessary for the production of the DANIEL Backup and the EXFOR Transmission dictionaries.

The format and contents of the Archive dictionaries are described in Chapter 3.

#### General Format

##### **Index File** (File name: `DICT_ARC.TOP`)

The index file contains a list of all of the dictionary files stored, along with supplementary information.

The format of a record of the dictionary index file is:

<u>Column</u>	<u>Format</u>	<u>Contents</u>
1-3	I03	Dictionary identification number
4		(blank)
5-34	A30	Dictionary name
35		(blank)
36-37	I02	# of DANIEL keys
39-82	A44	Formats of key and explanation fields

##### **Dictionary Files** (File names: `DICT_ARC_NEW.nnn`)

The dictionary files consist of two types of records: MASTER records and COMMENT records.

The general format of a MASTER record is:

<u>Column</u>	<u>Format</u>	<u>Contents</u>
1	A01	Alteration flag
2-4	A03	Status field
5		(blank)
6-11	I06	Date field (Date of last update - YYYYMM)
12		(blank)
13-42	A30	Key field

43		(blank)
44-123	A80	Explanation field

More detailed format and contents of the explanation fields are given in Chapter 3.

The general format of a COMMENT record is:

<u>Column</u>	<u>Format</u>	<u>Contents</u>
1	A01	Alteration flag
2-4	A03	Status field
5-43		(blank)
44-98	A55	Explanation field

More detailed format and contents of the explanation field are given in Chapter 3. Note that there are following exceptions for the last column position of the explanation field: 99 for Dictionary 5 (Journals), 100 for Dictionary 33 (Particles) and Dictionary 209 (Compounds), 111 for Dictionary 213 (Reaction types), and 87 for Dictionary 236 (Quantities).

### **Alteration Flags**

Dictionary updates are recorded on the Master Archive Dictionary Files at NDS by adding an alteration flag and the date of last update. The flags are used to process the records for the output files, and are deleted from the Master Archive Dictionary Files. Note that the alteration flags are not kept in the Archive dictionaries produced from the Master Archive Dictionary Files, and therefore these flags are seen only by NDS.

The following flags are used to indicate an alteration to a dictionary record.

- A The record has been added
- D The record is marked for deletion
- M A modification has been made to the key or explanation field of the MASTER record
- S The status has been changed

### **Status Codes**

A list of legal status codes (for all dictionaries) follows.

CIN	CINDA	used only by CINDA
EXT	extinct	valid on EXFOR exchange files, but usually in entries of old works
INT	internal	used only by NDS
OBS	obsolete	not to be used on EXFOR exchange files
PRE	preliminary	do not need approval or are approved
PRO	proposed	are not yet approved
TRA	transmitted	valid on EXFOR exchange files



## 2.2 DANIEL Backup Dictionaries

The DANIEL Backup dictionaries are a version of the dictionaries containing only the information needed for interfacing with computer programs. They are extractions of all MASTER records from Archive dictionaries (but without expansions of Dictionary 1 and sorting codes of Dictionary 25), containing all codes needed for computer programs, but no comments. They combine all dictionary information in one file which can be used to generate (load) a dictionary database specific to a certain application (e.g. EXFOR check program) and/or a certain software platform.

A DANIEL Backup dictionary file (File name: DAN\_BACK\_NEW.9nnn or DAN\_BACK\_NEW.ALL) consists of an index records and the dictionary records (similar to the index file and dictionary files of the Archive dictionaries).

### General Format

#### **Index Records:**

<u>Column</u>	<u>Format</u>	<u>Contents</u>
1-3 records)	I03	Dictionary identification number (blank signifies end of the index
4		(blank)
5-34	A30	Dictionary name
35		(blank)
36-37	I02	# of DANIEL keys
38		(blank)
39-82	A44	Formats of key and explanation fields
83		(blank)
84-87	I04	# of records in dictionary

#### **Dictionary Records:**

<u>Column</u>	<u>Format</u>	<u>Contents</u>
1-3	I03	Dictionary identification number
4		(blank)
5-7	A03	Status code
8		(blank)
9-14	I06	Date of last update (year, month - YYYYMM)
15		(blank)
16-45	A30	Key field
46		(blank)
47-126	A80	Explanation field

## Status Codes

The status codes used are the same as in the Archive dictionaries, see Chapter 2.1.

## Redefining the data base

Since the format of the records for each dictionary is contained in the dictionary index, fields may be re-defined, added, and/or eliminated without changing the programs. New dictionaries may be added and old ones eliminated by updating the index records.

Normally, a dictionary will be added through creating a new file for the Archive dictionaries. Then the archive index (`DICTIONARY.ARC.TOP`) must be updated accordingly, reflecting the contents of the new dictionary. Then an updated DANIEL Backup file can be generated by the appropriate software run at NDS (program `MAKE_BACK`).

## 2.3 EXFOR Transmission Dictionaries

The EXFOR Transmission dictionary files (File name: `TRANS.9nnn`) have much the same format as an EXFOR exchange file. Both the structure of the dictionary transmission files and the format of the individual dictionaries are described in this chapter. More detailed information for specific dictionaries see Chapter 3.

### General Format

1. An EXFOR Transmission dictionary file is one logical file (compare *EXFOR Formats Manual*, Chapter 2 on System Identifiers).

**TRANS** is the **first record** of the dictionary transmission.

N1 - Dictionary transmission number. "9" is used as the centre identification character, although in column 67 the centre identification "3" is used (as throughout the file).

N2 - Date of last update (year, month - YYYYMM).

The record identification contains the centre identification character 3 in column 67 and zeros in columns 68-79.

**ENDTRANS** is the **last record** of the dictionary transmission.

N1 - Number of dictionaries transmitted.

N2 - Presently unused (may be blank or zero)

The record identification contains a character, whose value is  $\geq 3$  in column 67 and 9's in columns 68-79.

2. An EXFOR Transmission Dictionary file is made up of dictionaries (compare *EXFOR Formats Manual*, Chapter 2 on System Identifiers).

**DICTION** is the **first record** of each dictionary

N1 - Dictionary identification number.

N2 - Date of last change (year, month - YYYYMM).

Columns 34-66 describe the contents of the dictionary in free text.

The record identification (columns 67-79) contains "30000" in columns 67-71, the dictionary identification number in columns 72-74, and the record sequence number "00001" in columns 75-79.

**ENDDICTION** is the last record of each dictionary

N1 - Number of records in the dictionary, excluding the DICTIION and ENDDICTION records.

N2 - Presently unused (may be blank or zero)

The record identification is the same as in the DICTIION record, except that the record sequence number is "99999".

3. The format of the transmitted dictionaries is generally similar to that of the BIB section in EXFOR entries. A dictionary record consists of three parts:

columns 1-11: key field,  
columns 12-66: explanation field,  
columns 67-79: record identification field  
column 80: flag field

Key field: the key (i.e., keyword or code) to be defined is given, left adjusted, in the first field, starting in column 1. The field is usually contained in columns 1-11, but may be longer for some dictionaries (see Chapter 1, Table of Dictionaries).

Explanation field: The explanation field usually starts in column 12 (in column 23, in the case of quantity codes) and usually (but with some exceptions) ends in column 66 of the first record.

Expansions are enclosed in parentheses for certain dictionaries; the opening parenthesis is given in the first column of the explanation field. The expansion is normally restricted to the length of the explanation field of one record, but, for certain dictionaries the expansion may continue within the explanation field onto following records.

Free text may immediately follow the closing parenthesis of the expansion or, if no parenthesized expansion is given, begin in the first column of the explanation field. It may continue within the explanation field, onto any number of records. The free text may include parentheses, but a left parenthesis that is part of the free text must not be entered in the first column of the explanation field (signalling the presence of an expansion).

Record identification field: The record identification (columns 67-79) of a dictionary record contains "30000" in columns 67-71, the dictionary identification number in columns 72-74 with leading zero(s), and the record sequence number with leading zeros in columns 75-79.

Flag field: Column 80 is used

1. to flag certain validity conditions for the code given on the same record. These flags remain permanently attached to the respective codes or keywords. For an explanation of the **Obsolete flag** (o) and the **Extinct flag** (x) see Chapter 1.

2. as an indication that the record was altered since the last dictionary transmission, e.g, added (I), corrected (C). See *EXFOR Exchange Formats Manual*, Chapter 8, for use of alteration flags.

The order of entries in each dictionary has been chosen for ease of use by compilers. It is the prerogative of each centre to rearrange the dictionary for their own purposes if they wish, e.g., for optimum computer use.

An example of a dictionary is shown below; columns 67-80 are omitted.

```

DICTION          5      200706 Journal Codes
AAA      (Astronomy and Astrophysics)          2GER
AAB      (Anais da Academia Brasileira de Ciencias) 3BZL
AAF      (Annales Acad. Sci. Fennicae, Series A6: Physica) 2SF
AANL     (Atti Acad. Naz. Lincei, Rend., Sci. Fis., Mat. Nat.) 2ITY
         Atti della Academia Nazionale dei Lincei (Roma),
         Rendiconti, Classe di Scienze Fisiche, Matematiche
         e Naturali
AAST     (Atti Acad. Sci. Torino, Cl. Sci. Fis. Mat. Nat.) 2ITY
         Atti della Academia della Scienze di Torino,
         Classe de Scienze Fisiche, Matematiche e Naturali
ABS      (Memoires de l'Acad. Roy. Belg., Cl. Sci.) 2BLG
AC       (Analytical Chemistry)                1USA
ACA      (Analitica Chimica Acta)              2NED
ACH      (Angewandte Chemie)                  2GER
.....
ENDDICTION

```

## Chapter 3

### DETAILS OF INDIVIDUAL DICTIONARIES

The definitions of the various fields and their positions in the Archive and EXFOR Transmission dictionaries are summarized in this chapter in table form, followed for some dictionaries by additional explanations of the contents.

**Archive** = column range in Archive dictionary  
**Trans** = column range in EXFOR Transmission dictionary  
**CHEX** = This field is used in the Exfor check program CHEX

A parenthesized column range means that the expansion is always parenthesized, and the opening parenthesis appears in the initial column. For example, “(12-38)” means that **the expansion follows an opening in column 12 of the first record and it is terminated by a closing parenthesis in column 38 or before of the last record.**

A line number followed by + means that the line may consist of two or more records.

The contents of the **DANIEL** Backup dictionaries are very similar to the Archive dictionaries, therefore below only the differences are mentioned:

- The column positions of MASTER records are shifted by three columns to the right (e.g., a system identifier keyword may be given in columns 16-25 in the DANIEL Backup dictionaries.)
- COMMENT records are NOT included.
- Dictionary 1 (System Identifiers): Field 2 (Expansion) is NOT included.
- Dictionary 25 (Data Units): Field 4 (Sorting code) is NOT included.

#### **Dictionary 1: System identifiers**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Keyword	A10	13-22	1-10	x
	Internal numerical equivalent	I9	44-52	N/A	x
	Expansion (not in backup dictionary)	A55	54-108	12-66	
2+	Comment	A55	44-98	12-66	

## Dictionary 2: Information identifiers

Line	Contents	Format	Archive	Trans	CHEX
1	Keyword	A10	13-22	1-10	x
	Expansion	A25	44-68	(12-38)	
	Keyword required	A1	69	49	x
	R required				
	B one required				
	X required when relevant				
	Internal numerical equivalent	I2	70-71	50-51	x
	Code required	A1	72	52	x
	R required code				
	O optional code				
	Pointer to related dictionary	I3	73-75	53-55	

## Dictionary 3: Institutes

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A7	13-19	1-7	x
	CINDA code	A3	44-46	N/A	
	Area code	I1	47	N/A	
	Country code	A3	48-50	N/A	
	Expansion	A53	51-103	(12-66)	
	Country for CINDA	A15	104-118	N/A	
2+	Comment flag = CINDA comment	A1	44	12	
	Comment	A54	45-98	13-66	

The 7-character code `ABBCC` is constructed as follows:

- A = area code, 1 (USA and Canada), 2 (OECD Member Countries as of 1970 and Monaco), 3 (countries not belonging to the other three areas), or 4 (former USSR countries). Compare EXFOR Formats Manual, page 1.4.
- B = country code (zzz for international organisation or cooperation of many institutes)
- C = laboratory code (may be less than 3 characters, left adjusted)

The 3-character laboratory codes include all laboratory, university, institute, agency and commission codes in use in the CINDA/EXFOR system, and must be unique.

Where the code identifies only a country, the information in the 3-character country code is repeated, as for example: `1CANCAN` (Canada). For this reason, a laboratory code may not be identical to a country code.

For *obsolete* and *extinct* codes, the code that replaces it, if any, is given (in free text) in all cases. The dictionary is sorted by the code, thus grouping together the institutes for each area and country.

#### Dictionary 4: Reference types

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A1	13	1	
	Short expansion	A4	44-47	(12-17)	
	Pointer flag DICT pointer given	N/A		56-59	
	Pointer to related dictionary (The first integer of the pointer is not in the EXFOR Transmission dictionary.)	I3	48-50	60-61	
	Expansion	A35	51-85	19-53	
2+	Comment	A55	44-98	12-66	

#### Dictionary 5: Journals

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A6	13-18	1-6	x
	CINDA code	A4	44-47	N/A	
	Area code	I1	48	63	
	Country code zzz followed by an organization code at col.53-55	A3	49-51	64-66	
	Additional area code 1,2,3 or 4 followed by country of origin at col.53-55 T followed by country of original publication at col.53-55 blank if zzz is coded in col.49-51	A1	52	N/A	
	Additional country code	A3	53-55	N/A	
	Short expansion	A20	56-75	N/A	
	Expansion	A48	76-123	(12-61)	
2+	Comment flag + addition to title * full title . translation of title = CINDA comment	A1	44	N/A	
	Comment	A55	45-99	12-66	

The actual journal code is restricted to 4 characters or less. Where journals are subdivided into parts, the part is included in the dictionary with the journal code, and separated from it by a slash; the complete code is restricted to 6 characters, as for example:

ND/A = Nuclear Data, Part A.

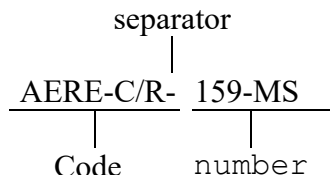
The expansion follows the commonly adopted style for journal titles. However, some abbreviations have been expanded for clarity.

## Dictionary 6: Reports

Line	Contents	Format	Archive	Trans	CHEX
1	Code (CINDA code is 8-character truncation of code)	A11	13-23	1-11	x
	Institute code	A7	44-50	60-66	
	Expansion	A48	51-98	12-59	
	CINDA flag	A1	99	N/A	
	* Expansion not entered in CINDA book dictionary				
2+	Comment flag = CINDA comment	A1	44	12	
	Comment	A54	45-98	13-66	

*Note:* This dictionary contains CINDA codes flagged with the status code CIN, which are not simply truncations of the 10-character EXFOR code.

The codes are 11 characters or less in length. Each code in the dictionary consists of the alphanumeric character string that precedes the actual report number. The final character of the codes given in the dictionary is always a hyphen (-), except in a few cases where the report codes are 11 characters (e.g., IAEA-TEC-DOC); 12th character (not given in the dictionary) is a hyphen. Since the code and the number may both contain hyphens, **the separator is defined as the first hyphen that is followed by a digit or an opening parenthesis**, for example:



Namely a hyphen followed by a digit or an opening parenthesis should not be a part of a report code defined in this dictionary.

**Annual progress reports which do not have a report number given** are assigned an EXFOR report code A-, followed by the 3-digit institute code; when coded, the code is followed by the year for which the report is given.

*Examples:* A-ARK-84 OR A-COL-1999

**The TRANS dictionary 6 is sorted on the institute code** and, within the institute code, by report code. This sorting is different from the Archive and DANIEL Backup dictionary which are sorted by report code.



## Dictionary 7: Conferences

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code (CINDA code is 8-character truncation of code)	A10	13-22	1-10	x
	Expansion	A53	44-96	(12-66)	
	Area code	I1	97	N/A	
	Country code zzz - followed by an organization code at col.102-104	A3	98-100	N/A	
	Additional area code 1,2,3 or 4 followed by country of origin at col.102-104 T followed by country of original publication at col.102-104 blank if zzz is coded at col.98-100	A1	101	N/A	
	Additional country code	A3	102-104	N/A	
	CINDA short code	A10	105-114	N/A	
2+	Long expansion	A55	(44-98)	(12-66)	
3+	Comment flag = CINDA comment	A1	44	12	
	Comment	A54	45-98	13-66	

Conference codes are composed of the year of the conference given in the first 2 digits (up to 1999) or the first 4 digits (from the year 2000) of the code, followed by the place of the conference, which may have up to 6 characters.

**Examples:** 66PARIS  
82ANTWER  
2007NICE

Two conferences at the same place in the same year may be distinguished as shown in the following examples.

66ANL and 66ARGONNE  
80BNL and 80BNL-2  
69WIEN and 69VIENNA

Two expansions may be given: a short expansion, restricted in length to the explanation field of one record, which may be followed by a long expansion, starting on a new record and extending over more than one record. In Archive and DANIEL Backup dictionaries, the short expansion is not enclosed in parentheses.

See also LEXFOR **Reference**.

### Dictionary 8: Elements

Line	Contents	Format	Archive	Trans	CHEX
1	Atomic number of element	I3	13-15	N/A	
	Z-symbol (e.g., 79-AU)		N/A	1-6	
	Element symbol	A2	44-45	N/A	
	Element name	A20	46-65	(12-33)	
2+	Comment	A55	44-98	12-66	

### Dictionary 15: History

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A1	13	1	x
	Short expansion	A15	44-58	(12-28)	
	Expansion	A37	59-95	30-66	
2+	Comment	A55	44-98	12-66	

### Dictionary 16: Status

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A5	13-17	1-5	x
	Internal numerical equivalent	I5	44-48	N/A	x
	Expansion	A52	49-100	(12-65)	
	Subentry number field flag	A1	104	66	x
	R code must be followed by subentry number				
	S code can be followed by subentry number				
2+	Comment	A55	44-98	12-66	

The subentry number field flag may be also used at column 104 of the comment records at the header of the Archive dictionary. It is used to print these comments at the appropriate lines in the Trans dictionary.

### Dictionary 17: Related reference types

Line	Contents	Format	Col	Trans	CHEX
1	Code	A1	13	1	x
	Expansion	A53	44-96	(12-66)	
2+	Comment	A55	44-98	12-66	

### **Dictionary 18: Facilities**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	x
	Expansion	A53	44-96	(12-66)	
	Special use flag NEUT for neutron induced reaction PHOT for photonuclear reaction	A4	97-100	N/A	
2+	Comment	A55	44-98	12-66	

### **Dictionary 19: Incident particle sources**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	x
	Expansion	A53	44-96	(12-66)	
	Special use flag NEUT for neutron induced reaction PHOT for photonuclear reaction	A4	97-100	N/A	
	Delimiter flag = Code may be followed by REACTION code, e.g. (MPH= (reaction) ) , Code may be followed by specific polarized source, e.g. (POLNS, D-T)	A1	101	N/A	x
2+	Comment	A55	44-98	12-66	

### **Dictionary 20: Additional results**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	x
	Expansion	A53	44-96	(12-66)	
2+	Comment	A55	44-98	12-66	

### **Dictionary 21: Methods**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	x
	Expansion	A53	44-96	(12-66)	
	Special use flag FY for fission yield measurement NEUT for neutron induced reaction	A4	97-100	N/A	
2+	Comment	A55	44-98	12-66	

## Dictionary 22: Detectors

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A5	13-17	1-5	x
	Expansion	A53	44-96	(12-66)	
	Special use flag NEU for neutron detection GAM for gamma detection	A4	97-100	N/A	
2+	Comment	A55	44-98	12-66	

## Dictionary 23: Analysis

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A5	13-17	1-5	x
	Expansion	A53	44-96	(12-66)	
	Special use flag RP for resonance parameter analysis PHOT for photonuclear reaction	A4	97-100	N/A	
2+	Comment	A55	44-98	12-66	

## Dictionary 24: Data headings

Line	Contents	Format	Archive	Trans	CHEX
1	Keyword	A10	13-22	1-10	x
	<i>Data type flag 1 (see page 21)</i>	I1	44	N/A	x
	<i>Data type flag 2 (see page 21)</i>	I1	45	N/A	x
	Family flag	A1	46	66	x
	<i>Plotting flag 1 (see page 22)</i>	I1	47	N/A	x
	<i>Plotting flag 2 (see page 22)</i>	I1	48	N/A	x
	<i>Plotting flag 3 (see page 22)</i>	I1	49	N/A	x
	<i>Plotting flag 4 (see page 22)</i>	I1	50	N/A	x
	<i>Plotting flag 5 (see page 22)</i>	I1	51	N/A	x
	<i>Plotting flag 6 (see page 22)</i>	I1	52	N/A	x
	<i>Plotting flag 7 (see page 22)</i>	I1	53	N/A	x
	Unit family code	A4	54-57	N/A	x
	Special use flag (presently not used)	A1	58	N/A	
	Expansion	A54	59-112	12-65	
	Special use flag RHI for relativistic heavy-ion reaction	A4	119-122	N/A	
2+	Comment	A55	44-98	12-66	

The data headings are used in the COMMON and DATA sections to define the contents of data fields.

Keywords should be unique within Dictionary 24 and 25, *i.e.*, a data heading may not be identical to any data unit.

Many headings are identified by a data type flag, plotting flag and family flag, which are used for checking purposes and define the category (i.e., independent variable, dependent variable, associated quantity or additional information) and the family (or independent variable type which is approximately equal to the 1st integer of the data type flag minus 2) within each category, according to the scheme in the following table.

### Family Flags

Family	Flags	
	Variables	Associated Quantities <sup>10</sup>
<u>Independent variables</u>		
Incident energy	A	B
Resonance energy	C	D
Secondary energy <sup>11</sup>	E	F
Angle of outgoing particle	G	H
Product charge	I	
Product mass	J	
Number of particles	P	
Secondary effective mass (obsolete)	S	
Secondary linear momentum	L	
Linear momentum	M	R
Coefficient number	N	
<u>Dependent variable</u>		
Data	*	
<u>Additional information<sup>12</sup></u>		
Sample thickness	K	
Flag	Z	
Sample temperature	8	9
Half life	6	7
Spin J	4	
Momentum <i>l</i>	2	
Parity	0	

### Data Type Flags

1st integer 0: flags, *etc.*

2<sup>nd</sup> integer 1: flag  
 2: decay flag  
 3: level flag  
 9: miscellaneous data

1: assumed values

<sup>10</sup> Associated quantities are those data heading keywords which contain the characters ERR or RSL

<sup>11</sup> Except LVL-INI and LVL-FIN.

<sup>12</sup> In certain cases, these may act as an independent variable with the exception of Flag.

- 2<sup>nd</sup> integer (blank): normalization point  
 1: monitor  
 5: assumed
- 2: data  
 2<sup>nd</sup> integer 1: data  
 2: ratio (*obsolete*)
- 3: resonance parameter  
 2<sup>nd</sup> integer 1: quantum number  
 2: energy
- 4: incident energy  
 2<sup>nd</sup> integer 1: energy  
 2: momentum  
 3: spectrum energy  
 4: spectrum temperature  
 5: wave-length
- 5: secondary energy  
 2<sup>nd</sup> integer 1: particle energy  
 2: level energy  
 3: excitation energy  
 4: Q value  
 5: energy degradation  
 6: energy gain  
 7: level number  
 8: linear momentum  
 9: polarity
- 6: angle  
 2<sup>nd</sup> integer 1: angle  
 2: cosine  
 3: momentum transfer  
 8: wave number
- 7: number  
 2<sup>nd</sup> integer 5: coefficient number  
 8: kq
- 8: other variable  
 2<sup>nd</sup> integer 2: sample temperature  
 3: sample thickness  
 4: polarization  
 5: half-life  
 6: group number  
 7: decay constant
- 9: isotope/particle identification  
 2<sup>nd</sup> integer 1: element  
 2: mass  
 3: isomer  
 4: monitor element  
 5: monitor mass  
 8: effective mass squared (*obsolete*)  
 9: emitted nucleons

## Plotting Flags

(0 is given when none of the flag listed below is applicable for the column)

- col 1-3 - independent variable or its associate
- col 4-6 - dependent variable or its associate
- col 1 & 4: variable
  - 1 - value
  - 2 - minimum
  - 3 - maximum
  - 4 - approximate
  - [5 - one of multiple variables] – *no longer used*
  - 9 - uncertainty or resolution
- if col 1 = 1-5:
  - col 2: 1 - numerator
  - 2 - denominator
- if col 1 or 4 = 9:
  - col 2 & 5: +error; col 3 & 6: -error
    - 1 - error
    - 2 - resolution
    - 3 - half resolution
    - 4 - statistical error
    - 5 - partial error
- col 7 - reference frame flag
  - 1 - c.m. system

## Dictionary 24 Classes (Data type – Heading – Family flag)

The data headings collected in Dictionary 24 are categorized in two ways: the Family flags and two numerical “Data type” flags. (The EXFOR Transmission dictionaries contain only the Family flags.) The following table combines the Data type flags with the headings for which they are used, and with the Family flags.

<b>Data type 1</b>	<b>Ind. var. fam. flag</b>	<b>Data type 1+2</b>	<b>Explanation</b>	<b>Headings</b>	<b>Fam. (value / error)</b>
0 Flags		01	Flag	FLAG	Z
		02	Decay flag	DECAY-FLAG	blank
		03	Level flag	LVL-FLAG	blank
		09	Misc. data	MISC*, LVL*, TIME-IRR, TOF*	blank
1 Assum.		1 blank	Normalization points	*-NRM	blank
		11	Monitor	MONIT*	blank
		15	Assumed	ASSUM*	blank
2 Data		21	Data	DATA*, ERR*	* / blank
		22	Ratio	RATIO* (obsolete)	* / blank
3 Res.Par		31	Quantum number	STAT-W G / SPIN J / MOMENTUM L / PARITY	4 / 4 / 2 / 0
	1	32	Energy	EN-RES*, MU-ADLER	C / D
4 Inc.En.		41	Energy	EN* except 43	A / B

		42	Momentum	MOM*	M / R
		43	Spectrum energy	EN-MEAN*, EN-DUM*	A / B
		44	Spectrum temperature	KT*	A / B
		45	Wave-length	WVE-LN	A
5 Sec.En.	3	51	Particle energy	E, E1, ..., S-MEAN, E-TR, E-RL	E / F
		52	Level energy	E-LVL*	E / F
		53	Excitation energy	E-EXC*	E / F
		54	Q value	Q-VAL*	E / F
		55	Energy degradation	E-DGD*	E / F
		56	Energy gain	E-GAIN*	E / F
		57	Level number	LVL-NUM*, IAS-NUMB	E
		58	Linear momentum	MOM-SEC*, M1-SEC-MAX etc.	L
		59	Polarity	POLAR*	E
6 Angle	4	61	Angle	ANG*	G / H
		62	Cosine	COS*	G / H
		63	Momentum transfer	MOM-TR, q	G / H
		68	Wave number	WVE-NM	G
7 Number	5	75	Coefficient number	NUMBER, NUMBER-CM	N
		78	kq	KQ	N
8 Other	6	82	Sample temperature	TEMP	8 / 9
		83	Sample thickness	THICKNESS	K
		84	Polarization	POL-BM, POL-TR	blank
		85	Half-life	HL*	6 / 7
		86	Group number	GRP-NUM	N
		87	Decay constant	DCNST	N
9 Isot.id.	7	91	Element	ELEMENT, ELEM1, etc.	I
		92	Mass	MASS, MASS-RATIO, etc.	J
		93	Isomer	ISOMER*	J
		94	Monitor element	ELEM-NRM	blank
		95	Monitor mass	MASS-NRM	blank
		98	Effective mass squared	EMS* ( <i>obsolete</i> )	S
		99	Emitted nucleons	PART-OUT	P

### **Dictionary 25: Data units**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Keyword	A10	13-22	1-10	x
	Expansion	A33	44-76	12-44	
	Unit family code	A4	79-82	45-48	x
	Conversion factor	E11	83-93	56-66	x
	Sorting flag (not in backup dictionary)	A3	94-96	N/A	
2+	Comment	A55	44-98	12-66	

The data units are entered in the COMMON and DATA section below the data heading to define the units for the contents of each field.

Keywords are unique within Dictionary 24 and 25, *i.e.*, a data unit may not be identical to any data heading.



Each unit is assigned a unit family code, which provides a cross-link with Dictionary 24 and 236 (Quantities), where the unit family code is also given (see page 31). This facilitates computerized cross-checks for consistency of quantities and units in a data set.

Each unit is also assigned a conversion factor, which is given as a floating-point number and may be used for transforming units with the same dimension to standard units, for example:

energies	to electron-volts (eV);
angles	to degrees;
time	to seconds (s);
length	to meters (m);
cross sections	to barns (b).

In order to standardize the data unit codes, the following will be used:

PRT for outgoing particle, *i.e.*, for particle given in REACTION SF3 or SF7.

PRD for reaction product, *i.e.*, REACTION SF4.

INC for incident projectile, *i.e.*, REACTION SF2.

REAC for reaction, in general, REACTION SF2-SF3, with the exception that FIS will be used for fission.

PC for number of products multiplied by 100.

**Examples:** PRD/FIS or PRT/REAC

### **Dictionary 26: Unit families**

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A4	13-16	N/A	
	Dictionary 24 use	I2	44-45	N/A	
	Dictionary 25 use	I2	46-47	N/A	
	Dictionary 236 use	I2	48-49	N/A	
	Expansion	A50	50-99	N/A	
2+	Comment	A55	44-98	N/A	

### **Dictionary 30: Processes**

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A3	13-15	1-3	x
	Internal numerical equivalent	I10	44-53	N/A	x
	Expansion	A55	54-108	12-66	
	Special use flag	A4	109-112	N/A	
	PHOT for photonuclear reaction				
2+	Comment	A55	44-98	12-66	

### Dictionary 31: Branches

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A5	13-17	1-5	x
	Internal numerical equivalent	I10	44-53	N/A	
	Expansion	A55	54-108	12-66	
	Special use flag PHOT for photonuclear reaction RHID for relativistic heavy-ion reaction	A4	109-112	N/A	
2+	Comment	A55	44-98	12-66	

### Dictionary 32: Parameters

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A3	13-15	1-3	x
	Internal numerical equivalent	I10	44-53	N/A	
	Expansion	A55	54-108	12-66	
	Special use flag RHID for relativistic heavy-ion reaction	A4	109-112	N/A	
2+	Comment	A55	44-98	12-66	

### Dictionary 33: Particles

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A6	13-18	1-6	x
	Internal numerical equivalent <b>1</b> (for REACTION SF2, 3)	I6	44-49	57-62	x
	Internal numerical equivalent <b>2</b> (for REACTION SF7)	I5	50-54	N/A	x
	Allowed subfield flag <b>1</b> D used in BIB keyword other than REACTION	A1	55	63	x
	Allowed subfield flag <b>2</b> <b>2</b> used in REACTION SF2	A1	56	64	x
	Allowed subfield flag <b>3</b> <b>3</b> used in REACTION SF3	A1	57	65	x
	Allowed subfield flag <b>4</b> <b>7</b> used in REACTION SF7	A1	58	66	x
	Expansion	A40	59-98	(12-53)	
2+	Output dictionary number for DANIEL (presently not used)	I2	44-45	N/A	
	Comment	A55	46-100	12-66	

### **Dictionary 34: Modifiers**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	x
	Internal numerical equivalent	I10	44-53	N/A	x
	General quantity modifier flag	A5	54-58	N/A	x
	Expansion	A55	59-113	12-66	
	Special use flag RHID for relativistic heavy-ion reaction	A4	114-117	N/A	
2	Comment flag * replaces EXFOR Transmission dictionary expansion	A1	44	N/A	
	Comment	A55	45-99	12-66	
3+	Comment	A55	45-99	12-66	

### **Dictionary 35: Data types**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	x
	Internal numerical equivalent	I10	44-53	N/A	
	Expansion	A40	54-93	(12-53)	
2+	Comment	A55	44-98	12-66	

### **Dictionary 37: Results**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	x
	Expansion	A53	44-96	(12-66)	
2+	Comment	A55	44-98	12-66	

### **Dictionary 38: Supplemental information**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A5	13-17	1-5	
	Expansion	A53	44-96	(12-66)	
2+	Comment	A55	44-98	12-66	

### **Dictionary 43: NLIB for evaluated data libraries**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	I2	13-14	1-2	
	Expansion	A40	44-83	12-51	
2+	Comment	A55	44-98	12-66	

### Dictionary 45: CINDA quantities

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A3	13-15	1-3	
	Web quantity code	A3	44-46	12-14	
	Expansion	A48	51-98	19-66	
2+	Comment	A55	44-98	12-66	

### Dictionary 47: Old CINDA quantities

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A3	13-15	1-3	
	CINDA REACTION code	A10	44-53	12-21	
	CINDA quantity code	A3	54-56	22-24	
	Flag	A1	59	27	
	* 0 instead of N at column 44 when energy is SPON				
2+	Comment	A55	44-98	12-66	

### Dictionary 48: Alphabetic energy values

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A5	13-17	1-5	
	Short expansion	A10	44-53	12-21	
	Expansion	A45	54-98	22-66	
2+	Comment	A55	44-98	12-66	

### Dictionary 52: CINDA readers

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A2	13-14	1-2	
	Expansion	A55	44-98	12-66	
	Country	A15	104-118	N/A	
2+	Comment	A55	44-98	12-66	

### Dictionary 113: Web quantities

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A3	13-15	1-3	
	Expansion	A55	44-98	12-66	
2+	Comment	A55	44-98	12-66	

## Dictionary 144: **Data libraries**

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A13	13-25	1-13	
	Area code	I1	44	N/A	
	Country code	A3	45-47	N/A	
	zzz - followed by an organization code at col.49-51				
	Additional area code	A1	48	N/A	
	1,2,3 or 4 followed by country of origin at col.49-51 blank – if zzz is coded in col.45-47				
	Additional country code	A3	49-51	N/A	
	Expansion	A52	52-103	15-66	
2+	Comment	A55	44-98	12-66	

## Dictionary 207: **Books**

Line	Contents	Format	Archive	Trans	CHEX
1	Code (CINDA code is 8-character truncation of code)	A10	13-22	1-10	x
	Expansion	A53	44-96	(12-66)	
	Area code	I1	97	N/A	
	Country code	A3	98-100	N/A	
	zzz followed by an organization code at col.102-104				
	Additional area code	A1	101	N/A	
	1,2,3 or 4 followed by country of origin at col.102-104 T followed by country of original publication at col.102-104 blank if zzz is coded at col.98-100				
	Additional country code	A3	102-104	N/A	
	CINDA short code	A10	105-114	N/A	
2+	Long expansion	A55	(44-98)	(12-66)	
3+	Comment flag = CINDA comment	A1	44	12	
	Comment	A54	45-98	13-66	

Book codes give a concise short title of the book, or the family name of the first author.

**Examples:** ABAGJAN - Group Constants for Nuclear Reactor Calculations, Abagjan, et al., 1964  
NEJTRONFIZ - Neytronnaya Fizika, P.Krupchitskiy, 1961

Two expansions may be given: a short expansion, restricted in length to the explanation field of one record, which may be followed by a long expansion, starting on a new record and extending over more than one record. In Archive and DANIEL Backup dictionaries, the short expansion is not enclosed in parentheses.

## **Dictionary 209: Compounds**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Archive</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	A10	13-22	1-10	x
	CINDA code	A5	44-48	N/A	
	Internal numerical equivalent (Field not currently used)	I6	49-54	N/A	x
	(presently not in use)	A13	55-67	N/A	
	(presently not in use)	E5	68-72	N/A	
	(presently not in use)	E11	73-83	N/A	
	Expansion	A25	84-108	(12-38)	
	Compound flag * compound	A1	114	N/A	
2+	Output dictionary number for DANIEL (presently not used)	I2	44-45	N/A	
	Comment	A55	46-100	12-66	

The actual compound codes (*e.g.*, OXI for oxide) are restricted to three characters. The codes are sorted by atomic number of the principal element in the compound.

See also LEXFOR **Chemical Compounds**.

## Dictionary 213: Reaction types

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A4	13-16	1-4	x
	CINDA quantity code	A3	44-46	12-14	
	(presently not in use)	A2	47-48		
	Web quantity code	A3	49-51	17-19	
	Sorting flag	I2	53-54	N/A	
	(for TRANS dictionary 236)				
	(Presently not in use)	A1	55	N/A	
	*				
	Independent variable family flag 1	I1	56	N/A	x
	1 – Resonance energy				
	Independent variable family flag 2	I1	57	N/A	?
	(presently not in use)				
	Independent variable family flag 3	I1	58	N/A	x
	3 – Secondary energy				
	Independent variable family flag 4	I1	59	N/A	x
	4 – Angle				
	Independent variable family flag 5	I1	60	N/A	x
	5 – Number				
	Independent variable family flag 6	I1	61	N/A	x
	6 – Other variable				
	Independent variable family flag 7	I1	62	N/A	x
	7 – Isotope / particle identification				
	Independent variable family flag 8	I1	63	N/A	?
	(presently not in use)				
	Independent variable family flag 9	I1	64	N/A	?
	(presently not in use)				
	Independent variable family flag 10	I1	65	N/A	?
	(presently not in use)				
	Expansion	A46	66-111	21-66	
2+	Comment	A46	66-111	21-66	

## Dictionary 227: Nuclides and natural isotopic mixtures

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A12	13-24	1-12	x
	Internal numerical equivalent	I7	50-56	21-27	x
	Use flag	A1	57	29	x
	Z – not to be used in REACTION SF2,3,7 as well as in DECAY-DATA, DECAY-MON, EN-SEC, HALF-LIFE, MOM-SEC, PART-DET, RAD-DET (where the appropriate particle codes are to be used)				
	Spin and parity	A6	58-63	31-36	
	State ordering flag	A1	64	38	
	* - state ordering uncertain				
	Half-life (in sec)	E11	65-75	39-49	
	Decay flag	A1	76	50	?
	S - stable				
	U - unstable				
	P - particle unstable				
	Isotopic abundance	E11	79-89	54-64	
	Atomic weight	E12	90-101	N/A	
	(in amu, 1 amu=931.49410242 MeV)				
	Explanation	A21	102-122	N/A	
2	Explanation	A21	N/A	14-34	

The **nuclide code** has the format  $Z-S-A(-X)$

- where:
- $Z$  = the charge number, up to 3 digits, no leading zeros;
  - $S$  = the element symbol; 1 or 2 characters;
  - $A$  = the mass number; up to 3 digits, no leading zeros; a single zero denotes natural isotopic composition.
  - $X$  = **G** for the ground state when a metastable state exists  
**M** for the metastable state if only one metastable state exists  
**M1** for the first metastable state  
**M2** for the second metastable state

The code is right adjusted on  $Z$ , *i.e.*, the  $Z$  ends in the 3<sup>rd</sup> position, and continuing with no blanks in the code.

The data associated with a nucleus are taken from the **NUBASE Evaluation**. All ground states and metastable states defined with half-lives longer than 0.1 sec are included.

## Dictionary 235: Work types

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A1	13	1	
	Short expansion	A4	44-47	12-15	
	Expansion	A35	50-84	18-52	
2+	Comment	A55	44-98	12-66	



## Dictionary 236: Quantities

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A30	13-42	1-18 <sup>13</sup>	x
	Reaction type <b>code</b>	A3	44-46	N/A	x
	Reaction dimension code (presently not used)	A1	47	N/A	x
	Unit family code	A4	48-51	19-22	x
	Resonance flag . resonance parameter	A1	52	22	x
	Expansion	A71	53-123	(23-66)	
	Flag 9 Expansion is given in the next line	I1	N/A	66	
2+	<b>Long expansion</b>	A44	(44-87)	(23-66)	
3+	<b>Comment</b>	A44	44-87		

The quantity code is composed of the codes for the REACTION subfields 5 to 8. A short expansion (not enclosed in parentheses) is given as a short definition of the quantity. A longer expansion (in parentheses) may follow on the comment lines.

Resonance parameters are flagged with a “.” in column 52 (Archive) or 22 (TRANS) (immediately preceding the short expansion).

All meaningful combinations of the branch, parameter, particle and modifier codes **that are in use** are included in this dictionary, with the following two exceptions:

- These quantity codes do not include the **general-quantity modifiers** from Dictionary 34
- The Particle Considered Subfield (SF7) may contain a wildcard in place of an explicit code for the *particle considered*:

In order to keep the size of the dictionary to a minimum, specific particles are not always included in the particle designator field (REACTION SF7). Instead, this field may contain a code indicating that a particle designator (or designators) is legal for this quantity.

\* All codes from Dictionary 33 with flag ‘7’

\*F Any fission fragment particle code is allowed, *i.e.*, FF, LF, HF.

If the particle designator is blank, only a blank field is allowed for that quantity<sup>14</sup>.

If more than one particle designator must be given (*e.g.*, for correlations), the codes are given for each particle, separated by slashes.

### Examples:

, AKE, \*F

, DA/DA, \*/\*

<sup>13</sup> If the quantity code length is >18 characters, the code is continued on the same record and followed by blanks and "9" in column 66. The unit family code and the expansion follow on the next record in their assigned fields.

<sup>14</sup> This means that there must be a separate dictionary entry for the quantity with codes in SF7.

The *reaction type* code provides a cross-link to Dictionary 213 through which the necessary independent variables for each quantity (such as angles and secondary energies) are defined. This facilitates computerized checks of whether quantities and variables given in a table are consistent.

The *unit family* code provides a cross-link to Dictionary 25 (Data Units), where the *unit family* code is also given. This facilitates computerized checks of whether quantities and units given in a table are consistent.

**Dictionary 950: List of dictionaries**

<b>Line</b>	<b>Contents</b>	<b>Format</b>	<b>Col</b>	<b>Trans</b>	<b>CHEX</b>
1	Code	I3	N/A	1-3	
	Expansion	A30	N/A	12-41	

## Chapter 4

### RELATIONS BETWEEN QUANTITIES, HEADINGS AND UNITS

The EXFOR quantity dictionary (Dictionary 236) contains several hundred quantities. This is not only inconvenient but also confusing for many users, especially when retrieving data. Furthermore, it presents a challenge for the checking process concerning consistency of the REACTION codes with respect to the correct unit dimensions of the data and required independent variables. This situation is managed by a hierarchy of quantities and certain relations between dictionaries, which are linked by common fields.

The hierarchy of quantities is maintained as follows:

<b>EXFOR quantity</b> →	<b>Reaction type</b> →	<b>CINDA quantity</b> →	<b>Web quantity</b>
>700 codes	~130 codes	~42 codes	~26 codes
Dict. 236	Dict. 213	Dict. 45	Dict. 113

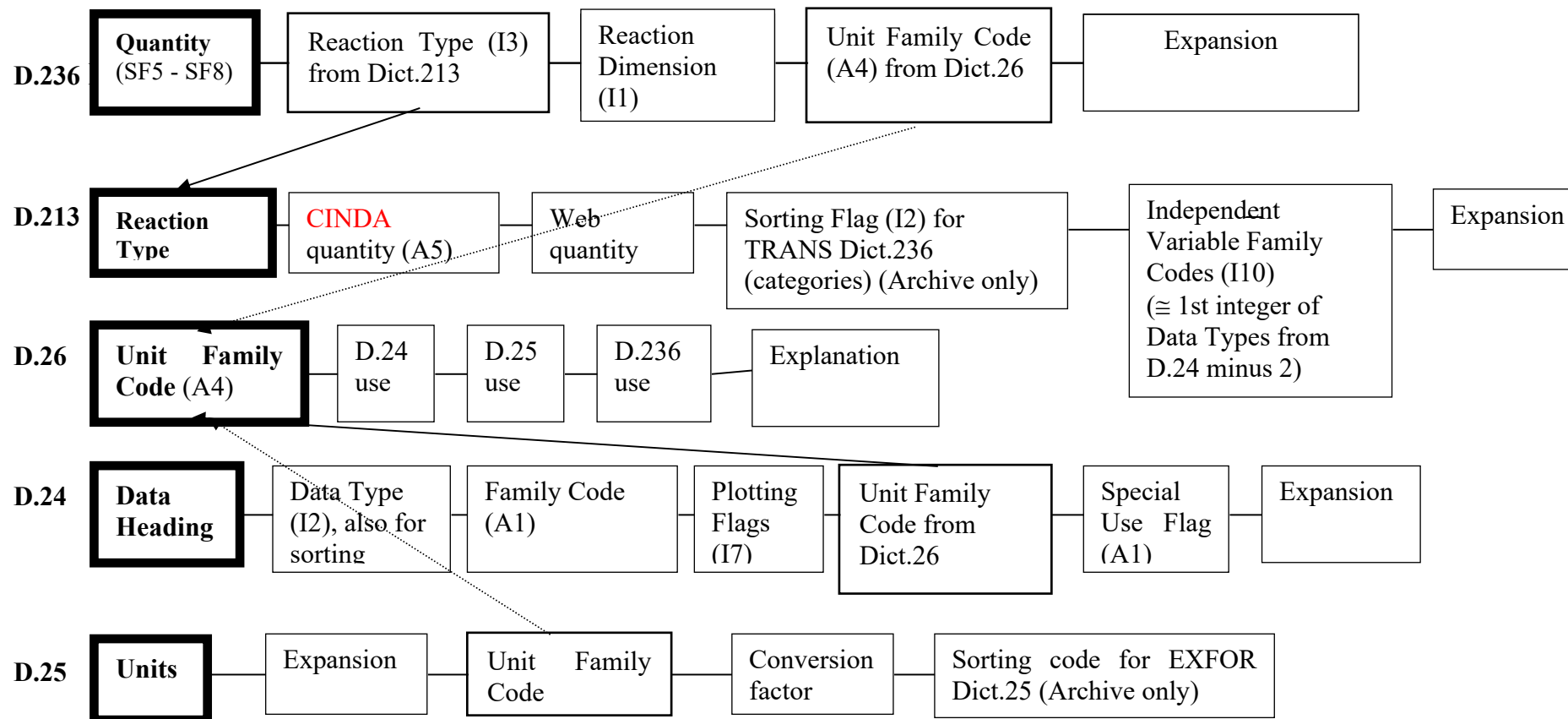
i.e., every EXFOR quantity belongs to only one Reaction Type; every Reaction Type belongs to only one CINDA quantity; and every CINDA quantity belongs to only one Web quantity.

Therefore, users may start their retrievals by selecting – for the target nuclide(s) of interest – just one (or more) of 26 web quantities (EXFOR) or one (or more) of the 42 quantities used in CINDA; they need not be familiar with the details of the many quantities of dictionary 236.

Every quantity of dictionary 236 belongs to one reaction type, which, among other things, determines the required independent variables, and is also assigned a unit family code which determines the allowed data units. These relations are realized by relevant fields which appear in more than one dictionary and are used by the check programs such as CHEX.

When updating the relevant dictionaries, or when compilers propose new codes for quantities, headings or units, it may be useful to visualize these relations which are shown on the figure below.

## Dictionary and Checking Logic around Quantities, Headings and Units





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