2 - REACTION QUANTITY

Format

Columns 6 - 8 — code for reaction quantity measured or calculated. Left adjusted for two letter codes. The internal sortcode defines the order in which reactions are listed in the CINDA book.

Neutron nuclear scattering

SEL	5	Elastic
DEL	7	Differential elastic
POL	9	Polarization
POT	11	Potential
SIN	13	Total inelastic
DIN	15	Differential inelastic
SCT	19	Elastic + inelastic

Neutron production

N2N	39	(n,2n)
NXN	41	(n,3n)(n,4n)...
NEM	43	Neutron emission

Gamma ray production

NG	29	(n, γ)
RIG	31	Capture res. integral
SNG	33	(n,γ) gamma spectrum
DNG	35	Inelastic γ
NEG	37	Nonelastic γ

Charged particle production

NP	45	(n,p)
NNP	47	(n,np)
PEM	48	
ND	49	
NND	51	
DEM	52	
NT	53	
NNT	55	
TEM	56	
NHE	57	
NA	59	
NNA	61	
AEM	62	

Fission

NF	63	Fission
RIF	65	Fission resonance integral
ALF	67	Alpha
ETA	69	Eta
NU	71	Nu
NUD	73	Delayed neutrons
NUF	73	Fragment neutrons
SFN	77	Fission neutron spectrum
SFG	79	Fission γ spectrum
FPG	81	Fission product γ
FPB	82	Fission product β
NFY	83	Fragment yield
FRS	85	Fragment energy and/or
	87	angular distribution
CHG		Fragment charge distribution

Aggregate cross sections

TOT	3	Total
SNE	21	Nonelastic
NX	44	Nuclide production
ABS	23	Absorption
RIA	25	Absorption resonance integral

Resonance parameters

RES	89	Resonance parameters
STF	91	Strength function
LDL	93	Level Density

Gamma-induced reactions

GN	95	(γ,n)
GF	97	Photo fission

Special quantities

EVL	1	Evaluation (used in addition to other specific quantities)
TSL	17	Thermal scattering

CINDA quantities are of necessity rather broad in scope so that the file can be kept manageably small. Further subdivision of most quantity categories is available in the EXFOR system for numerical data exchange. Uhere possible any further necessary information on measured or calculated reaction quantities should be mentioned in the CINDA comment field. For example, the CINDA quantity NP covers all measured properties of the (n,p) reaction.

Example :

$\sigma_{n,p}\ (E_n)$	comment	INTEGRAL SIG or SIG(E)
$\sigma_{n\ p}(E_{n;}\ \theta)$	comment	ANG DIST or similar
$\sigma_{n\ p}(E_n;E_p)$	comment	E DIST, P SPECT, etc.
$\sigma_{n,p}(E\ _{n;}E_{p,}\theta)$	comment	E + ANG DIST. etc.

$$\int_{E_{min}}^{E_{max}} \frac{\sigma_{n,p}\ (E)}{E}\ dE$$ Resonance integral

CINDA CROSS SECTION QUANTITY SCHEMES

```
|___________________________
|       |              |
TSL            SCT            SNE*
               |              |
               |   _________________
               |   |                |
               |   |                ABS*
        _______|   |                |
       |       |   |    ___________ _|_______________________________________
       |       |   |   |       |    |     |    |     |     |    |   |   |   |   |
       SEL* SIN*      NF* N2N NXN NNP NND NNT NNA NHE NP ND NT NA NG*
       |____________________________________________________|
                          NEM
```

* In contrast to the unmarked quantities, these reactions have separate codes for partial cross-sections (SEL/POL, SIN/DIN), differential data (SEL/DEL, SIN/DIN), gamma-emission data (DIN/DNG, SNE/NEG, NG/SNG) or resonance integrals (ABS/RIA, NF/RIF, NO/RIG or RIA).

<u>Note</u> : the following quantities include or are deduced from (measurements of) (several) other auantities: EVL, POL, RES, STF, LDL, NX.

Associated fission quantities

ALF, ETA, NU, SFG, SFN, NUD, NUF, NFY, FRS, FPB, FPG

Charged particle emission quantities

PEM, DEM, TEM, AEM

These are sums of processes from which emergent charged particles can be detected, weighted for the number of charged particles produced. The code PEM, representing proton emission, may include the summed quantities NP and NNP; similarly for the other three charged particle emission codes given above.

The Convention of least Z

Particularly for light element reactions, some quantities can legitimately be expressed in several ways. To get uniformity a general rule covers this possibility : the quantity listed refers to the lightest (one or two) particles emerging, and for equal atomic number A to the particle with least Z.

Examples :

1. Break-up of deuterons by neutrons is listed as d(n,2n) (coded as H002 N2N)

2. Li-6+n $\rightarrow$ T+α is listed as Li-6(n,t) and not as Li-6(n,α). Even if the experiment concerns the energy spectrum of emergent alphas it is listed as : Li-6(n,t) but with a comment such as ALPHA E SPECT.

The following table lists all possible light nuclei reactions, together with their thresholds (taken from URCL-1400 - May, 1964, R.J. Howerton et al. "Thresholds of Nuclear Reactions"). The list is adapted from the EXFOR MANUAL (EXFOR is the format in which numerical neutron data are exchanged between Centres). According to the “convention of least Z” these reactions shall be described by the one or two lightest out-going particles. However, there are some exceptions to this rule.

For example :

Li-7(n,2ndα) is coded as NND to avoid confusion with
Li7(n,2n),Li-6 coded as N2N

C-12(n,npt2α) is coded as NNT because NNP means
C-l2(n,np)B-11

	Reaction	Threshold	CINDA Entry	Notes
		(MeV)	1 2 3 4 5 6 7 8	
Z=1	H-l(n,γ)H-2	0	H O O 1 N G	(where NG is
	H-2(n,γ)H-3	0	H 0 0 2 N G	permitted, SNG
	H-2(n,2n p)	3.34	H 0 0 2 N 2 N	and RIA are of
	H-3(n,2n d)	8.35	H 0 0 3 N 2 N	course accepted
	H-3(n,3n p)	11.31	H 0 0 3 N X N	too).
Z=2	He-3(n,γ)He-4	0	H E 0 0 3 N G	
	He-3(n,p t)	0	H E 0 0 3 N P	
	He-3(n,2d)	4.35	H E 0 0 3 N D	
	He-3(n,n p d)	7.32	H E 0 0 3 N N P	
	He-3(n,2n 2p)	14	H E 0 0 3 N 2 N	
	He-4(n,d t)	21.97	H E 0 0 4 N D	
	He-4(n,n p t)	24.76	H E 0 0 4 N N P	
	He-4(n,2n)He-3	25.72	H E 0 0 4 N 2 N	
	He-4(n,n 2d)	29.80	H E 0 0 4 N N D	
Z=3	Li-6(n,γ)Li-7	O	L I 0 0 6 N G	
	Li-6(n,tα)	0	L I 0 0 6 N T	$\leftarrow$ More usually,
	Li-6(n,n dα)	1.71	L I 0 0 6 N N D	the alpha par
	Li-6(n,p)He-6	3.19	L I 0 0 6 N P	ticle is obser
	Li-6(n,2n pα)	5.43	L I 0 0 6 N 2 N	ved. If so,
	Li-6(n,n t)He-3	18.42	L I 0 0 6 N N T	mention it in
	Li-7(n,γ)Li-8	0	L I 0 0 7 N G	the comment
	Li-7(n,n tα)	2.81	L I 0 0 7 N N T	field.
	Li-7(n,2n)Li-6	8.29	L I 0 0 7 N 2 N	
	Li-7(n,d)He-6	8.87	L I 0 0 7 N D	
	Li-7(n,2n da)	11.06	L I 0 0 7 N 2 N	
	Li-7(n,n p)He-6	11.41	L I 0 0 7 N N P	
	Li-7(n,3n pa)	14.76	L I 0 0 7 N X N	

	Reaction	Threshold (MeV)	CINDA Entry 1 2 3 4 5 6 7 8	Notes
Z=4	Be-9(n,y)Be-10	0	B E O O 9 N G	
	8e-9(n,a)He-6	0.67	B E 0 0 8 N A	
	Be-9(n,2n 2a)	1.85	B E O O 9 N 2 N	
	Be-9(n,t)Li-7	11.59	B E O O 9 N T	
	Be-9(n,p)Li-9	14.74	B E O O 9 N P	
	Be-9(n,d)Li-8	16.28	B E O O 9 N D	
	Be-9(n,n d)Li-7	18.54	B E O O 9 N N D	
	Be-9(n,n p)Li-8	18.76	B E O O 9 N N P	
	Be-9(n,n t)Li-6	19.66	B E O O 9 N N T	
	Be-9(n,3 n)Be-7	22.85	B E 0 0 9 N X N	
	Be-9(n,n He-3)He-6	23.54	B E O O 9 N H E	(No separate quantity exists for n,n,He).
Z=5	B-lO(n,y)B-11	0	B O 1 0 N G	
	B-lO(n,p)Be-10	0	B O 1 0 N P	
	B-lO(n,t 2a)	0	B O 1 0 N T	← Via Be-8, Li-7**,or
	B-lO(n,a)Li-7	0	B O 1 0 N A	3 particle break up
	B-lO(n,d)Be-9	4.79	B O 1 0 N D	to ground state and
	B-lO(n,na)Li-6	4.90	B O 1 0 N N A	1st excited state;
	B-lO(n,n d 2a)	6.62	B O 1 0 N N D	the 2nd excited
	B-lO(n,n p)Be-9	7.24	B O 1 0 N N P	state decays to t+a
	B-lO(n,2n p 2a)	9.28	B 0 1 0 N 9 N	
	B-lO(n,He-3)Li-8	17.32	B O 1 0 N H E	
	B-lO(n,n He-3)Li-7	19.56	B O 1 0 N H E	←(No separate quant ity for n,n He-3).
	B-lO(n,n t)Be-7	20.54	B O 1 0 N N T	
	B-lO(n,3n)B-8	29.72	B O 1 0 N X N	

	Reaction	Threshold (MeV)	CINDA Entry 1 2 3 4 5 6 7 8	Notes
	B-ll(n,a)Li-8	7.23	B O 1 1 N A	
	B-ll(n,na)Li-7	9.44	B O 1 1 N N A	
	B-ll(n,d)Be-10	9.82	B O 1 1 N D	
	B-ll(n,t)Be-9	10.42	B O 1 1 N T	
	B-ll(n,p)Be-11	11.70	B O 1 1 N P	
	B-ll(n,n p)Be-10	12.25	B O 1 1 N N P	
	B-ll(n,n t 2a)	12.25	B O 1 1 N N T	
	B-ll(n,2n)B-10	12.50	B 0 1 1 N 2 N	
	B-ll(n,n d)Be-9	17.25	B O 1 1 N N D	
	B-ll(n,3n p 2a)	21.70	B 0 1 1 N X N	
	B-ll(n,He-3)Li-9	25.73	B O 1 1 N H E	
	B-ll(n,n He-3)Li-8	29.68	B O 1 1 N H E	(No separate quan tity for n,nHe-3).

	Reaction	Threshold (MeV)	CINDA Entry 1 2 3 4 5 6 7 8	Notes
Z=6	C-12(n,y)C-13	0	C 0 1 2 N G	Carbon is a "nearly
	C-12(n,a)Be-9	6.17	C 0 1 2 N A	monoisotopic" ele
	C-12(n,n 3a)	7.98	C 0 1 2 N N A	meet; input pro
	C-12(n,p)B-12	13.63	C 0 1 2 N P	grams will not
	C-12(n,d)B-11	14.87	C 0 1 2 N D	accept a natural's'
	C-12(n,n p)B-11	17.29	C 0 1 2 N N P	target.
	C-12(n,t)B-10	20.50	C 0 1 2 N T	
	C-12(n,2n)C-11	20.28	C 0 1 2 N 2 N	
	C-12(n,He-3)Be-10	21.09	C 0 1 2 N H E	(No separate quan
	C-12(n,n He-3)Be-9	28.47	C 0 1 2 N H E	tity for n,nHe-3)
	C-12(n,n d)B-10	27.28	C 0 1 2 N N D	
	C-12(n,n p t 2a)	29.65	C 0 1 2 N N T	Not NNP.
	C-12(n,3n)C-10	34.47	C 0 1 2 N X N	

<u>Note</u> At one time, reactions with incident neutron energies > 20 MeV were excluded from CINDA. This arbitrary limit has now been dropped, but there are still very few entries for neutron energies above 15 MeV.

Forbidden ZAQ Combinations

In addition to fission quantities and RIG, the following combinations are forbidden for Z < 6 :

```
H 001 ABS
      AEM
      DEM
      DIN
      DNG
      GN
      NA
      ND
      NEG
      NEM
      NHE
      NNA
      NND
      NNP
      NNT
      NP
      NT
      NXN
      N2N
      PEM
      SCT
      SIN
      SNE
      TEM

H 002 AEM
      DEM
      DIN
      NA
      ND
      NHE
      NNA
      NND
      NNP
      NNT
      NP
      NT
      NXN
      SIN
      TEM
      PEM

H 003 AEM
      NA
      ND
      NHE
      NNA
      NND
      NNP
      NNT
      NP
      NT
      TEM

HE 003AEM
      NA
      NHE
      NNA
      NND
      NNT
      NT
      NXN

HE 004AEM
      NA
      NHE
      NNA
      NNT
      NP
      NT
      NXN

LI    NA
      ND
      NHE
      NNA
      NND
      NT

LI 006NA
      ND
      NHE
      NNA
      NNP
      NXN

LI 007NA
      NHE
      NNA
      NND
      NP
      NT

BE 009 NNA
```

Indirectly deduced values

If a value has been obtained simply by subtraction or addition of the quantity measured with a value taken from other work or a compilation such as BNL 325, enter only the measured quantity.

Inverse reactions

Charged-particle reactions from which useful information can be deduced about an inverse neutron-induced reaction should be entered under the target and cross-section of the neutron-induced reaction. However, only a small proportion of measurements do give enough information to apply the principle of detailed balance. If such an entry is made, the energy range for the reaction must be converted, at least approximately.

(d,p) and (d,pf) reactions

Useful information can be deduced about the equivalent (n,γ) and (n,f) reactions; entries should be made under NG or NF with an appropriate note in the comments.

DEFINITION OF QUANTITY CODES IN CINDA

Reaction (Goldstein notation)	Code	Expansion in CINDA book	
			Neutron nuclear scattering
$\sigma_{n,n}(E)$	SEL	Elastic	Definition : The total elastic scattering cross-section, integrated over all angles. Scattering amplitude measurements are entered under Elastic, with a note in the comment. Associated quantities : DEL, POL, POT.
$\sigma_{n,n}(E,\theta)$	DEL	Diff Elastic	Definition : Angular distribution (not normalized) or differential scattering cross-section (normalized) for elastically scattered neutrons. Where the author has integrated a distribution already normalized at one angle to give the total elastic scattering cross-section enter also under Elastic. Associated quantities : SEL, POL, POT.
	POL	Polarization	Definition : All polarization measurements for neutrons in the exit channel, following scattering or any other reaction. Associated quantities : DEL. In entries for work published before 1970, polarisation measurements are likely to be entered only as DEL. Where readers notice such cases, they should make a POL entry for that target.
	POT	Potntal Scat	Definition : A theoretical construction : that part of the scattering cross-section which corresponds physically to scattering by a hard sphere. Use : For the non-resonant part of scattering cross-section in resonance region. This quantity currently not much found in literature.

Reaction (Goldstein notation)	Code	Expansion in CINDA book

Reaction (Goldstein notation)	Code	Expansion in CINDA book	
$\sigma_{n,n'}(E)$	SIN	Tot Inelastc	Definition : Total cross-section for neutron inelastic scattering, i.e. for neutron excitation of levels in the target nucleus above the ground state. Use : Only for the cross-section integral over all levels excited and all angles. Angular distributions of inelastic neutrons and cross-sections for excitation of specific levels are entered under DIN. Inelastic slow neutron scattering, where energy is lost to or gained molecular excitations, should entered under TSL = Thermal Scat. Note : Some literature uses the term "inelastic" where "nonelastic" is meant in the sense of these definitions. Associated quantities : DIN, DNG.
$\sigma_{n,n'}(E,\theta)$ $\sigma_{n,n'}(E;E')$ $\sigma_{n,n'}(E;E',\theta)$	DIN	Diff Inelast	Definition : Angular distributions or energy spectra of inelastically scattered neutrons. Examples of use : 1) cross-sections for scattering to the 6.14 MeV level in 0-16, the reaction 0-16(n,n')0-16; 2) the angular distribution of inelastically scattered 14 MeV neutrons from Ca-40; 3) the energy spectrum recorded at 90 scattering angle for inelastically scattered neutrons Note: As for Tot Inelastic. the category covers only nuclear scattering. Associated quantities : SIN, DNG.

$\sigma_{nS}(E)$ $\sigma_{nS}(E,\theta)$	SCT	Scattering	Definition : Information on the total scattering cross section, ($\sigma_{nS} = \sigma_{n,n}(E) + \sigma_{n,n'}(E)$) Use : for experiments at neutron energies above threshold for inelastic scattering, below the (n,2n) threshold, and in which neutron energy groups are not resolved. Remember, "n-p scattering" is SEL or DEL. This quantity includes both the integrated cross section and neutron angular distributions.Give extra information in the comment if necessary : ANGDIST or DIFF SIG. Associated quantities : DNG. Note : Where neutron scattering crosssections are strongly affected by the molecular or crystalline structure of the material (for neutron energies below about 1 eV) then the quantity TSL should be entered ("Thermal Scattering"). Scattering lengths are a parameterisation of (nuclear) elastic scattering, extrapolated to zero energy, but are derived from measurements made at higher energies.
$\sigma_{n,2n}(E)$ $\sigma_{n,2n}(E;E')$ $\sigma_{n,2n}(E;E',\theta)$	N2N	(N,2N)	Definition : Information on (n,2n) and (n,2nC) reactions (C =charged par ticle). Use : For cross sections, angular and energy distributions of neutrons in reactions where two neutrons, with or without other particles, are emitted. Obviously, (n,f) and (n,3n) are not included. Examples : 1) cross section for 0-16(n,2n)N-15; 2) spectrum of protons from the d(n,2n)p reaction (convention of least Z). Note : If not a plain (n,2n) cross section explain further in the comment
Reaction (Goldstein notation)	Code	Expansion in CINDA book	

$\sigma_{x,n}(E;E',\theta)$	NXN	(N,XN)	Definition : Information on (n,xn) and (n,xnC) reactions (C =charged particle) where x>2. Use : Primarily (n,3n) and (n,4n) reactions. Give further specifications of the number of emitted neutrons inthe comment.
$\sigma_{nM}(E)$ $\sigma_{nM}(E',\theta)$ $\sigma_{nM}(E;E',\theta)$	NEM	n Emission	Definition : The sum cross-section for all processes resulting in neutron emission, weighted for the number of neutrons produced : $\sigma_{nM} = \sigma_{n,n} + \sigma_{n,n'} + 2\,\sigma_{n,2n} + x\,\sigma_{n,xn} + \nu\sigma_{n,f} + \sigma_{n,np} + ...$
$\sigma_{n,g}(E)$	NG	(n,γ)	Definition : Radiative capture cross section $\sigma_{n\,\gamma}$
	SNG	Spect (n,γ)	Definition : Spectrum of gamma rays following neutron capture. Note 1 : The term 'gamma decay' includes the competing processes of internal conversion and pair production, so that conversion electron spectra from neutron capture would be entered under 'Specs Ngamma' with an appropriate comment. Note 2 : Do not make entries for the gamma spectrum observed following the beta decay of the product nucleus. SNG is limited to the prompt gammas following neutron capture. Note 3 : Heasurements of gamma polarisation following capture of polarised neutrons are entered under SNG, with an appropriate comment. Enter the target nucleus. Associated quantities : RIG, NG, NEG.
$\int_{E_{min}}^{E_{max}} \frac{\sigma_{n,\gamma}(E)}{E}\,dE$	RIG	Res Int Capt	Definition : Resonance integral for radiative capture for fissionable elements only. Use : Measurements by capture and activation; calculations from NG resonance parameters. With or without the 1/v part. The lower energy limit should be entered. Associated quantities : NG, SNG.

Reaction (Goldstein notation)	Code	Expansion in CINDA book	
$\sigma_{n,n'}(E;E_\gamma)$	DNG	Inelastic γ	Definition : Information on production cross-

$\sigma_{n,n'}(E;E_\gamma,\theta)$			section, angular distributions or energy spectra for gamma rays following the inelastic scattering of neutrons. This code is used in the case of hydrogen only when Bremsstrahlung production is involved. Note 1 : The comment Bremsstrahlung production should be included in the comment field. Note 2 : Many inelastic scattering experiments measure the production cross-section for a specific gamma ray. This cross-section will in general differ from the cross-section for excitation of its state of origin, but will be equal if gamma-ray cascades to and from the level can be excluded. In this case, prepare a second entry for DIN = Diff Inelast. Associated quantities : SIN, DIN.
$\sigma_{nG}(E)$ $\sigma_{nG}(E;E_\gamma)$ $\sigma_{nG}(E;E_\gamma,\theta)$	NEG	Nonelastic γ	Definition : Information on gamma rays from unseparated nonelastic processes. Use : Covers production cross sections distributions and energy spectra. Do not use for gamma rays which can be assigned to one of the definite processes a) Inelastic scattering (use DNG) b) Fission or fission fragments (use SFG or RPG) c) Radiative capture (use SNG) d) Gamma rays following (n,p) or other charged-particle reactions (use NP, etc.). Associated quantities : SNE, DNG, SFG, FPG. SNG.

Reaction (Goldstein notation)	Code	Expansion in CINDA book	
			Charged-particle production
$\sigma_{n,p}(E)$	NP	(n,p)	These quantities cover all total and partial cross-

$\sigma_{n,p}(E,\theta)$ etc ..... $\sigma_{n,np}(E)$ $\sigma_{n,np}(E,\theta)$ etc	NNP ND NND NT NNT NHE NA NNA	(n,np) (n,d) (n,nd) (n,t) (n,nt) (n,He3) (n,α) (n,nα)	sections, angular and energy distributions, prompt gamma rays following these reactions, etc. It is important to specify more exactly in the comment what was measured, even if it is simply the total cross section for that reaction. Note 1 : If two or more neutrons are emitted, use N2N or NXN. Note 2 : Production of a given charged particle may be due to, say, (n,p)+(n,np). In this case, make entries for both quantities, or, better, for PEM, with an appropriate comment. Note 3 : If observed, (n,nHe-3) is coded as (n,He3) Note 4 : Resonance integrals for charged particle production are coded under the appropriate reaction and not under resonance integrals.
$\sigma_{n,p}(E)$ $\sigma_{n,p}(E,\theta)$ etc	PEM DEM TEM AEM	p emission d emission t emission α emission	These quantities refer to the sum of processes from which emergent charged particles can be detected weighted for the number of charged particles produced.
$\sigma_{n,f}(E)$	NF	Fission	Fission quantities Definition : The cross section for neutron induced fission. Note : A number of quantities below cover associated measurements. Unless a value is given for σ(n,f), one of these other quantities will be more appropriate.
$\int_{E_{min}}^{E_{max}} \frac{\sigma_{n,f}(E)}{E} dE$	RIF	Res int Fiss	Definition : The resonance integral for fission. The limits of integration should be entered in the neutron ENERGY field.
$\alpha = \frac{\sigma_{n,\gamma}}{\sigma_{n,f}}$	ALF	Alpha	Definition : The ratio of capture and fission cross sections.
$\eta = \frac{\nu\sigma_{n,\gamma}}{\sigma_{n,\gamma} + \sigma_{n,f}}$	ETA	Eta	Definition : The mean number of fission neutrons emitted per neutron absorbed. Eta is used only for fissionable elements.

Reaction (Goldstein notation)	Code	Expansion in CINDA book	
	NU	Nu	Definition : ν, the number of prompt neutrons emitted per fission. Use : Information covered includes ν (the average number of fission neutrons), the

			probability distribution of ν per individual fission and angular distribution of fission neutrons. Note : Information on neutrons from a given fragment is entered under Frag Neuts = NUF, and on delayed neutrons in general under Delayd Neuts = NUD. Total ν (prompt + delayed) is entered under NU.
	NUD	Delayd Neuts	Definitions : Information on yields, energies, etc., of delayed neutrons from fission
	NUF	Frag Neuts	Definition : Information on neutrons emitted by a given fission fragment. Note : Distribution of ν versus fragment mass is entered under this quantity.
	SFN	Spect Fiss n	Definition : Spectrum of neutrons emitted in fission. Use : For spectra, mean energies, etc. Associated quantities : NU, NUF.
	SFG	Spect Fiss γ	Definition : Spectrum of prompt gamma rays emitted in fission. Do not confuse this quantity with Fiss Prod γ (FPG).

Reaction (Goldstein notation)	Code	Expansion in CINDA book	
	NFY	Fiss Yield	Definition : Yields of fission products or fission fragments. Including : independent cumulative, fractional or chain yields of fission products (identified by Z,A).

Including : direct or total mass yields of fission fragments;
Including : ternary fission probabilities.
Excluding : yield data correlated with kinetic energy or emission angles of fragments or prompt neutrons: see FRS or NUF.
Excluding : yield of fragments of a given charge (Z) but unspecified mass; see CHG.
Note : Charge dispersions, i.e. (fractional) independent yields for constant A, and charge distributions for constant Z should be entered under NFY and CHG, if the fission products measured are identified by Z and A.
Note : Some old NFY entries need correcting to FRS.

CHG	Frag Charge	Definition : Information on the charge distribution of fission fragments, charge dispersion, most probably charge Zp (A), fractional yields for constant A, etc.
FRS	Frag Spectra	Definition : The energy or angular distribution of fission fragments, or partial yields correlated with other fragment parameters. Including : kinetic energy dependent fragment data. Excluding : fragment-energy dependent prompt neutron emission, see NUF. Note : Some older data of this type have been coded under NFY.
FPG	Fiss Prod γ	Definition : Gamma rays from unseparated fission products originating from a given fissioning nucleus. Use : Spectra, mean energies, yields, etc. Note : K, L, H X-rays from fission products are entered here. The quantities 'Fiss Prod r' and 'Specs Fiss r' are not always separable.
FPB	Fiss Prod β	Definition : Betas from unseparated fission products originating from a given fissioning nucleus. Use : Spectra, mean energies,yields, etc.

Reaction (Goldstein notation)	Code	Expansion in CINDA book	**Aggregate cross-sections**
$\sigma_{nT}(E)$	TOT	Total	Definition : The total neutron cross section oT. Entries are often made for transmission experiments carried out in order to measure resonance parameters; even if such measurements are not analysed to give values for σ_T, entries for TOT should be made; such cases should appear clearly in the comments.
$\sigma_{nNuc}(E)$ $\sigma_{nNuc}(\theta)$ $\sigma_{nNuc}(E;E',\theta)$	NX	Nucl Product	Definition : This quantity refers to tne sum of processes occurring in a given target from which a given nuclide is produced, if these processes are not specified individually. The product nuclide must be given in the "Comments" field, following the author name. Use : For sum cross-sections of reactions in a given target leading to the same product nucleus. At higher energies the target can be a natural element or an isotope; example: Z-S-A ((n,α)+(n,2d)+(n,2n+2p)+...)Z'-S'-A. At lower energies the target must be a natural element; example: the target has isotopes Z-A and Z-(A+2); the reactions Z-A (n,r) and Z-(A+2) (n,2n) both lead to the product nuclide z-(A+l). Both cases: If the partial crosssections leading to the product nuclide are not given, the sum cross section (n,x) is coded as "NX" with the product nuclide specified in the "Comments" field
$\sigma_{nX}(E)$ $\sigma_{nX}(\theta)$ $\sigma_{nX}(E;E',\theta)$ etc...	SNE	Nonelastic	Definition : The sum cross section for all nonelastic processes, $\sigma_{nX} = \sigma_{nT} - \sigma_{n,n} = \sigma_{n,n'} + \sigma_{n,2n} + \sigma_{n,Xn}$ $+ \sigma_{n,f} + \sigma_{n,p} + \sigma_{n,d} + \sigma_{n,\gamma}$
$\sigma_{nA}(E)$	ABS	Absorption	Definition : The absorption cross section, $\sigma_{nA} = \sigma_{nT} - \sigma_{nS}$, i.e. the sum of all partial cross sections except for elastic and inelastic scattering. Use : Do not use if σ_{nA} is equal to $\sigma_{n,\gamma}$ (at low energies for many targets). Note : "Absorption" is frequently given different meanings in the literature, and readers should check that the author's definition corresponds to this one.

Reaction (Goldstein notation)	Code	Expansion in CINDA book	
$\int_{E_{min}}^{E_{max}} \frac{\sigma_{n,A}(E)}{E} dE$	RIA	Res Int Abs	<u>Definition</u> : The resonance integral for absorption, activation or capture. <u>Use</u> : Should not be used for fissionable nuclei except to represent the sum of RIG + RIF + other contributions <u>Note 1</u> : The energy limits of the integral should be entered under E_{min} and E_{max} <u>Note 2</u> : Charged particle production resonance integrals should be coded under the charged particle reaction and not under RTA.
	RES	Reson Params	<u>Definition</u> :All resonance parameter information. <u>Use</u> : For total width, partial widths (neutron, fission or gamma widths), spins of resonances, level spacings, etc. Enter the <u>target</u> nucleus in Cols.1-5 (not the compound nucleus), the lowest and highest <u>resonance</u> energies covered in the E_{min} , E_{max} columns (not the energy range of experiment). Specify in the comment the parameters covered. The comprehensive scope of RES makes it difficult to compress into the comment all the parameters measured : list only the two or three most important. A list of standard abbreviations for such information in <u>the comment</u> field is given below : WA Alpha width WG Gamma width WF Fission width WN Neutron width WT Total width TBL RESPARS Table of resonance parameters <u>Associated quantities</u> : STF, LDL, TOT, and all resonance integrals.

Reaction (Goldstein Code Expansion in

notation)		CINDA book	
	STF	Strnth Fnctn	Definition : The strength function $\frac{<\Gamma>}{D} = \frac{\Sigma_i \Gamma_i}{\Delta E}$ where Γ_i is the reduced neutron width, D the mean level spacing, and $E = E_{max} - E_{min}$ Use : Show in comment whether the entry refers to S or P wave resonances As with resonance parameters, enter the target nucleus and the highest and lowest resonance energies included. State how many levels are included in the average. Note : This quantity can also be obtained from the values of σ_T in the unresolved region; in this case, enter the corresponding values of E_{min} and E_{max} Associated quantities : RES, LDL, resonance integrals.
	LDL	Lvl Density	Definition : Level density parameters (spin cut-off factor, parameter "a", nuclear temperature); level density obtained from cross sections in unresolved resonance regions should also be entered under this quantity. Use : Code entries under the nucleus for which the level density is given NOT the target nucleus. Note : For the quantity LDL the incident neutron energy is meaningless. In this case a slash "/" may be entered in column 19 of the E_{min} field

Reaction (Goldstein notation)	Code	Expansion in CINDA book	**Gamma induced reactions**
$\sigma_{\gamma,n}(E_{\gamma})$	GN	(γ,n)	Definition : Information on (γ,n) reactions. Use : Restricted to Er <15 MeV. Note : Contrary to normal practice for inverse reactions, the gamma energy should be entered in the ENERGY field
	GF	Photo-Fissn	Definition : Information on gamma (E_{γ} < 15 MeV) induced fission. Use : Cross section, yields and of neutrons and fragments, spectra etc. Note : The fissioning nucleus is the same as the target nucleus. To avoid confusion, articles on this subject are entered only under GF, even if they contain information about fission yields, etc.

Reaction (Goldstein notation)	Code	Expansion in CINDA book	**Special quantities**
	EVL	Evaluation	Definition : A complete and consistent set of cross sections in some energy ranges. Use : Only for complete sets, of evaluated data : a separate entry may be prepared for each quantity given in the evaluation. Note : An "evaluation" can be distinguished either by use of the worktype 'D' with a normal quantity code. For example, a "best value" derived from comparing different ν measurements would be entered under "NU" only, with "D" in column 18. The quantity 'EVL' implies that a (near) complete set of cross sections has been evaluated.
	TSL	Thermal Scat	Definition : Information on the energy and angular dependence of the elastic and inelastic scattering of slow neutrons from molecules in gases, liquids, crystals, etc., especially as expressed in the Egelstaff S(α,β) formalism. Use : This quantity should only be used when the nuclear environment influences neutron scattering. When nuclear scattering is distinguished from effects of the environment the quantity codes SEL, DEL, or SCT should be used. Coherent scattering amplitudes of compounds and bound atoms should be coded under TSL. Neutron diffraction measurements are not usually coded in CINDA, unless nuclear scattering information is given.