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DOCUMENTATION SERIES OF THE IAEA NUCLEAR DATA SECTION

EXFOR/CINDA Dictionary Manual (DRAFT)

last revision edited by

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on behalf of the
International Network of Nuclear Reaction Data Centres

???? 2023

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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.

???? 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:

Name	Report code	Topics	Intended readership
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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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 updates¹ 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

- 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.
- 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.

¹ See NRDC Protocol for dictionary updating procedures.

- 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 June 2014.

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. Expansions² 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.

² 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 ³	Key length ⁴
*1	System Identifiers		≤10
*2	Information Identifiers		≤10
3	Institutes	X	6 – 7
*4	Reference Type		1
5	Journals	X	≤6 ⁵
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 ⁶		≤4
*30	Process (REACTION SF3)		≤3
*31	Branch (REACTION SF5)		≤5 ⁷
*32	Parameter (REACTION SF6)		≤3
*33	Particles		≤6
*34	Modifiers (REACTION SF8)		≤5 ⁵
*35	Data Type (REACTION SF9)		≤5
*37	Result		≤5
38	Supplemental information		≤5
43	NLIB for Evaluated Libraries		≤2
45	CINDA Quantities		≤3
47	Old CINDA Quantities		≤3
48	Spectrum Averaged Energy Codes		≤5
52	CINDA Reader Codes		≤2
113	Web Quantities		≤3
144	Data Libraries for CINDA		≤13
207	Books	X	≤10
209	Chemical Compounds	X	7-10

³ Additional code is given in Chapter 3.

⁴ Key = keyword or code

⁵ Normally limited to a four-character code. The rest two characters are reserved for subdivisions such as APPL/A.

⁶ Only Archive and DANIEL Backup Dictionaries

⁷ Normally limited to a three-character code. 5 characters are allowed for parenthesized codes such as (CUM).

Dict. #	Name	Additional code ³	Key length ⁴
213	REACTION Types		≤4
227	Nuclides	X	3-12
235	Work type		1
*236	Quantities	X	30
950	List of Dictionaries ⁸		3

*Additions to these dictionaries require NRDC approval.

⁸ 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 ≥ 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

Line	Contents	Format	Archive	Trans	CHEX
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.

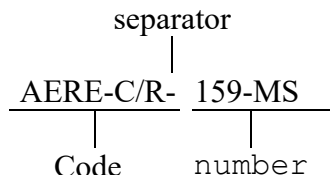
The expansion follows the commonly adopted style for journal titles. However, some abbreviations have been expanded for clarity.

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

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 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	

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

Line	Contents	Format	Archive	Trans	CHEX
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

Line	Contents	Format	Archive	Trans	CHEX
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

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

Dictionary 21: Methods

Line	Contents	Format	Archive	Trans	CHEX
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 ⁹
<u>Independent variables</u>		
Incident energy	A	B
Resonance energy	C	D
Secondary energy ¹⁰	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 information¹¹</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.*

2nd integer 1: flag
 2: decay flag
 3: level flag
 9: miscellaneous data

1: assumed values

⁹ Associated quantities are those data heading keywords which contain the characters ERR or RSL

¹⁰ Except LVL-INI and LVL-FIN.

¹¹ In certain cases, these may act as an independent variable with the exception of Flag.

- 2nd integer (blank): normalization point
 1: monitor
 5: assumed
- 2: data
 2nd integer 1: data
 2: ratio (*obsolete*)
- 3: resonance parameter
 2nd integer 1: quantum number
 2: energy
- 4: incident energy
 2nd integer 1: energy
 2: momentum
 3: spectrum energy
 4: spectrum temperature
 5: wave-length
- 5: secondary energy
 2nd 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
 2nd integer 1: angle
 2: cosine
 3: momentum transfer
 8: wave number
- 7: number
 2nd integer 5: coefficient number
 8: kq
- 8: other variable
 2nd integer 2: sample temperature
 3: sample thickness
 4: polarization
 5: half-life
 6: group number
 7: decay constant
- 9: isotope/particle identification
 2nd 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.

Data type 1	Ind. var. fam. flag	Data type 1+2	Explanation	Headings	Fam. (value / error)
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

Line	Contents	Format	Archive	Trans	CHEX
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 1 (for REACTION SF2, 3)	I6	44-49	57-62	x
	Internal numerical equivalent 2 (for REACTION SF7)	I5	50-54	N/A	x
	Allowed subfield flag D used in BIB keyword other than REACTION 2 used in REACTION SF2 3 used in REACTION SF3 7 used in REACTION SF7	A4	55-58	63-66	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

Line	Contents	Format	Archive	Trans	CHEX
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	44-98	12-66	

Dictionary 35: Data types

Line	Contents	Format	Archive	Trans	CHEX
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

Line	Contents	Format	Archive	Trans	CHEX
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

Line	Contents	Format	Archive	Trans	CHEX
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

Line	Contents	Format	Archive	Trans	CHEX
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 for **CINDA**

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 or 4C (Four Centres) 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	A53	(44-98)	(12-66)	
3+	Comment flag	A1	44	12	
	= CINDA comment				
	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

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A10	13-22	1-10	x
	CINDA code	A5	44-48	N/A	
	Internal numerical equivalent	I6	49-54	N/A	x
	(Field not currently used)	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
	A-symbol (e.g., 197AU)	A6	44-49	14-19	
	Internal numerical equivalent	I7	50-56	21-27	x
	Use flag	A1	57	29	x
	<i>z</i> – 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	
	Half-life flag	A1	64	38	
	~ about				
	< less than				
	Half-life	E11	65-75	39-49	
	Half-life unit	A3	76-78	50-52	x
	Isotopic abundance	E10	79-88	54-64	
	Atomic weight	E13	89-101	N/A	
	Explanation	A21	102-122	N/A	
2	Explanation	A21	N/A	14-34	

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

- 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.

The code is right adjusted on *Z*, *i.e.*, the *Z* ends in the 3rd position, and continuing with no blanks in the code. All metastable states are labelled as –M.

The data associated with a nucleus are taken from the Nuclear Wallet Cards and the Atomic Mass Evaluation (AME) Tables. All nuclides given in the Nuclear Wallet Cards 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	A20	50-69	18-37	
2+	Comment	A55	44-98	12-66	

Dictionary 236: Quantities

Line	Contents	Format	Archive	Trans	CHEX
1	Code	A30	13-42	1-18 ¹²	x
	Reaction type code	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+	Long expansion	A44	(44-87)	(23-66)	
3+	Comment	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 quantity¹³.

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, */*

¹² 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.

¹³ 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

Line	Contents	Format	Col	Trans	CHEX
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:

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

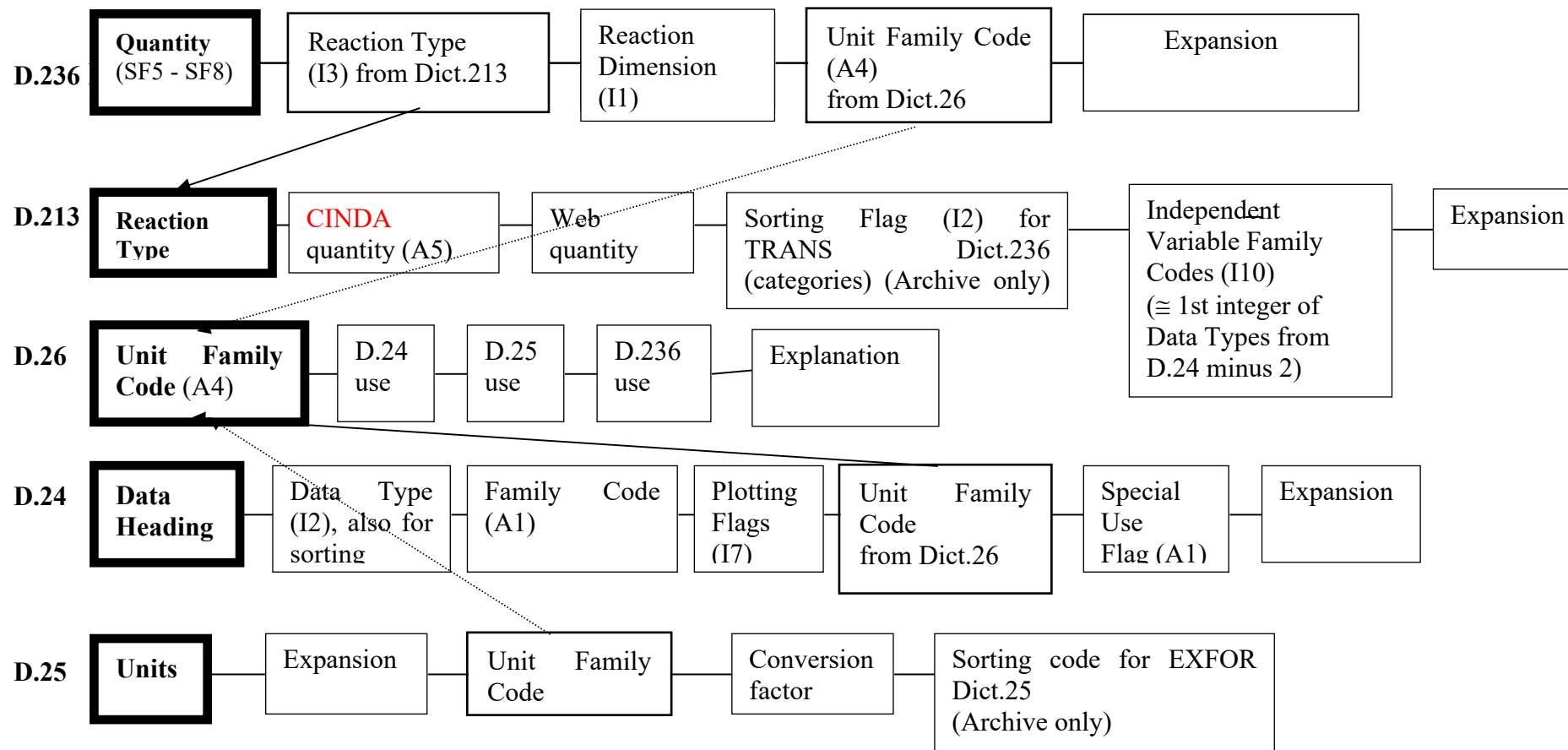
i.e., every EXFOR quantity belongs to only one Reaction Type; every Reaction Type belongs to only one CINDA quantity; and every CINDA quantity belongs to only one Web quantity.

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



Appendix: Example of Archive Dictionaries

(Format: "a" is similar to "A" but signifies the format is not the same in the INDEX record. Note that the length of the key field in the INDEX record is usually 10 characters more than the actual length given in this table. * is similar to + but this boundary is not seen in the INDEX record.)

		Alteration flag	Status field	Date field	Key field	Explanation field
Dictionary 1 (System identifier)		AA3	I6	A30	A80	
				A10	I9	a55
		TRA	198202	ENTRY	3 First record of each work (accession number).	
		TRA			N1=5-digit accession number	
	TRA				N2=date of entry on file or last update (yyyymmdd)	
Dictionary 2 (Information identifier)				A10	A25	AI2AI3
		TRA	198202	DETECTOR	Detector	B120 22
Dictionary 3 (Institutes)				A7	A3 ia3 A53	A15
		TRA	199306	2ZZZGEL	GEL2ZZZInst. for Ref. Mat. and Meas. (IRMM), Geel Belgium	
		TRA			formerly Bureau Central des Mesures Nucleaires,	
		TRA			Commission of European Communities.	
	TRA				=(until 1992, BCMN, before that EURATOM)	
Dictionary 4 (Reference types)				A	A4 i3 A35	
		TRA	198307	J	JOUR 5Journal	
Dictionary 5 (Journals)				A6	A4 ia3 aa3 A20	A48
		TRA	199406	BJE	BJE 3CZR3SLKBezpecnost Jad.En. Bezpecnost Jaderne Energie	
		TRA			.Safety of Nuclear Energy	
		TRA			=(continuation of JE, started in 1993)	
Dictionary 6 (Reports)				A11	A7 A48	A
		TRA	198202	BARC-	3INDTRMB.A.R.C., Trombay report series	
		TRA			Starts with BARC-276 (1967)	
	TRA			=(formerly AEET- series)		

	Alteration flag	Status field	Date field	Key field	Explanation field
Dictionary 7 (Conferences)	AA3	I6	A30	A80	
			A10	A53	ia3 aa3 A10
			76ANL		>*->+*->+----->
	TRA	198610			Meet.Fast Neutr.Cross Sect.of U and Pu,Argonne 1976 1USA 76ANL
	TRA				(Meeting on Fast Neutron Cross Sections of U-233,235,238 and Pu-239, Argonne, USA, 28-30 Jun 1976) Some papers published in CONF-7606-47.
Dictionary 8 (Elements)			i3	A2A20	
	TRA	198202	13		+>+-----> ALAluminium
Dictionary 15 (History)			A	A15	a37
			>		+----->+----->
	TRA	198307	D		Deleted Entry or subentry deleted This must be followed by free text justifying the deletion.
Dictionary 16 (Status)			A5	I5	a52
	TRA	198202	OUTDT		+----->+-----> A 92Normalization out-of-date + Reason or cross-reference to renormalized data S
Dictionary 17 (Related reference types)			A	A53	
			+		+----->
	TRA	198202	R		Reference from which data were used Do not use this code for references coded under MONIT-REF
Dictionary 18 (Facilities)			A5	A53	A4
	TRA	200908	NGEN		+----->+-----> Neutron generator NEUT To be used when specific type is unknown
Dictionary 19 (Incident particle sources)			A5	A53	A4 A
	TRA	199801	POLNS		+----->+-----> Polarized neutron source NEUT,

	Alteration flag	Status field	Date field	Key field	Explanation field
Dictionary 20 (Additional results)	AA3	I6	A30	A80	
			A5	A53	
			+	+	
	TRA	198202	POT	Parameters of nuclear potential	
	TRA			e.g., barrier heights or deformation	
Dictionary 21 (Methods)			A5	A53	A4
			+	+	+
	TRA	198903	FLUX	Neutron flux monitoring	
	TRA			by a reaction to be coded under MONITOR	
Dictionary 22 (Detectors)			A5	A53	A4
			+	+	+
	TRA	200503	GE	Germanium detector	
	TRA	200503		to be used when specific type is not known	
Dictionary 23 (Analysis)			A5	A53	A4
			+	+	+
	TRA	201307	AREA	Area analysis	
	TRA			For derivation of resonance parameters	
Dictionary 24 (Data headings)			A10	IIAiiiiiiiA4 Aa54	a4
			+	+	+
	TRA	198202	EN-ERR	41B9110000E Uncertainty in incident projectile energy	
	TRA			for monoenergetic incident projectile energy or	
	TRA			for central energy in an incident projectile spectrum.	
Dictionary 25 (Data units)			A10	a33	A4 E11 a3
			+	+	+
	TRA	198307	MB	millibarns	
				B	1.E-3Z
Dictionary 26 (Unit families)			A4	I2I2I2A50	
			+	+	
	INT	199411	E	242536energy	
Dictionary 30 (Processes)			A3	I10	A55
			+	+	+
	TRA	198202	THS	70Thermal neutron scattering	
	TRA			involving molecular and crystalline binding vibrations	

	Alteration flag	Status field	Date field	Key field	Explanation field
Dictionary 31 (Branches)	AA3	I6	A30	A80	
			A5	I10 A55	A4
			TRA 198610 (CUM)		72Compiler uncertain if cumulative Application of the code 'CUM' uncertain. Explanation is obligatory. To be used only with process codes 'F' or 'X'
Dictionary 32 (Parameters)			A3	I10 A55	A4
			TRA 198307 SIG		1Cross section (Integral) cross-section for the formation of the specified product nucleus or the specified reaction- type (x,y)
Dictionary 33 (Particles)			A6	I6 I5 A4 A40	
			TRA 198202 G		0 2D237Gammas 13 except decay gammas
Dictionary 34 (Modifiers)			A5	I10 A5 A55	A4
			TRA 200908 RAB		60 times nat.abund.div.by abund.of targ.of 1st term *times natural isotopic abundance, divided by isotopic abundance of target of first term of REACTION sum
Dictionary 35 (Data types)			A5	I10 A40	
			TRA 198202 EVAL		9Evaluated data Using best available experimental and theoretical information
Dictionary 37 (Results)			A5	A53	
			TRA 199007 FRCUM		Fractional cumulative yield Ratio of cumulative yield to chain yield
Dictionary 38 (Supplemental information)			A5	A53	
			TRA 201906 INCSP		Incident particle spectrum

	Alteration flag	Status field	Date field	Key field	Explanation field
Dictionary 43 (NLIB for evaluated data libraries)	AA3	I6	A30		A80
			i2		A40
			+>		+----->
	TRA	200902	33		FENDL/E, FENDL/C, FENDL/D
	TRA				FENDL/E (neutrons, full evaluations);
	TRA				FENDL/C (charged particles, fusion reactions);
	TRA				FENDL/D (decay data)
Dictionary 45 (CINDA quantities)			a3		a3 a48
			+>		+--> +----->
	TRA	200205	KE		E Kinetic energy
Dictionary 47 (Old CINDA quantities)			a3		A10 a3 a
			+>		+----->+> >
	TRA	200406	NUD		N,F NUD *
Dictionary 48 (Alphabetic energy values)			A5		A10 a45
			+>		+----->+----->
	TRA	200406	SPON		Spont Spontaneous fission
Dictionary 52 (CINDA readers)			a2		a55
			+>		+-----> A15
	TRA	200509	J		Japan Charged-Particle Nuclear Reaction Data Group
	TRA				Sapporo Japan
Dictionary 113 (Web quantities)			a3		a55
			+>		+----->
	TRA	201412	MFQ		Fission neutron quantities
Dictionary 144 (Data libraries for CINDA)			A13		ia3 aa3 a52
			+>		>*->*->+----->
	TRA	200902	VIEN-V		3ZZZ IAEVarious International Evaluated Neutron data (VIEN)
Dictionary 207 (Books)			A10		A53 ia3 aa3 A10
			+>		+----->*>+>+----->
	TRA	198312	LEDERER-7		C.M.Lederer, Table of Isotopes, 7th Ed., 1978 1USA LEADERER-7
	TRA				(C.M.Lederer, V.S.Shirley, ed., Table of Isotopes, 7th
	TRA				Ed., Wiley and Sons, 1978)

	Alteration flag	Status field	Date field	Key field	Explanation field
Dictionary 209 (Compounds)	AA3	I6	A30		A80
			A10		A5 I6 A13 E5 E11 A25 a
			1-H-ARM		H ARM 13701 Aromatic compounds *
			200908		9 except benzene, benzyl compounds, phenol and phenyl
					9 compounds
Dictionary 213 (Reaction types)			A4		a3 a2a3 i2aiiiiiiiiia46
			DPR		DAP DAP 8 1 34 Partial angular distribution at resonance
Dictionary 227 (Nuclides)			A12		A6 I7 AA6 AE11 A3 E10 E13 A21
			6-C-12		12C 60120 +0. 98.93 12000000.0
Dictionary 235 (Work types)			A		a4 A20
			E		Expt Experimental
Dictionary 236 (Quantities)			A30		A3 AA4 Aa71
			,TTY/MLT		TT PYT Outg.part.mult.f.thick tgt,fct.of beam curr.
					(Outgoing particle multiplicity for thick target as a function of beam current)
					Obsolete. Use ,MLT,,TT/CH

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