April 6, 2021

ITPA Global H-Mode Confinement Database
Version DB5.2.3 variable definitions

Introduction

Usage

Time averaging

The majority of the data was obtained by averaging over time windows, defined w.r.t. the variable TIME, as specified in the table below.

MHD analysis

The MHD analysis was either based on a full equilibrium fit, or on a current filament approach. This is specified in more detail for each device in the table below.

Device	Time averaging (ms)	MHD analysis
ASDEX	± 2	Current filaments
ASDEX Upgrade	$\pm 50 - 100$	Full equilibrium code fit based on function parameterization
Alcator C-Mod	$\pm 20 - 340$ (0.3 – 5 ∗ TAUTH)	Full equilibrium fit (EFIT)
COMPASS-D	± 1	Full equilibrium fit (EFIT)
DIII-D	± 5	Full equilibrium fit (EFIT)
JET	± 100	• Before 1994: current filaments • From 1994: full equilibrium fit (EFIT)
JFT-2M	± 2.5	• Most variables using current filament approach • Exceptions for RMAG, Q95, $\beta_i + 0.5\, l_i$, β_{p}, B_{t}, W: full equilibrium fit
JT-60U	± 25	For ELMy H-mode data: full equilibrium code fit based on function parameterization, putting $q(0) = 1$
MAST	± 2.5	
NSTX	± 150	
PBX-M	± 3.75	Current filaments
PDX	± 5	Full equilibrium MHD fit for representative discharges
START	± 1	Full equilibrium fit (EFIT)
T-10	± 1	ASTRA equilibrium solver using 3-moment approach [Pereverzev02]
TCV	-5	Free boundary equilibrium reconstruction code (LIUQE) based on magnetic measurements (no Thomson scattering, no diamagnetic loop)
TdeV		
TEXTOR	$\pm 50 - 100$	Simple approach based on a geometry of shifted circles
TFTR		Current filaments
TUMAN-3M	± 0.5	Full equilibrium MHD fit for representative discharges

Error estimates

All numerical measurements are accompanied by an uncertainty estimate ("error"). This is usually stated in terms of a percentage error. The interpretation of this uncertainty estimate may differ from one variable or diagnostic to another and it may include both statistical and systematic uncertainties. The abbreviation "Co.", for "Compound', is used for the uncertainty estimate of non-elementary variables, as defined below.

Conventions

A number of conventions used throughout this document deserve further explanation:

- Variables of the type "Alphanumeric" may assume values containing letters, numbers and a limited selection of special characters, but no spaces.
- The statement "no data" refers to cases where a variable assumes a value for which no data is included in the database.
- A variable is referred to as "elementary" when it is not directly calculated from other database variables.
- "n.a." stands for "not applicable" or "not available", depending on the context.
- The unit "Da" is the dalton, the unit of mass currently recommended as unified atomic mass unit.

List of variables

The database variables are listed in alphabetical order in the following table, together with their ID numbers. Use the links in the table and click  to return to this index page.

AMIN	39	DELTAL	45	HIPB98Y3	167	LHTIME	22	PLTH	154	TAUMHD	148	WFANI	141
AREA	47	DELTAU	44	HIPB98Y4	168	LIMMAT	54	PNBI	98	TAUTH	156	WFANIIC	146
AUXHEAT	11	DIVMAT	53	HITER92Y	162	MEFF	25	POHM	91	TAUTH1	149	WFFORM	140
BEILI2	66	DIVNAME	3	HITERL96	160	NE0	80	PRAD	90	TAUTH2	150	WFICFORM	144
BEIMHD	67	DNELDT	78	HMWS2003	180	NE0TSC	81	PREMAG	61	TAUTOT	155	WFICRH	142
BEPDIA	70	DWDIA	111	HMWS2005	184	NEL	76	Q95	64	TE0	116	WFICRHP	143
BEPMHD	68	DWDIAPAR	112	HYBRID	13	NELFORM	77	RGEO	37	TE0TSC	117	WFPAR	139
BETMHD	69	DWHC	114	IAE2000N	178	NEV	79	RMAG	38	TEV	115	WFPER	138
BGASA	28	DWMHD	113	IAE2000X	179	OJK2006	185	RHOINV	75	TI0	119	WIKIN	136
BGASA2	30	ECHFREQ	100	IAE2004I	182	OLTIME	21	RHOQ2	74	TICX0	120	WKIN	134
BGASZ	29	ECHLOC	102	IAE2004S	181	OMGAIMP0	121	SELDB1	170	TIME	7	WMHD	133
BGASZ2	31	ECHMODE	101	IAEA92	173	OMGAIMPH	122	SELDB2	171	TIME_ID	8	WROT	137
BMHDMDIA	71	ELMDUR	19	ICANTEN	107	OMGAM0	123	SELDB2X	172	TIV	118	WTH	152
BSOURCE	94	ELMFREQ	17	ICFORM	145	OMGAMH	124	SELDB3	186	TOK	1	WTOT	151
BSOURCE2	96	ELMINT	20	ICFREQ	105	PALPHA	110	SELDB3X	187	TOK_ID	2	XGASA	34
BT	59	ELMMAX	18	ICSCHEME	106	PECRH	104	SELDB4	189	TORQ	126	XGASZ	35
COCTR	97	ELMTYPE	16	IEML	60	PECRHC	103	SELDB5	191	TORQBM	127	XPLIM	51
CONFIG	36	ENBI	92	IGRADB	58	PELLET	32	SEPLIM	50	TORQIN	128	ZEFF	88
DALFDV	57	EVAP	55	INDENT	46	PFLOSS	99	SHOT	6	TPI	23	ZEFFNEO	89
DALFMP	56	FBS	73	IP	62	PGASA	26	SH95	65	VOL	48		
DATE	5	FUELRATE	33	ISEQ	24	PGASZ	27	SPIN	125	VSURF	63		
DB2P5	174	H89	159	ITB	14	PHASE	12	STANDARD	169	VTOR0	129		
DB2P8	175	H93	161	ITBTYPE	15	PICRH	109	STD3	188	VTORIMP	131		
DB3DONLY	183	HEPS97	163	KAPPA	40	PICRHC	108	STDDB4V5	190	VTORV	130		
DB3IS	176	HIPB98Y	164	KAPPAA	41	PINJ	93	T1	9	WALMAT	52		
DB3V5	177	HIPB98Y1	165	KAREA	42	PINJ2	95	T2	10	WDIA	132		
DELTA	43	HIPB98Y2	166	LCUPDATE	4	PL	153	TAUCR	72	WEKIN	135		

General variables

1. TOK

Description: Short name of the tokamak that supplied the data
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

TOK	TOK_ID	Full device name	Institute
ASDEX	**1**	ASDEX	Max Planck Institute for Plasma Physics, Garching, Germany
AUG	**2**	ASDEX Upgrade	Max Planck Institute for Plasma Physics, Garching, Germany
CMOD	**3**	Alcator C-Mod	Plasma Science and Fusion Center, MIT, Cambridge, MA, USA
COMPASS	**4**	COMPASS-D	Culham Centre for Fusion Energy, Abingdon, UK
D3D	**5**	DIII-D	Multi-Institutional DIII-D Team Led by General Atomics, San Diego, CA, USA
JET	**6**	JET	Culham Centre for Fusion Energy, Abingdon, UK
JFT2M	**7**	JFT-2M	Japan Atomic Energy Agency, Naka, Japan
JT60U	**8**	JT-60U	Japan Atomic Energy Agency, Naka, Japan
PBXM	**9**	PBX-M	Princeton Plasma Physics Laboratory, Princeton, NJ, USA
PDX	**10**	PDX	Princeton Plasma Physics Laboratory, Princeton, NJ, USA
TCV	**11**	TCV	Swiss Plasma Centre, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland
TEXTOR	**12**	TEXTOR	Institute of Energy and Climate Research (Plasma Physics), Forschungszentrum Jülich, Jülich, Germany
TFTR	**13**	TFTR	Princeton Plasma Physics Laboratory, Princeton, NJ, USA
TDEV	**14**	TdeV	Hydro-Québec – Centre Canadien de Fusion Magnétique, Varennes, Canada
START	**15**	START	Culham Centre for Fusion Energy, Abingdon, UK
T10	**16**	T-10	Kurchatov Institute, Moscow, Russia
TUMAN3M	**17**	TUMAN-3M	Ioffe Institute, St. Petersburg, Russia
MAST	**18**	MAST	Culham Centre for Fusion Energy, Abingdon, UK
NSTX	**19**	NSTX	Princeton Plasma Physics Laboratory, Princeton, NJ, USA

2. TOK_ID

Description: Tokamak ID number
Definition: Elementary variable: See table under TOK
Data type: Integer
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

3. DIVNAME

Description: Divertor configuration
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

TOK	DIVNAME	Shot range
ASDEX	**DV-IPRE**	$1 \leq \mathrm{SHOT} \leq 13583$
	DV-IPOST	$13584 \leq \mathrm{SHOT} \leq 20282$
	DV-II-O (no data)	$20283 \leq \mathrm{SHOT} \leq 25776$
	DV-II-C	$25777 \leq \mathrm{SHOT}$
AUG	**DIV-I**	$4670 \leq \mathrm{SHOT} \leq 8609$
	DIV-II	$9825 \leq \mathrm{SHOT} \leq 13622$
	DIV-IIb	$15024 \leq \mathrm{SHOT}$
CMOD	**NONAME**	
COMPASS	**DIV1**	
D3D	**OPEN**	$56348 \leq \mathrm{SHOT} \leq 69648$
	ADP	$70678 \leq \mathrm{SHOT} \leq 90768$
	RDP	$98889 \leq \mathrm{SHOT}$
JET	**MARK0**	$\mathrm{SHOT} < 27968$
	MARKI	$28792 < \mathrm{SHOT} < 35779$
	MARKIIA	$35953 < \mathrm{SHOT} < 38912$

	MARKIIAP	$38983 < \text{SHOT} < 45081$
	MARKGB	$45202 < \text{SHOT} \leq 55125$
	MARKGBSR	$55125 < \text{SHOT}$
JFT2M	**NONAME**	
JT60U	**NONAME**	
PBXM	**NONAME**	
PDX	**NONAME**	
TCV	**OPEN**	
TEXTOR	**NONAME**	
TFTR	**NONAME**	
TDEV	**NONAME**	
START	**OPEN**	
T10	**NONAME**	
TUMAN3M	**NONAME**	
MAST	**RIB (sketch)** **PLATES1**	
NSTX	**NONAME**	

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4. LCUPDATE

Description: Date of the most recent update for any variable listed in the database
Definition: Elementary variable
Data type: Date
Allowed values: YYYYMMDD (Year – Month – Day)
Units: n.a.
Error: n.a.

---

5. DATE

Description: Date where the shot was taken
Definition: Elementary variable
Data type: Date

Allowed values: YYYYMMDD (Year – Month – Day)
Units: n.a.
Error: n.a.

---

6. SHOT

Description: Discharge number (shot) from which the data were taken
Definition: Elementary variable
Data type: Integer
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

---

7. TIME

Description: Time during the shot at which the data were taken
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: See table with time average data

---

8. TIME_ID

Description: Integer equivalent of TIME
Definition:

- Default: $\mathrm{TIME\_ID} = \mathrm{INT}(10^3 * \mathrm{ROUND}(\mathrm{TIME}, 10^{-3}))$, where ROUND rounds TIME to the 3rd decimal position
- Exceptions and comments: See table

Data type: Integer
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table with time average data

TOK	Definition
TUMAN3M	$\mathrm{TIME\_ID} = \mathrm{INT}(10^5 * \mathrm{ROUND}(\mathrm{TIME}, 10^{-5}))$, where INT takes the integer part and ROUND rounds TIME to the 5th decimal position

9. T1

Description: Start of main time average window
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: n.a.

10. T2

Description: End of main time average window
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: n.a.

11. AUXHEAT

Description: Type of auxiliary heating
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

AUXHEAT	Definition
NONE	No auxiliary heating
NB	Neutral beam injection
IC	Ion cyclotron resonance heating
EC	Electron cyclotron resonance heating
ECOA	Electron cyclotron resonance heating (off-axis)

ECIC	Combined ECRH + ICRH
NBEC	Combined NBI + ECRH
NBIC	Combined NBI + ICRH
NBECIC	Combined NBI + ECRH + ICRH

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12. PHASE

Description: Phase of the discharge at TIME
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

PHASE	Definition
OHM	Ohmic
L	L-mode
RI	Radiative-improved mode
LHLHL	H-mode with frequent LH transitions
H	ELM-free H-mode
HSELM	H-mode with small ELMs
HSELMH	H-mode with high-frequency small ELMs
HGELM	H-mode with large ELMs
HGELMH	H-mode with high-frequency large ELMs
H???	ELM-free H-mode to be confirmed
HGELM???	H-mode with large ELMs to be confirmed

---

13. HYBRID

Description: Flag indicating whether the data point is in a hybrid mode
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

HYBRID	Definition
NO	Not a hybrid discharge
YES	Hybrid discharge
IH	Improved H-mode (AUG)
HYBRID	Hybrid H-mode (DIII-D)
UNKNOWN	Not checked for HYBRID properties

---

14. ITB

Description: Flag indicating whether the data point has an internal transport barrier
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ITB	Definition
NOITB	No ITBs (no data)
PREITB	Before ITB onset (no data)
ITB	ITB present (no data)
UNKNOWN	Not checked for ITB

---

15. ITBTYPE

Description: Flag describing type of ITB
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ITBTYPE	Definition
NONE	No ITB (no data)
TI	T_i ITB (no data)
TE	T_e ITB (no data)
NE	n_e ITB (no data)
TITENE	ITBs in T_e, T_i and n_e (no data)
NA	Not applicable

---

16. ELMTYPE

Description: Flag describing type of ELMs
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ELMTYPE	Definition
NONE	No ELMs
TYPE-I	Type I ELMs
TYPE-II	Type II ELMs (no data)
TYPE-III	Type III ELMs
TYPE-V	Type V ELMs
TYPE-1+2	Mixed type I and type II ELMs
TYPE-1+5	Mixed type I and type V ELMs
TYPE-RF	ICRH ELMs on JET
UNKNOWN	Type has not been determined

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17. ELMFREQ

Description: ELM frequency
Definition:
- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: [0, Inf[
Units: Hz
Error:
- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
JET	Default	• Regular ELMs: 1% • Irregular ELMs: 50%
JT60U	Elementary variable, average over 400 – 500 ms	n.a.
TCV	Default	1%

---

18. ELMMAX

Description: Average ELM amplitude of the Hα signal (minus base level)
Definition: Elementary variable
Data type: Floating point
Allowed values: [0, Inf[
Units: a.u.
Error:
- Default: n.a.
- Exceptions: See table

TOK	Error
JET	20%

---

19. ELMDUR

Description: Average ELM duration of the Hα signal
Definition: Elementary variable
Data type: Floating point
Allowed values: [0, Inf[
Units: s
Error:
- Default: n.a.
- Exceptions: See table

TOK	Error
JET	20%

---

20. ELMINT

TOK	Error
JET	20%

Description: Average ELM integral of the Hα signal (minus base level)
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: a.u.
Error:

- Default: n.a.
- Exceptions: See table

---

21. OLTIME

Description: Time of the Ohmic to L-mode transition (start of auxiliary heating)
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: n.a.

---

22. LHTIME

Description: Time of the L to H transition
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: n.a.

---

23. TPI

Description: Time point indicator (ASDEX only)
Definition: Elementary variable: See table
Data type: Integer
Allowed values: $[0, 9]$
Units: n.a.
Error: n.a.

TPI	Definition
0	Indicator not used
1 – 3	Ohmic points
4	L-mode
5 – 7	H-mode points up to the time at which $\mathrm{DWDIA} = 0$
8 – 9	Extra H-mode points (no data)

---

24. ISEQ

Description: Parameter scan identifier
Definition: Elementary variable: See tables
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ASDEX	
ISEQ	**Definition**
NONE	No scan
BT1, BT2P4, BT3, BT4, BT5, BT6, BT7	Toroidal magnetic field scans
HBE1, HBE2, HBE3	High β investigations, T_i profile measurements
QC1P3	QCYL scan
EF11	Search for long ELM-free periods
NE1	Density variation
SP11	Spectroscopic investigations
P1, P2, QC1P3, BT2P4	Power scans (PNBI)
G1	Comparison shots for helium program
HT1	Search for high confinement times

AUG	
ISEQ	Definition
NONE	No scan
AUG_DIIID	Confinement identity AUG-DIII-D
AUG_JET	Confinement identity AUG-JET
AUG_CMOD	Confinement identity AUG-CMOD
IP1	Current scan
IPBTP1	IP, BT and power scan
PNE1	Power and density scan nr. 1
PNE2	Power and density scan nr. 2
PNE3	Power and density scan nr. 3
PNE4	Power and density scan nr. 4
PELLET	Pellet scan
IHMODE	

CMOD	
ISEQ	Definition
NONE	No scan

COMPASS	
ISEQ	Definition
NONE	No scan

D3D	
ISEQ	Definition
NONE	No scan
KAPPA1, KAPPA2, KAPPA3	Elongation scans
LRHO1, LRHO2, LRHO3	L-mode ρ_* scans
HRHO1, HRHO2, HRHO3, RHOSCAN	H-mode ρ_* scans
LNU1, HNU1	ν_* scans
LBETA1, HBETA1	β scans
QSCAN	q scans
JET1, JETSIMILAR	ρ_* scaling from DIII-D-JET comparison
HINE	High density, good confinement with pellets
HI_GP_REF	Reference shot without gas puff
HI_GP	High density, good confinement with gas puff
TETISCALE	Variation of T_e/T_i ratio

JET	
ISEQ	**Definition**
NONE	No scan
DIIID, D3D1, AUG, CMOD, CMOD1, JT60U, ITER, ITER/LL, ITER/LU, ITER-LIKE	Tokamak identity scans
LRHO1, LRHO2, LRHO3 (no data)	L-mode ρ_* scans
RHO1, RHO2, RHO3, RHO4, LOW-RHO	H-mode ρ_* scans
NU1	ν_* scans
BETA1, HIGH-BETA	β scans
H/SFE/VLT, H/SFE/LT, H/SFE/HT, H/SFE/VHT, H/SFE/VH, H/SFE/?? H/LFE/HT **H/HFE/LT, H/HFE/HT, H/HFE/?? HC/SFE/LT** **HK/LT/99, HK/HT/99 LK/LT/99** **V/SFE/LTS, V/SFE/LT, V/SFE/HT, V/SFE/VHT** **V/SFE/VH, V/SFE/EH V/HFE/LT, V/HFE/HT V/LFE/LT** **C/SFE/LT, C/SFE/HT SEPTUM, S/SFE/LT, S/SFE/HT** **HC, HC/HT, HIGHCL, DNX, HT3**	Configuration scans
DOC-U, DOC-L, DOC-LL	

JFT2M		
ISEQ	**Definition**	
NONE	No scan	
G1	Gas scans	Intense gas puff for comparison with hydrogen pellet H-mode
G2		Intense gas puff for comparison with deuterium pellet H-mode
G3IP2		Intense gas puff in hydrogen
G4IP3		Intense gas puff in deuterium
IP1	Current scans	At $\mathrm{BT} = 1.25\ \mathrm{T}$
IP2		In hydrogen plasma
IP3		In deuterium plasma
P1	Power scans (PNBI)	CO or CTR with $\mathrm{IP} = 0.25\ \mathrm{MA}$
P2		CO + CTR with $\mathrm{IP} = 0.24\ \mathrm{MA}$
P3IP4NE1	Density scans (NEL)	In hydrogen plasma
P4IP5NE2		In deuterium plasma
BT1	Toroidal field scans	$\mathrm{IP} = 0.16\ \mathrm{MA}$
BT2		$\mathrm{IP} = 0.21\ \mathrm{MA}$

JFT2M		
ISEQ	**Definition**	
PE1	Pellet scans	Hydrogen pellet into hydrogen
PE2		Deuterium pellet into deuterium
EB1	ENBI scans	BSOURCE = 603010
EB2		BSOURCE = 801010
AM1	AMIN scan with IP = 0.22 MA (same Q95)	
BS1	Scan of 801010 (CO or CTR) and 603010 (CO or CTR)	
IE1	IEML and PNBI scan looking for steady state H-mode region	
XP1	XPLIM scan with IP = 0.24 MA	

JT60U	
ISEQ	**Definition**
NONE	No scan
BETA	β scan

PBXM	
ISEQ	**Definition**
NONE	No scan

PDX	
ISEQ	**Definition**
NONE	No scan

TCV	
ISEQ	**Definition**
NONE	No scan

TEXTOR	
ISEQ	**Definition**
NONE	No scan
HT1	Search for high confinement times

TFTR	
ISEQ	**Definition**
NONE	No scan

TDEV	
ISEQ	**Definition**
NONE	No scan

START	
ISEQ	**Definition**
NONE	No scan

T10	
ISEQ	**Definition**
NONE	No scan

TUMAN3M	
ISEQ	**Definition**
NONE	No scan

MAST	
ISEQ	**Definition**
NONE	No scan

NSTX	
ISEQ	**Definition**
NONE	No scan

Plasma composition

25. MEFF

Description: Effective atomic mass
Definition:

- Default:
  - If $\mathrm{PINJ} > 0$ and $\mathrm{PINJ2} > 0$: $\mathrm{MEFF} = 0.5 * (\mathrm{PGASA} + 0.5 * (\mathrm{BGASA} + \mathrm{BGASA2}))$
  - If $\mathrm{PINJ} > 0$ and $\mathrm{PINJ2} = 0$: $\mathrm{MEFF} = 0.5 * (\mathrm{PGASA} + \mathrm{BGASA})$
  - Otherwise: $\mathrm{MEFF} = \mathrm{PGASA}$
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Da
Error: See table

TOK	Definition	Error
ASDEX	Default	10%
AUG	Default	20%
CMOD	Default	3%
COMPASS	Default	10%
D3D	Default	• Pure gas: 1% • Mixed gas: 20%
JET	• Alternative: concentration measurement • Exceptions: for a few Ohmic observations with $\mathrm{PNBI} \leq 3$ kW: $\mathrm{MEFF} = \mathrm{PGASA}$	20%
JFT2M	Default	n.a.
JT60U	Default	5%
PBXM	Default	25%
PDX	Default	25%
TCV	Default	0%
TEXTOR	Default	n.a.
TFTR	Alternative: concentration measurement	0.2%
TDEV	Default	10%
START	Alternative: concentration measurement	50%
T10	Default	10%
TUMAN3M	Default	5%
MAST	Default	n.a.

TOK	Definition	Error
NSTX	Default	n.a.

---

26. PGASA

Description: Mass of the plasma working gas
Definition: Elementary variable: See table
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Da
Error: n.a.

PGASA	Definition
1	Hydrogen
2	Deuterium
2.5	Deuterium and tritium
3	^{3}He or tritium
4	^{4}He
14.01	Nitrogen

---

27. PGASZ

Description: Charge number of the plasma working gas
Definition: Elementary variable: See table
Data type: Integer
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

PGASZ	Definition
1	Hydrogen, deuterium or tritium
2	Helium
7	Nitrogen

---

28. BGASA

Description: Mass of the neutral beam gas
Definition: Elementary variable: See table
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Da
Error: n.a.

BGASA	Definition
0	When $\mathrm{PINJ} = 0$
1	Hydrogen
2	Deuterium
3	^{3}He or tritium
4	^{4}He

29. BGASZ

Description: Charge number of the neutral beam gas
Definition: Elementary variable: See table
Data type: Integer
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

BGASZ	Definition
0	When $\mathrm{PINJ} = 0$
1	Hydrogen, deuterium or tritium
2	Helium

30. BGASA2

Description: Mass of the second neutral beam gas
Definition: Elementary variable: See table
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Da
Error: n.a.

BGASA2	Definition
0	When $\mathrm{PINJ2} = 0$
1	Hydrogen
2	Deuterium
3	^{3}He or tritium
4	^{4}He

31. BGASZ2

Description: Charge number of the second neutral beam gas
Definition: Elementary variable: See table
Data type: Integer
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

BGASZ2	Definition
0	When $\mathrm{PINJ2} = 0$
1	Hydrogen, deuterium or tritium
2	Helium

32. PELLET

Description: Pellet material if pellets (1 or more) have been injected
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

PELLET	Definition
NONE	No pellets
H	Hydrogen pellets
D	Deuterium pellets
GP_H	Strong hydrogen gas fueling
GP_D	Strong deuterium gas fueling
GAS-FUEL	Strong gas fueling (JET)

---

33. FUELRATE

Description: Fueling rate of extra gas
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: e s^{-1}
Error:

- Default : n.a.
- Exceptions : See table

TOK	Error
AUG	20%
JET	20%

---

34. XGASA

Description: Mass of extra-fueled gas
Definition: Elementary variable: See table
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Da
Error: n.a.

XGASA	Definition
0	No extra fueled gas
1	Hydrogen
2	Deuterium
3	Tritium or ^{3}He
4	^{4}He
~ 14	Nitrogen
~ 20.18	Neon
28	Silicon
~ 39.95	Argon
83.8	Krypton

---

35. XGASZ

Description: Charge number of extra-fueled gas
Definition: Elementary variable: See table
Data type: Integer
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

XGASZ	Definition
0	No extra fueled gas
1	Hydrogen
2	Helium
7	Nitrogen
10	Neon
16	Sulfur
18	Argon
36	Krypton

Geometry

36. CONFIG

Description: Plasma configuration
Definition: Elementary variable: See tables
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

CONFIG	Definition
SN	Single null
SN(L)	Single null with the X-point at the bottom of the machine
SN(U)	Single null with the X-point at the top of the machine
DN	Double null
DND	Double null divertor
IW	Inner wall
LIM	Outboard limiter
BOT	Limited at bottom of vessel
TOP	Limited at top of vessel
MAR	Marginally diverted/limited

Overview of configurations											
TOK	**Comment**	**SN**	**SN(L)**	**SN(U)**	**DN**	**DND**	**IW**	**LIM**	**BOT**	**TOP**	**MAR**
ASDEX	DN if vertical shift $DZ < 5$ mm, otherwise SN	x			x						
AUG	n.a.		x								
CMOD	n.a.	x			x			x			
COMPASS	n.a.	x									
D3D	DN if two nulls and the separatrix flux surface are inside the divertor tiles and on the same flux surface within 0.25 cm	x	x	x	x		x		x	x	x
JET	n.a.	x	x		x		x				
JFT2M	DN if two nulls are inside the limiter	x			x						
JT60U	n.a.	x									

Overview of configurations											
TOK	Comment	SN	SN(L)	SN(U)	DN	DND	IW	LIM	BOT	TOP	MAR
PBXM	n.a.				x						
PDX	n.a.	x									
START	n.a.					x					
T10	n.a.								x		
TCV	n.a.		x	x							
TDEV	n.a.	x									
TEXTOR	n.a.							x			
TFTR	n.a.							x			
TUMAN3M	n.a.							x			
MAST	n.a.				x						
NSTX	n.a.		x								

---

37. RGEO

Description: Plasma geometrical major radius
Definition: Elementary variable, obtained from an MHD equilibrium fit, defined as the average of the minimum and the maximum radial extent of the plasma
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	1%	JET	1%	TCV	1%	T10	1%
AUG	0.5%	JFT2M	0.75%	TEXTOR	0.5%	TUMAN3M	2%
CMOD	0.6%	JT60U	0.5%	TFTR	1 cm	MAST	n.a.
COMPASS	1 cm	PBXM	0.65%	TDEV	0.5 cm	NSTX	n.a.
D3D	0.6%	PDX	0.75%	START	2 cm		

38. RMAG

Description: Major radius of the magnetic axis
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m
Error: See table

TOK	Definition	Error
ASDEX	Based on multiple equilibrium fits	1%
AUG	Default	1%
CMOD	Default	1%
COMPASS	Default	n.a.
D3D	Default	1%
JET	Default	2%
JFT2M	Default	2%
JT60U	Default	0.5%
PBXM	Default	1%
PDX	Default	4%
TCV	Default	1%
TEXTOR	Default	2%
TFTR	Default	4 cm
TDEV	Default	2%
START	Default	n.a.
T10	Default	1%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

39. AMIN

Description: Horizontal plasma minor radius
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m
Error: See table

TOK	Definition	Error
ASDEX	Based on multiple equilibrium fits	1.5%
AUG	Default	1%
CMOD	Default	2%
COMPASS	Default	1 cm
D3D	Default	0.5%
JET	Default	3%
JFT2M	Default	3%
JT60U	Default	1%
PBXM	Default	3%
PDX	Default	3%
TCV	Default	2%
TEXTOR	Default	3%
TFTR	Default	1 cm
TDEV	Default	5%
START	Default	2 cm
T10	Default	3%
TUMAN3M	Default	3%
MAST	Default	n.a.
NSTX	Default	n.a.

40. KAPPA

Description: Plasma elongation
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Definition	Error
ASDEX	Based on multiple equilibrium fits	2%
AUG	Default	1%
CMOD	Default	1%
COMPASS	Default	10%
D3D	Default	1%
JET	Default	5%
JFT2M	Default	10%
JT60U	Default	2%
PBXM	Default	10%
PDX	$\mathrm{KAPPA} = 1$ for all records	10%
TCV	Default	2%
TEXTOR	Default	4%
TFTR	Default	0.04
TDEV	Default	2%
START	Default	10%
T10	Default	5%
TUMAN3M	Default	5%
MAST	Default	n.a.
NSTX	Default	n.a.

41. KAPPAA

TOK	Definition
COMPASS	$\mathrm{KAPPAA} = \frac{\mathrm{VOL}}{2*\pi^2*\mathrm{AMIN}^2*\mathrm{RGEO}}$

Description: Alternative plasma elongation definition
Definition:

- Default:

$$\mathrm{KAPPAA} = \frac{\mathrm{AREA}}{\pi * \mathrm{AMIN}^2}$$

- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: Co.

---

42. KAREA

Description: Alternative plasma elongation definition
Definition:

$$\mathrm{KAREA} = \frac{\mathrm{VOL}}{2 * \pi^2 * \mathrm{AMIN}^2 * \mathrm{RGEO}}$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: Co.

---

43. DELTA

Description: Triangularity of the plasma boundary
Definition: Elementary variable, obtained from an MHD equilibrium fit
Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	3%	**JET**	10%	**TCV**	3%	**T10**	n.a.
AUG	10%	**JFT2M**	10%	**TEXTOR**	n.a.	**TUMAN3M**	n.a.
CMOD	3%	**JT60U**	5%	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	10%	**PBXM**	25%	**TDEV**	10%	**NSTX**	n.a.
D3D	10%	**PDX**	n.a.	**START**	10%		

44. DELTAU

Description: Upper triangularity of the plasma boundary
Definition: Elementary variable, obtained from an MHD equilibrium fit
Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	n.a.	**JET**	10%	**TCV**	3%	**T10**	n.a.
AUG	10%	**JFT2M**	n.a.	**TEXTOR**	n.a.	**TUMAN3M**	n.a.
CMOD	2%	**JT60U**	n.a.	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	10%	**PBXM**	n.a.	**TDEV**	10%	**NSTX**	n.a.
D3D	10%	**PDX**	n.a.	**START**	10%		

45. DELTAL

Description: Lower triangularity of the plasma boundary
Definition: Elementary variable, obtained from an MHD equilibrium fit
Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	n.a.	**JET**	10%	**TCV**	3%	**T10**	n.a.
AUG	10%	**JFT2M**	n.a.	**TEXTOR**	n.a.	**TUMAN3M**	n.a.
CMOD	1%	**JT60U**	n.a.	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	10%	**PBXM**	n.a.	**TDEV**	10%	**NSTX**	n.a.
D3D	10%	**PDX**	n.a.	**START**	10%		

46. INDENT

TOK	Error
PBXM	15%

Description: Indentation of the plasma
Definition: Elementary variable, obtained from an MHD equilibrium fit
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error:

- Default : n.a.
- Exceptions : See table

47. AREA

Description: Area of the plasma cross-section
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^2
Error: See table

TOK	Definition	Error
ASDEX	Based on multiple equilibrium fits	2%
AUG	Default	3%
CMOD	Default	3%
COMPASS	Default	n.a.
D3D	Default	3%
JET	Default	6%
JFT2M	Default	5%
JT60U	Default	5%
PBXM	Default	10%
PDX	Default	5%
TCV	Default	1%
TEXTOR	Default	5%

TOK	Definition	Error
TFTR	Default	5%
TDEV	Default	5%
START	Default	10%
T10	Default	6%
TUMAN3M	Default	6%
MAST	Default	n.a.
NSTX	Default	n.a.

---

48. VOL

Description: Plasmas volume
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^3
Error: See table

TOK	Definition	Error
ASDEX	Based on multiple equilibrium fits	3%
AUG	Default	3%
CMOD	Default	3%
COMPASS	Default	10%
D3D	Default	3%
JET	Default	6%
JFT2M	Default	5%
JT60U	Default	2%
PBXM	Default	10%
PDX	Default	5%
TCV	Default	1%
TEXTOR	Default	5%

TOK	Definition	Error
TFTR	Default	6%
TDEV	Default	1%
START	Default	10%
T10	Default	7%
TUMAN3M	Default	8%
MAST	Default	n.a.
NSTX	Default	n.a.

---

49. SURFFORM

Description: Surface area of the plasma from formula
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^2
Error: n.a.

---

50. SEPLIM

Description: Minimum distance between the separatrix flux surface and either the vessel wall or limiters
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m
Error: See table

TOK	Definition	Error
ASDEX	Based on multiple equilibrium fits	1 cm
AUG	Default	n.a.
CMOD	Default	0.5 cm
COMPASS	Default	n.a.

TOK	Definition	Error
D3D	Default	0.5 cm
JET	Default	1 cm
JFT2M	Default	1 cm
JT60U	Default	1 cm
PBXM	Default	0.5 cm
PDX	Default	1 cm
TCV	Default	2%
TEXTOR	Default	0.5 cm
TFTR	Default	n.a.
TDEV	Default	0.5 cm
START	Default	n.a.
T10	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

51. XPLIM

Description: Minimum distance between the X-point and either the vessel walls or limiters
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m
Error: See table

TOK	Definition	Error
ASDEX	Based on multiple equilibrium fits	n.a.
AUG	Default	n.a.
CMOD	Default	n.a.
COMPASS	Default	n.a.

TOK	Definition	Error
D3D	Default	3 cm
JET	Default	5 cm
JFT2M	Default	3 cm
JT60U	Default	2 cm
PBXM	Default	5 cm
PDX	Default	5 cm
TCV	Default	2%
TEXTOR	Default	n.a.
TFTR	Default	n.a.
TDEV	Default	1 cm
START	Default	n.a.
T10	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

Machine condition

52. WALMAT

Description: Material of the vessel wall
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

WALMAT	Definition
C	Carbon
SS	Stainless steel
IN	Inconel
IN/C	Inconel with carbon
CSS	(Partly) carbon on stainless steel
AL	Aluminum

---

53. DIVMAT

Description: Material of the divertor tiles
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

WALMAT	Definition
NONE	No divertor
SS	Stainless steel
C **CC**	Carbon
TI1 **TI2**	Titanium
BE	Beryllium
C/BE	Carbon at the top and beryllium at the bottom
W	Tungsten
MO	Molybdenum
IN	Inconel

---

54. LIMMAT

Description: Material of the limiters
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

LIMMAT	Definition
NONE	No limiters
C	Carbon
BE	Beryllium
MO	Molybdenum

---

55. EVAP

Description: Evaporated material used to cover the inside of the vessel
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

EVAP	Definition
NONE	No evaporation
BOR **BO**	Boron
BOROA	Boron ($B_2H_6 + CH_4 + H_2$)
BOROB	Boron ($B_2H_6 + H_2$)
BOROC	Boron
BOROX	Boron
B2D6	Boron
CARB	Carbon
CARBH	Carbon ($CH_4 + D_2$)
CARBORANE	Orto-carborane ($C_2B_{10}H_{12}$) into He glow
DECABORA	Decaborane ($B_{10}H_{14}$)
TI	Titanium
BE	Beryllium
SILICON	Silicon
SID4	Silicon

---

56. DALFMP

Description: Dα emission on the midplane
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{ph\ s^{-1}\ m^{-2}\ sr^{-1}}$
Error:

- Default : n.a.
- Exceptions : See table

TOK	Error
AUG	20%
JET	20%
PBXM	5%
PDX	5%

---

57. DALFDV

Description: Dα emission in the divertor
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{ph\ s^{-1}\ m^{-2}\ sr^{-1}}$
Error: See table

TOK	Error
JET	20%
PBXM	5%
PDX	5%

Magnetics

58. IGRADB

Description: Indicates the direction of the ion ∇B drift
Definition: Elementary variable: See table
Data type: Integer
Allowed values: $-1, 0, 1$
Units: n.a.
Error: n.a.

IGRADB	Definition
-1	CONFIG = SN and ion ∇B drift away from the X-point
0	Undefined
1	CONFIG = SN and ion ∇B drift toward the X-point

---

59. BT

Description: Vacuum toroidal magnetic field at RGEO
Definition:

- Default: Elementary variable, determined from the current in the toroidal field coils
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: T
Error: See table

TOK	Definition	Error
ASDEX	Default	1%
AUG	Usually negative values	1%
CMOD	Usually negative values	1%
COMPASS	Default	2%
D3D	Default	1%
JET	Negative values indicate operation with reversed toroidal field	1%
JFT2M	Default	1%
JT60U	Default	1%
PBXM	Default	1%
PDX	Default	1%
TCV	Default	1%
TEXTOR	Default	1%
TFTR	Default	2%

TOK	Definition	Error
TDEV	Default	1%
START	Default	6%
T10	Default	1%
TUMAN3M	Default	3%
MAST	Usually negative values	n.a.
NSTX	Default	n.a.

---

60. IEML

TOK	Error
JFT2M	1%

Description: Ergodic magnetic field coil current
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: A
Error:

- Default : n.a.
- Exceptions : See table

---

61. PREMAG

Description: Flag indicating whether start-up was done with or without pre-magnetization current
Definition:

- Default: Elementary variable: See table
- Exceptions and comments: See table

Data type: String
Allowed values: NO, YES
Units: n.a.
Error: n.a.

PREMAG	Definition
NO	Startup without pre-magnetization current
YES	Startup with pre-magnetization current

TOK	Definition
JET	If PREMAG = 'NO' for shots taken before 1994, then WMHD is missing

62. IP

Description: Plasma current
Definition:

- Default: Elementary variable, determined from an external Rogowski coil with vessel current subtraction
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $]-\mathrm{Inf},\mathrm{Inf}[$
Units: A
Error: See table

TOK	Definition	Error
ASDEX	Default	1%
AUG	Default	1%
CMOD	Usually negative values	2%
COMPASS	Default	1%
D3D	Default	1%
JET	Usually negative values. Positive values indicate operation with reversed current.	1%
JFT2M	Default	1%
JT60U	Default	0.5%
PBXM	Default	1%
PDX	Default	1%
TCV	Default	1%
TEXTOR	Default	1%
TFTR	Default	2%
TDEV	Usually negative values	2%
START	Default	2%
T10	Default	1%
TUMAN3M	Default	3%
MAST	Default	n.a.
NSTX	Default	n.a.

63. VSURF

Description: Loop voltage at the plasma boundary
Definition: Elementary variable
Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: V
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	5%	**JET**	5%	**TCV**	3%	**T10**	20%
AUG	10%	**JFT2M**	5%	**TEXTOR**	5%	**TUMAN3M**	5%
CMOD	5%	**JT60U**	20%	**TFTR**	$5\% + 0.05$ V	**MAST**	n.a.
COMPASS	10%	**PBXM**	50%	**TDEV**	0.02 V	**NSTX**	n.a.
D3D	n.a.	**PDX**	10%	**START**	10%		

---

64. Q95

Description: Plasma safety factor at the 95% poloidal flux surface
Definition:

- Default: Elementary variable, obtained from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Definition	Error
ASDEX	$\mathrm{Q95} = \mathrm{QCYL} * \left(1 + \left(\frac{\mathrm{AMIN}}{\mathrm{RGEO}}\right)^2 * (1 + 0.5 * \mathrm{BEILI2}^2)\right)$, where $\mathrm{QCYL} = 5 \times 10^6 * \frac{\mathrm{BT}}{\mathrm{IP}} * \frac{\mathrm{AMIN}^2}{\mathrm{RGEO}} * \frac{1+\mathrm{KAPPA}^2}{2}$	10%
AUG	Default	5%
CMOD	Default	3%
COMPASS	Default	10%
D3D	Default	3%
JET	Default	10%

TOK	Definition	Error
JFT2M	Default	10%
JT60U	Default	5%
PBXM	Default	10%
PDX	Default	10%
TCV	Default	3%
TEXTOR	Default	10%
TFTR	q at boundary defined by limiter	6%
TDEV	Default	10%
START	Default	10%
T10	Default	10%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

65. SH95

TOK	Error
D3D	50%
JET	50%

Description: Magnetic shear at the 95% poloidal flux surface
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table

---

66. BEILI2

Description: Represents $\beta_\mathrm{i} + 0.5 l_\mathrm{i}$, where β_i is the Shafranov β and l_i the internal inductance
Definition:

- Default: Elementary variable, determined from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.

Error: See table

TOK	Definition	Error
ASDEX	Determined from probe measurements	10%
AUG	Default	3%
CMOD	Default	3%
COMPASS	Default	n.a.
D3D	Default	3%
JET	Default	5%
JFT2M	Default	10%
JT60U	Default	5%
PBXM	Default	10%
PDX	Default	10%
TCV	Default	3%
TEXTOR	Default	20%
TFTR	Default	4%
TDEV	Default	5%
START	Default	n.a.
T10	Default	10%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

67. BEIMHD

Description: β Shafranov
Definition:

- Default: Elementary variable, determined from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Definition	Error
ASDEX	BEIMHD is BEILI2, minus an estimate of $l_i/2$ obtained during the Ohmic phase, assuming a resistive equilibrium.	15%
AUG	Default	n.a.
CMOD	Default	n.a.
COMPASS	Default	n.a.
D3D	Default	$0.05/\beta_p$
JET	Default	12%
JFT2M	Default	15%
JT60U	Default	n.a.
PBXM	Default	15%
PDX	Default	15%
TCV	Default	10%
TEXTOR	Default	15%
TFTR	$\mathrm{BEIMHD} = \frac{2*\mathrm{BEPMHD}+\mathrm{BEPDIA}}{3}$	$0.04 * \mathrm{BEILI2} + 0.1$
TDEV	Default	n.a.
START	Default	n.a.
T10	Default	10%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

68. BEPMHD

Description: Poloidal β
Definition:

- Default: Elementary variable, determined from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Definition	Error
ASDEX	$\mathrm{BEPMHD} = \mathrm{BEIMHD}$	15%
AUG	Default	10%
CMOD	Default	5%
COMPASS	Default	n.a.
D3D	Default	5%
JET	Default	n.a.
JFT2M	Default	15%
JT60U	Default	7%
PBXM	Default	20%
PDX	Default	20%
TCV	Default	10%
TEXTOR	Default	15%
TFTR	$\mathrm{BEPMHD} = \mathrm{BEILI2} - \frac{l_i}{2}$, with l_i from a time evolution model	$0.04 * \mathrm{BEILI2} + 0.1$
TDEV	Default	n.a.
START	Default	n.a.
T10	Default	10%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

69. BETMHD

Description: Toroidal β
Definition:

- Default: Elementary variable, determined from an MHD equilibrium fit
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Definition	Error
ASDEX	Default	18%
AUG	Default	15%
CMOD	Default	5%
COMPASS	Default	n.a.
D3D	Default	5%
JET	Default	12%
JFT2M	Default	15%
JT60U	Default	7%
PBXM	Default	20%
PDX	Default	20%
TCV	Default	10%
TEXTOR	Default	15%
TFTR	$\mathrm{BEPMHD} = \mathrm{BEILI2} - \frac{l_i}{2}$, with l_i from time evolution model	4% + fractional error BEIMHD
TDEV	Default	n.a.
START	Default	15%
T10	Default	10%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

70. BEPDIA

Description: Poloidal diamagnetic β
Definition:

- Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Definition	Error
ASDEX	Corrected using an average of 3 Ohmic points in the database	15%
AUG	Default	10%
CMOD	Default	n.a.
COMPASS	Default	0.1%
D3D	Default	n.a.
JET	Default	20%
JFT2M	Default	n.a.
JT60U	Default	n.a.
PBXM	Default	n.a.
PDX	Default	n.a.
TCV	Default	n.a.
TEXTOR	Default	n.a.
TFTR	Default	$4\% + 100\ \mathrm{kJ} / \mathrm{WDIA}$
TDEV	Default	25%
START	Default	n.a.
T10	Default	10%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

71. BMHDMDIA

Description: Offset during the Ohmic phase between MHD and diamagnetic quantities
Definition:

- Default: Not defined
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units:

- Default: n.a.
- Exceptions: See table

Error:

- Default: n.a.

- Exceptions: See table

TOK	Definition	Units	Error
ASDEX	ASDEX: offset between diamagnetic β poloidal and MHD β poloidal	n.a.	5%
JFT2M	Offset between diamagnetic energy and MHD energy	J	10% – 20%

---

72. TAUCR

Description: Current relaxation time
Definition: From [Mikkelsen89]:

$$\mathrm{TAUCR} = 2.51 \times 10^{-6} * \mathrm{IP} * \frac{\mathrm{RGEO}}{\mathrm{VSURF}}$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: Co.

---

73. FBS

Description: Bootstrap current fraction
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

---

74. RHOQ2

Description: Normalized radius ρ of the $q = 2$ surface
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, 1]$
Units: n.a.
Error: n.a.

75. RHOINV

Description: Normalized sawtooth inversion radius ρ
Definition: From Eq. (7) in [Weisen02]:

$$\mathrm{RHOINV} = 4 \times 10^{-7} * \frac{\mathrm{IP} * \mathrm{RGEO}}{\mathrm{AMIN}^2 * \mathrm{BT} * \mathrm{KAPPA} * (\mathrm{KAPPA} + 1/\mathrm{KAPPA})}$$

Data type: Floating point
Allowed values: $[0, 1]$
Units: n.a.
Error: Co.

Plasma composition

76. NEL

Description: Central line-averaged electron density
Definition:

- Default: Elementary variable, determined from interferometry
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^{-3}
Error: See table

TOK	Definition	Error
ASDEX	Default	3%
AUG	Default	3%
CMOD	Default	5%
COMPASS	Default	5%
D3D	Default	$2 \times 10^{18}\ \mathrm{m}^{-3}$
JET	Determined from LIDAR Thomson scattering In case a measurement is not available, NEL is approximated as follows: • Ohmic: $\mathrm{NEL} \sim \exp(2.931 + 0.873 * \ln(\mathrm{NEV}) + 0.064 * \ln(\mathrm{NE0}))$ • H-mode: $\mathrm{NEL} \sim \exp(3.745 + 0.825 * \ln(\mathrm{NEV}) + 0.092 * \ln(\mathrm{NE0}))$ The variable NELFORM indicates whether NEL was measured or approximated.	8%
JFT2M	Default	2%
JT60U	Default	10%
PBXM	Default	5%
PDX	Default	5%
TCV	Default	5%
TEXTOR	Default	2%
TFTR	Default	5%
TDEV	Default	2%
START	Default	5%
T10	Default	3%
TUMAN3M	Default	10%
MAST	Default	n.a.

TOK	Definition	Error
NSTX	Default	n.a.

---

77. NELFORM

Description: Indicates whether NEL is an indirect measurement
Definition: Elementary variable: See table
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

NELFORM	Definition
0	• NEL at JET based on direct measurement • Data point from device other than JET
1	NEL at JET approximated by formula

---

78. DNELDT

Description: Time rate of change of NEL
Definition: Elementary variable
Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: $\mathrm{m}^{-3}\ \mathrm{s}^{-1}$
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	2%	**JET**	8%	**TCV**	5%	**T10**	n.a.
AUG	3%	**JFT2M**	2%	**TEXTOR**	5%	**TUMAN3M**	n.a.
CMOD	5%	**JT60U**	10%	**TFTR**	5%	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	5%	**TDEV**	10%	**NSTX**	n.a.
D3D	$2 \times 10^{18}\ \mathrm{m}^{-3}\ \mathrm{s}^{-1}$	**PDX**	5%	**START**	n.a.		

---

79. NEV

Description: Volume-averaged electron density

Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Allowed values: $[0, \mathrm{Inf}[$
Units: m^{-3}
Error: See table

TOK	Definition	Error
ASDEX	Determined from 4 HCN laser interferometer channels by fitting the following radial density profile and assuming a circular plasma: $n(x) = n(1) + \big(n(0) - n(1)\big) * (1 - x^a)^b, \quad 0 \le x \le 1$	5%
AUG	Default	10%
CMOD	Default	7%
COMPASS	Default	n.a.
D3D	Determined from CO_2 laser interferometer and Thomson scattering data, using a spline fit of the radial density profile	10%
JET	Determined from a weighted summation over 6 interferometer channels	8%
JFT2M	Determined from an analytic profile fit with a fixed shape to 2 interferometer channels	2%
JT60U	Default	10%
PBXM	Default	5%
PDX	Default	5%
TCV	Default	5%
TEXTOR	Default	10%
TFTR	Default	10%
TDEV	Default	10%
START	Default	n.a.
T10	Default	10%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

80. NE0

Description: Central electron density at the magnetic axis

Definition: Elementary variable, determined with similar methods as NEV
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^{-3}
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	10%	**JET**	10%	**TCV**	10%	**T10**	10%
AUG	20%	**JFT2M**	n.a.	**TEXTOR**	10%	**TUMAN3M**	n.a.
CMOD	10%	**JT60U**	20%	**TFTR**	10%	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	n.a.	**TDEV**	10%	**NSTX**	n.a.
D3D	15%	**PDX**	n.a.	**START**	n.a.		

---

81. NE0TSC

Description: Central electron density from Thomson scattering
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^{-3}
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
ASDEX	Average of the 3 YAG laser channels closest to the equatorial plane	5%
AUG	Default	30%
D3D	Thomson scattering point that is closest to the magnetic axis (less than 10 cm)	10%
JT60U	Default	10%
TCV	Default	10%

---

82. NESEP

Description: Electron density at the separatrix
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^{-3}
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG		
JET		

---

83. NESOL

Description: Electron density in the scrape-off layer
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: m^{-3}
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG		
JET		

---

84. PMAIN

Description: Neutral pressure in the main chamber
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Pa
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG		
JET		

---

85. PDIV

Description: Neutral pressure in the divertor
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Pa
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG		
JET		

---

86. GP_MAIN

Description: Gas puff in the main chamber
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: e s^{-1}
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG		
JET		

---

87. GP_DIV

Description: Gas puff in the divertor
Definition:
- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: e s^{-1}
Error:
- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG		
JET		

Impurities

88. ZEFF

Description: Line-averaged plasma effective charge determined from visible Bremsstrahlung
Definition: Elementary variable
Data type: Floating point
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	10%	**JET**	30%	**TCV**	20%	**T10**	30%
AUG	n.a.	**JFT2M**	n.a.	**TEXTOR**	n.a.	**TUMAN3M**	n.a.
CMOD	20%	**JT60U**	15%	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	n.a.	**TDEV**	25%	**NSTX**	n.a.
D3D	20%	**PDX**	n.a.	**START**	n.a.		

---

89. ZEFFNEO

Description: Plasma effective charge as determined by neoclassical resistivity
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[1, \mathrm{Inf}[$
Units: n.a.
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
ASDEX	Determined such that the current profile calculated from ZEFFNEO, $T_e(r)$ and U_{loop} is consistent with the total measured I_p	15%
JET	Determined using volume-averaged quantities	25%

---

90. PRAD

Description: Total radiated power
Definition: Elementary variable, determined from bolometry
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	20%	**JET**	10% – 15%	**TCV**	n.a.	**T10**	25%
AUG	20%	**JFT2M**	10% – 20%	**TEXTOR**	15%	**TUMAN3M**	n.a.
CMOD	20%	**JT60U**	20%	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	25%	**TDEV**	20%	**NSTX**	n.a.
D3D	15%	**PDX**	n.a.	**START**	n.a.		

Input powers

91. POHM

Description: Total Ohmic power
Definition:

- Default: $\mathrm{POHM} = \mathrm{VSURF} * \mathrm{IP}$
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Definition	Error
ASDEX	$\mathrm{POHM} = \max(0, \mathrm{VSURF} * \mathrm{IP})$	• Ohmic: 5% • H-mode: 50%
AUG	VSURF is corrected for flux variations between the loop and the plasma surface	15%
CMOD	$\mathrm{POHM} = V_{\mathrm{res}} * \mathrm{IP}$, where V_{res} is calculated from VSURF, corrected for inductive effects	15%
COMPASS	Default	10%
D3D	$\mathrm{POHM} = C * \frac{B_{10} * I_p^2 * \mathrm{RGEO}^2}{W_{\mathrm{th}} * n_{\mathrm{e}}}$, where B_{10} is the central visible Bremsstrahlung signal and W_{th} is the thermal plasma stored energy. The constant C is given by • $C = 1.03 \times 10^{-19}$, if n_{e} is determined from the radial CO_2 chord. • $C = 9.92 \times 10^{-20}$, if n_{e} is determined from the vertical CO_2 chord.	15%
JET	$\mathrm{POHM} = \mathrm{VSURF} * \mathrm{IP}$, corrected for inductance effects	20%
JFT2M	Default	10%
JT60U	• For $\mathrm{SHOT} < 33635$: default • For $\mathrm{SHOT} \geq 33635$: calculated by the transport analysis code TOPICS on the basis of a T_{e} profile, under the following assumptions: ○ Uniform Z_{eff} profile ○ Uniform profile of the toroidal electric field ○ Neoclassical resistivity	20%
PBXM	Default	50%
PDX	A correction for inductance effects is made	20%
TCV	VSURF is obtained from the equilibrium code LIUQE	10%
TEXTOR	Default	10%
TFTR	$\mathrm{POHM} = \mathrm{IP} * \mathrm{VSURF} - 3.14 \times 10^{-7} * \mathrm{RGEO} * \frac{\mathrm{d}}{\mathrm{d}t}(\mathrm{IP}^2 * l_{\mathrm{i}})$	300 kW
TDEV	n.a.	5%
START	A correction for inductance effects is made	10%

TOK	Definition	Error
T10	Default	20%
TUMAN3M	Default	6%
MAST	n.a.	n.a.
NSTX	n.a.	n.a.

---

92. ENBI

Description: Neutral beam energy weighted by power
Definition:

- Elementary variable, defined as

$$\mathrm{ENBI} = \frac{\sum_i E_i * P_i}{\sum_i P_i},$$

  where E_i and P_i are the beam energy and power for source i, respectively.
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: See table

TOK	Definition	Error
ASDEX	The primary energy component is given.	0.2 kV
AUG	Default	5%
CMOD	Default	n.a.
COMPASS	Default	n.a.
D3D	Default	10%
JET	Default	12%
JFT2M	Default	5%
JT60U	Default	5%
PBXM	Default	15%
PDX	Default	15%
TCV	Default	n.a.
TEXTOR	Default	5%
TFTR	Default	5%

TOK	Definition	Error
TDEV	Default	n.a.
START	Default	n.a.
T10	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

93. PINJ

Description: Power injected by neutral beam 1, using beam species BGASA, BGASZ
Definition: Elementary variable. $\mathrm{PINJ} = 0$ if no beams are on. Note that the total injected neutral beam power is $\mathrm{PINJ} + \mathrm{PINJ2}$.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	5%	**JET**	6%	**TCV**	n.a.	**T10**	n.a.
AUG	5%	**JFT2M**	5%	**TEXTOR**	5%	**TUMAN3M**	n.a.
CMOD	n.a.	**JT60U**	5%	**TFTR**	15% absolute, 2% relative	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	5%	**TDEV**	n.a.	**NSTX**	n.a.
D3D	10%	**PDX**	10%	**START**	5%		

---

94. BSOURCE

Description: Power fractions injected by neutral beam 1
Definition:

- Default: Elementary variable, given as a sequence $P_1P_2P_3$ of power fractions (in percentage) P_1, P_2 and P_3 of the 3 components in neutral beam 1
- Exceptions and comments: See table

Data type: Integer
Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

TOK	Definition
JET	For data between 1989 – 1990, the possibilities for BSOURCE are • $\mathrm{BSOURCE} = 781606$ for a 80 kV D beam • $\mathrm{BSOURCE} = 652114$ for a 140 kV D beam • $\mathrm{BSOURCE} = 990000$ for ^{3}He or ^{4}He beams

---

95. PINJ2

Description: Power injected by neutral beam 2, using beam species BGASA2, BGASZ2
Definition: Elementary variable. $\mathrm{PINJ2} = 0$ if no second beam is on. Note that the total injected neutral beam power is $\mathrm{PINJ} + \mathrm{PINJ2}$.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	n.a.	**JET**	6%	**TCV**	n.a.	**T10**	n.a.
AUG	5%	**JFT2M**	n.a.	**TEXTOR**	5%	**TUMAN3M**	n.a.
CMOD	n.a.	**JT60U**	n.a.	**TFTR**	15% absolute + 2% relative	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	n.a.	**TDEV**	n.a.	**NSTX**	n.a.
D3D	n.a.	**PDX**	n.a.	**START**	n.a.		

---

96. BSOURCE2

Description: Power fractions injected by neutral beam 2
Definition:

- Default: Elementary variable, given as a sequence $P_1P_2P_3$ of power fractions (in percentage) P_1, P_2 and P_3 of the 3 components in neutral beam 2.
- Exceptions and comments: See table

Data type: Integer

Allowed values: $[0, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

TOK	Definition
JET	For data from 1989 – 1990, the possibilities for BSOURCE2 are • $\mathrm{BSOURCE2} = 781606$ for a 80 kV D beam • $\mathrm{BSOURCE2} = 652114$ for a 140 kV D beam • $\mathrm{BSOURCE2} = 990000$ for ^{3}He or ^{4}He beams

---

97. COCTR

Description: Fraction of beam power co-injected as compared to the total beam power injected
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, 1]$
Units: n.a.
Error: n.a.

---

98. PNBI

Description: Total injected neutral beam power minus shine-through
Definition: Elementary variable. $\mathrm{PNBI} = 0$ if no beams are on.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	10%	**JET**	10%	**TCV**	n.a.	**T10**	n.a.
AUG	10%	**JFT2M**	10%	**TEXTOR**	10%	**TUMAN3M**	n.a.
CMOD	n.a.	**JT60U**	10%	**TFTR**	15% absolute + 5% relative	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	10%	**TDEV**	n.a.	**NSTX**	n.a.
D3D	10%	**PDX**	10%	**START**	20%		

99. PFLOSS

Description: Neutral beam power lost from the plasma through charge exchange and unconfined orbits
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Definition	Error
ASDEX	Obtained from fits to results from the FREYA code	30%
AUG	Default	20%
CMOD	Default	n.a.
COMPASS	Default	n.a.
D3D	$\mathrm{PNBI} = 10^{-2} * \exp(3.3 - 2.5 * \mathrm{IP} * 10^{-6})$	30%
JET	$\mathrm{PNBI} = 10^{-2} * \exp(3.35 - 0.667 * \lvert\mathrm{IP}\rvert * 10^{-6} - 0.2 * \mathrm{NEL} * 10^{-19})$	50%
JFT2M	Obtained from fits to results from a Monte Carlo code	20%
JT60U	Default	20%
PBXM	Obtained from fits to results from the TRANSP code	20%
PDX	Obtained from fits to results from the TRANSP code	30%
TCV	Default	n.a.
TEXTOR	Default	30%
TFTR	Default	20%
TDEV	Default	n.a.
START	Default	20%
T10	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

100. ECHFREQ

Description: ECRH frequency
Definition: Elementary variable. Zero if no ECRH is applied.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Hz
Error: See table

TOK	Error
COMPASS	0.1%
D3D	0.1%
TDEV	0.1%
T10	0.1%

---

101. ECHMODE

Description: Mode of ECRH waves
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ECHMODE	Definition
NONE	No ECRH power was applied throughout the discharge
OFF	Used when $\mathrm{PECRH} = 0$ for the data point, but $\mathrm{PECRH} > 0$ at some other time in the discharge
O	Ordinary mode
X	Extraordinary mode
X+O	Both extraordinary and ordinary mode
UNKNOWN	ECRH mode unknown

---

102. ECHLOC

Description: Location of ECRH launch
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ECHLOC	Definition
NONE	No ECRH power was applied throughout the discharge
OFF	Used when $\mathrm{PECRH} = 0$ for the data point, but $\mathrm{PECRH} > 0$ at some other time in the discharge
IN	Waves launched from the high-field-side
OUT	Waves launched from the low-field-side
IN+OUT	Waves launched from both the high-field-side and low-field-side
LFS_UP **LFS_UPPER**	Waves launched from the top low-field-side
UNKNOWN	Location of ECRH launch unknown

---

103. PECRHC

Description: ECRH power coupled to the plasma
Definition: Elementary variable. Zero if no ECRH is applied.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error
COMPASS	5%
D3D	10%
TDEV	10%
T10	10%

---

104. PECRH

Description: ECRH power absorbed by the plasma
Definition: Elementary variable. Zero if no ECRH is applied.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error
COMPASS	15%
D3D	10%
TDEV	10%
T10	15%

---

105. ICFREQ

Description: ICRH frequency
Definition: Elementary variable. Zero if no ICRH is applied.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: Hz
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	n.a.	**JET**	1%	**TCV**	n.a.	**T10**	n.a.
AUG	1%	**JFT2M**	n.a.	**TEXTOR**	0.1%	**TUMAN3M**	n.a.
CMOD	0.5%	**JT60U**	n.a.	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	n.a.	**TDEV**	n.a.	**NSTX**	n.a.
D3D	0.001%	**PDX**	n.a.	**START**	n.a.		

---

106. ICSCHEME

Description: ICRH heating scheme
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ICSCHEME	Definition
NONE	No ICRH power was applied throughout the discharge
OFF	Used when $\mathrm{PICRH} = 0$ for the data point, but $\mathrm{PICRH} > 0$ at some other time in the discharge
HMIN	H minority
HE3MIN	^{3}He minority
H2NDHARM	2nd harmonic H heating
HE3MIN-T	^{3}He minority in tritium
HMIN-T	H minority in tritium
HHFW	
UNKNOWN	Heating scheme not supplied

107. ICANTEN

Description: ICRH antenna phasing
Definition: Elementary variable: See table
Data type: String
Allowed values: Alphanumeric
Units: n.a.
Error: n.a.

ICANTEN	Definition
NONE	No ICRH power was applied throughout the discharge
OFF	Used when $\mathrm{PICRH} = 0$ for the data point, but $\mathrm{PICRH} > 0$ at some other time in the discharge
DIPOLE	Dipole phasing
MONOPOLE	Monopole phasing
UNKNOWN	Antenna phasing not supplied

108. PICRHC

Description: ICRH power coupled to the plasma
Definition: Elementary variable. Zero if no ICRH is applied.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	n.a.	**JET**	10%	**TCV**	n.a.	**T10**	n.a.
AUG	10%	**JFT2M**	n.a.	**TEXTOR**	10%	**TUMAN3M**	n.a.
CMOD	3% – 5%	**JT60U**	n.a.	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	n.a.	**TDEV**	n.a.	**NSTX**	n.a.
D3D	5%	**PDX**	n.a.	**START**	n.a.		

109. PICRH

Description: ICRH power absorbed by the plasma
Definition: Elementary variable. Zero if no ICRH is applied.
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	n.a.	**JET**	10%	**TCV**	n.a.	**T10**	n.a.
AUG	10%	**JFT2M**	n.a.	**TEXTOR**	10%	**TUMAN3M**	n.a.
CMOD	10%	**JT60U**	n.a.	**TFTR**	n.a.	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	n.a.	**TDEV**	n.a.	**NSTX**	n.a.
D3D	10% – 20%	**PDX**	n.a.	**START**	n.a.		

110. PALPHA

Description: Estimated α heating power in deuterium-tritium plasmas
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
JET	Estimated through the correspondence 1.601×10^{19} n s^{-1} → 3.5×10^{6} W. Set to zero if less than 0.01×10^{6} W.	10%
TFTR	Default	20%

111. DWDIA

Description: Time rate of change of the total plasma stored energy
Definition:

- Default: Elementary variable, obtained from diamagnetic loop measurements
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $]-\mathrm{Inf},\mathrm{Inf}[$
Units: W
Error: See table

TOK	Definition	Error
ASDEX	• If $\mathrm{DWHC}=0$: obtained from a parabolic fit to the time evolution of the diamagnetic β_p over ± 6 ms • If $\mathrm{DWHC}=1$: obtained from the tangent to the WDIA time trace	20%
AUG	Default	30%
CMOD	Default	n.a.
COMPASS	Default	30%
D3D	Default	25%
JET	Moving average over ± 100 ms	10%
JFT2M	Obtained from a derivative of WDIA over ± 5 ms	20%
JT60U	Default	20%
PBXM	Default	n.a.
PDX	Default	10%
TCV	Default	n.a.
TEXTOR	Default	20%
TFTR	Default	5% + fractional error on WDIA
TDEV	Default	50%
START	Default	n.a.
T10	Default	15%
TUMAN3M	Default	20%
MAST	Default	n.a.
NSTX	Default	n.a.

112. DWDIAPAR

Description: Time derivative for ASDEX of WDIA from a parabolic fit to the 3 available H-mode points
Definition: Elementary variable, only relevant for ASDEX and used in calculating TAUDIA
Data type: Floating point
Allowed values: $]-\mathrm{Inf},\mathrm{Inf}[$
Units: W
Error: 20%

113. DWMHD

Description: Time rate of change of the total plasma stored energy
Definition:

- Default: Elementary variable, obtained from MHD measurements
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $]-\mathrm{Inf},\mathrm{Inf}[$
Units: W
Error: See table

TOK	Definition	Error
ASDEX	As for DWDIA	20%
AUG	Default	30%
CMOD	Default	20%
COMPASS	Default	n.a.
D3D	Obtained by differentiating a spline fit to WMHD	25%
JET	As for DWDIA	20%
JFT2M	Obtained from a derivative of WMHD over ± 5 ms, without correcting for the change of l_i from a current filament method	20%
JT60U	Default	n.a.
PBXM	Default	10%
PDX	Default	10%
TCV	Default	10%
TEXTOR	Default	20%
TFTR	Default	5% +fractional error on WTOT

TOK	Definition	Error
TDEV	Default	25%
START	Default	20%
T10	Default	15%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

114. DWHC

Description: Flag indicating whether DWDIA or DWMHD were manually corrected for ASDEX
Definition: Elementary variable, only relevant for ASDEX: See table
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

DWHC	Definition
0	• No manual correction of DWDIA or DWMHD for ASDEX • No ASDEX data
1	DWDIA or DWMHD have been corrected manually for ASDEX

Temperatures

115. TEV

Description: Volume-averaged electron temperature
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: eV
Error: See table

TOK	Definition	Error
ASDEX	Determined from 16 radial YAG laser measurements by fitting the following radial temperature profile and assuming a circular plasma: $T_e(x) = T_e(0) * \exp(a * x^2 + b * x^4 + c * x^6)$	5%
AUG	Default	n.a.
CMOD	Default	5%
COMPASS	Default	n.a.
D3D	Determined from a spline fit to a temperature profile obtained from Thomson scattering	10%
JET	Determined from a 51-point temperature profile obtained from ECE	10%
JFT2M	Default	n.a.
JT60U	Default	5%
PBXM	Computed from BETMHD, VOL and NEL, assuming $Z_{\mathrm{eff}} = 1$	30%
PDX	Computed from BETMHD, VOL and NEL, assuming $Z_{\mathrm{eff}} = 1$	30%
TCV	Default	5%
TEXTOR	Default	n.a.
TFTR	Default	15%
TDEV	Default	n.a.
START	Default	n.a.
T10	Default	15%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

116. TE0

Description: Electron temperature on the magnetic axis
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: eV
Error: See table

TOK	Definition	Error
ASDEX	As for TEV	10%
AUG	Default	30%
CMOD	Default	10%
COMPASS	Default	n.a.
D3D	As for TEV	10%
JET	As for TEV	10%
JFT2M	Default	n.a.
JT60U	Default	10%
PBXM	Default	n.a.
PDX	Default	n.a.
TCV	Default	10%
TEXTOR	Default	15%
TFTR	Default	10%
TDEV	Default	10%
START	Default	n.a.
T10	Default	15%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

117. TE0TSC

Description: Electron temperature on the magnetic axis from Thomson scattering
Definition:

- Default: Elementary variable, determined from the Thomson scattering point closest to the magnetic axis
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: eV
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
ASDEX	Average of the 3 YAG laser channels closest to the equatorial plane	5%
D3D	Obtained from the Thomson scattering point closest to the magnetic axis, less than $10\ \mathrm{cm}$	10%
JT60U	Default	10%

118. TIV

Description: Volume-averaged ion temperature
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: eV
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
D3D	Determined by a spline fit to a temperature profile obtained from charge exchange recombination data	10%
JET	$\mathrm{TIV} = \frac{\mathrm{TI0}*\mathrm{TEV}}{\mathrm{TE0}}$	30%
JT60U	Default	7%

TOK	Definition	Error
PBXM	Determined by assuming $\mathrm{TIV} = \mathrm{TEV}$	30%
PBXM	Determined by assuming $\mathrm{TIV} = \mathrm{TEV}$	30%
TFTR	Default	20%

---

119. TI0

Description: Ion temperature at the magnetic axis
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: eV
Error: See table

TOK	Definition	Error
ASDEX	Default	n.a.
AUG	Default	40%
CMOD	Default	15%
COMPASS	Default	n.a.
D3D	As for TIV	10%
JET	From a crystal X-ray diagnostic	10%
JFT2M	Default	n.a.
JT60U	Default	10%
PBXM	Default	n.a.
PDX	Default	n.a.
TCV	Default	n.a.
TEXTOR	Default	n.a.
TFTR	Default	15%
TDEV	Default	n.a.
START	Default	n.a.
T10	Default	10%

TOK	Definition	Error
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

120. TICX0

TOK	Error
JET	10%
JT60U	10%

Description: Ion temperature on the magnetic axis from charge exchange recombination spectroscopy
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: eV
Error:

- Default: n.a.
- Exceptions: See table

Plasma rotation

121. OMGAIMP0

Description: Central rotation frequency of impurities
Definition: Elementary variable, obtained from the corresponding toroidal rotation velocity V_{tor} as

$$\mathrm{OMGAIMP0} = 2 * \pi * \frac{V_{\mathrm{tor}}}{L}, \quad \text{where} \quad L = 2 * \pi * R$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{rad\ s^{-1}}$
Error: n.a.

---

122. OMGAIMPH

Description: Rotation frequency of impurities at half radius
Definition: Elementary variable, obtained from the corresponding toroidal rotation velocity V_{tor} as

$$\mathrm{OMGAIMPH} = 2 * \pi * \frac{V_{\mathrm{tor}}}{L}, \quad \text{where} \quad L = 2 * \pi * R$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{rad\ s^{-1}}$
Error: n.a.

---

123. OMGAM0

Description: Central rotation frequency of main plasma species
Definition: Elementary variable, obtained from the corresponding toroidal rotation velocity V_{tor} as

$$\mathrm{OMGAM0} = 2 * \pi * \frac{V_{\mathrm{tor}}}{L}, \quad \text{where} \quad L = 2 * \pi * R$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{rad\ s^{-1}}$
Error: n.a.

---

124. OMGAMH

Description: Rotation frequency of main plasma species at half radius

Definition: Elementary variable, obtained from the corresponding toroidal rotation velocity V_{tor} as

$$\mathrm{OMGAMH} = 2 * \pi * \frac{V_{\mathrm{tor}}}{L}, \quad \text{where} \quad L = 2 * \pi * R$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{rad\ s^{-1}}$
Error: n.a.

---

125. SPIN

Description: Net fraction of NBI power in parallel direction
Definition: Elementary variable, calculated using the following expression:

$$\mathrm{SPIN} = \frac{1}{P_{\mathrm{inj}}} * \left(\sum_i P_{\mathrm{co},i} * \cos\theta_{\mathrm{co},i} - \sum_i P_{\mathrm{ctr},i} * \cos\theta_{\mathrm{ctr},i} \right),$$

where P_{inj} is the total injected NBI power, $P_{\mathrm{co},i}$ ($P_{\mathrm{ctr},i}$) is the power injected from NBI co-directed (counter-directed) source i and $\theta_{\mathrm{co},i}$ ($\theta_{\mathrm{ctr},i}$) is the angle between the source's centerline and the geometric axis of the machine.
Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: n.a.
Error: n.a.

---

126. TORQ

Description: Torque on plasma due to neutral beam injection
Definition: Elementary variable, calculated using the following expression:

$$\mathrm{TORQ} = 4.57 * \left(\sum_j \sum_i \sqrt{\frac{m_{\mathrm{co},j}}{E_{\mathrm{co},ji}}} * P_{\mathrm{co},ji} * R_{\mathrm{co},j} - \sum_j \sum_i \sqrt{\frac{m_{\mathrm{ctr},j}}{E_{\mathrm{ctr},ji}}} * P_{\mathrm{ctr},ji} * R_{\mathrm{ctr},j} \right),$$

where $E_{\mathrm{co},ji}$ ($E_{\mathrm{ctr},ji}$, in keV) is the energy of component i (full, half and one-third) of co-directed (counter-directed) NBI source j with power $P_{\mathrm{co},ji}$ ($P_{\mathrm{ctr},ji}$, in MW), beam particle mass $m_{\mathrm{co},j}$ ($m_{\mathrm{ctr},j}$, in Da) and radius of tangency $R_{\mathrm{co},j}$ ($R_{\mathrm{ctr},j}$, in m).
Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: N m
Error: n.a.

---

127. TORQBM

Description: Volume-integrated torque due to beam
Definition:

- Default: Elementary variable, calculated by a transport code (e.g. TRANSP)
- $\mathrm{TORQBM} = \mathrm{TORQ}$ if no calculated result is available

Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: $\mathrm{N\ m}$
Error: n.a.

---

128. TORQIN

Description: Volume-integrated total input torque
Definition:

- Default: Elementary variable, composed of beam torque and possible additional contributions due to applied or intrinsic error fields
- $\mathrm{TORQIN} = \mathrm{TORQBM}$ if no additional torques are to be considered

Data type: Floating point
Allowed values: $]-\mathrm{Inf}, \mathrm{Inf}[$
Units: $\mathrm{N\ m}$
Error: n.a.

---

129. VTOR0

Description: Central rotation velocity of plasma
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{m\ s^{-1}}$
Error: n.a.

---

130. VTORV

Description: Volume-averaged rotation velocity of plasma
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{m\ s^{-1}}$

Error: n.a.

---

131. VTORIMP

Description: Volume-averaged rotation velocity of impurity species
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{m\ s^{-1}}$
Error: n.a.

Energies

132. WDIA

Description: Total plasma energy as determined from the diamagnetic loop
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error: See table

TOK	Definition	Error
ASDEX	WDIA is determined from $W_{\mathrm{dia}} = 0.471 * \mathrm{RGEO} * 10^{-6} * \mathrm{IP}^2 * \mathrm{BEPDIA},$ as follows: • Ohmic: $\mathrm{WDIA} = W_{\mathrm{dia}}$ • H-mode: $\mathrm{WDIA} = W_{\mathrm{dia}} - \mathrm{DW}$, where $\mathrm{DW} = W_{\mathrm{dia}}(\mathrm{Ohmic}) - \mathrm{WMHD}(\mathrm{Ohmic})$	10% (20% on W_{dia})
AUG	Default	10%
CMOD	Default	n.a.
COMPASS	Default	15%
D3D	Default	$0.1 / \beta_{\mathrm{p}}$
JET	Default	5%
JFT2M	WDIA is determined from $W_{\mathrm{dia}} = 0.471 * \mathrm{RGEO} * 10^{-6} * \mathrm{IP}^2 * \mathrm{BEPDIA},$ as follows: • Ohmic: $\mathrm{WDIA} = W_{\mathrm{dia}}$ • H-mode: $\mathrm{WDIA} = W_{\mathrm{dia}} - \mathrm{DW}$, where $\mathrm{DW} = W_{\mathrm{dia}}(\mathrm{Ohmic}) - \mathrm{WMHD}(\mathrm{Ohmic})$	15% (1 – 2 kJ on W_{dia})
JT60U	Default	5%
PBXM	Default	n.a.
PDX	Default	15%
TCV	Default	n.a.
TEXTOR	Default	10%
TFTR	$\mathrm{WDIA} = 0.471 * \mathrm{RGEO} * 10^{-6} * \mathrm{IP}^2 * \mathrm{BEPDIA}$	$4\% + 100$ kJ
TDEV	Default	10%
START	Default	n.a.
T10	Default	10%
TUMAN3M	Default	20%

TOK	Definition	Error
MAST	Default	n.a.
NSTX	Default	n.a.

---

133. WMHD

Description: Total plasma energy as determined by MHD equilibrium calculations
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error: See table

TOK	Definition	Error
ASDEX	Determined by an MHD equilibrium fit or based on probe measurements and an estimate of $l_i/2$. Defined by $\mathrm{WMHD} = 0.471 * \mathrm{RGEO} * 10^{-6} * \mathrm{IP}^2 * \mathrm{BEPMHD}$	• Ohmic: 20% • H-mode: 10%
AUG	Default	10%
CMOD	Default	$10\% + 10$ kJ
COMPASS	Default	n.a.
D3D	Default	$0.05 / \beta_p$
JET	Default	15%
JFT2M	Default	15%
JT60U	Default	5%
PBXM	Default	15%
PDX	Default	15%
TCV	Default	10%
TEXTOR	Default	20%
TFTR	$\mathrm{WMHD} = \mathrm{WTOT}$, **to be replaced by** $\mathrm{WMHD} = (3 * \mathrm{WTOT} - \mathrm{WDIA}) / 2$	2% + fractional error BEIMHD
TDEV	Default	10%
START	Default	15%
T10	Default	10%

TOK	Definition	Error
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

134. WKIN

Description: Total thermal plasma energy as determined from kinetic measurements
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error: See table

TOK	Definition	Error
ASDEX	$\mathrm{WKIN} = \mathrm{WEKIN} * \left(1 + \frac{7-\mathrm{ZEFF}}{7-1}\right)$, where for Ohmic points ZEFFNEO is used instead of ZEFF	25%
AUG	Default	n.a.
CMOD	Default	20%
COMPASS	Default	n.a.
D3D	Default	$0.05 / \beta_\mathrm{p}$
JET	Obtained from profile fits, assuming a flat Z_eff profile and the same profile shape for T_i as for T_e	25%
JFT2M	Default	n.a.
JT60U	Default	15%
PBXM	Default	n.a.
PDX	Default	15%
TCV	Default	n.a.
TEXTOR	$\mathrm{WKIN} = \mathrm{WDIA} - \frac{3}{2} * \mathrm{WFPER}$	15%
TFTR	Default	25%
TDEV	Default	n.a.
START	Default	n.a.

TOK	Definition	Error
T10	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

135. WEKIN

Description: Total thermal electron plasma energy as determined from kinetic measurements
Definition: Elementary variable
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error: See table

TOK	Definition	Error
ASDEX	A circular plasma is assumed.	• Default: 10% • H-mode: 15%
CMOD	Default	15%
D3D	Default	15%
JET	Default	20%
JT60U	Default	15%
TCV	Default	10%
TFTR	Default	20%
T10	Default	20%

---

136. WIKIN

Description: Total thermal ion plasma energy as determined from kinetic measurements
Definition:

- Default: Elementary variable
- Exceptions and comments: See table

Data type: Floating point

Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
CMOD	Default	25%
D2D	Default	15%
JET	From the ECE temperature profile shape normalized to $T_{\mathrm{i}}(0)$, obtained from a crystal X-ray diagnostic	15%
JT60U	Default	15%
TFTR	Default	25%

---

137. WROT

Description: Total rotational energy
Definition: Elementary variable, defined as $\mathrm{WROT} = \frac{1}{2} * M * V^2$, where M is the mass of the thermal ions and V is the thermal ion toroidal velocity. V is determined indirectly by means of NCLASS from the toroidal rotation velocity of carbon (for NSTX this mainly corrects the edge rotational velocity).
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{m\ s^{-1}}$
Error: n.a.

---

138. WFPER

Description: Total perpendicular fast ion energy due to NBI as determined from transport calculations
Definition:

- Default: Elementary variable, zero if no NBI is applied
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG	Default	30%
JET	Calculated from the PENCIL code	30%
JFT2M	Calculated from a Monte Carlo code	20%
PBXM	Calculated from the TRANSP code	30%
PDX	Calculated from the TRANSP code	30%
TEXTOR	Calculated from the TRANSP code	25%
TFTR	Default	30%

---

139. WFPAR

Description: Total parallel fast ion energy due to NBI as determined from transport calculations
Definition:

- Default: Elementary variable, zero if no NBI is applied
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error:

- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
AUG	Default	30%
JET	Calculated from the PENCIL code	30%
JFT2M	Calculated from a Monte Carlo code	20%
PBXM	Calculated from the TRANSP code	30%
PDX	Calculated from the TRANSP code	30%
TEXTOR	Calculated from the TRANSP code	25%
TFTR	Default	30%

---

140. WFFORM

Description: Total fast ion energy due to NBI estimated from approximate formula
Definition:

- Default: Elementary variable, zero if no NBI is applied
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error: See table

TOK	Definition	Error
ASDEX	Obtained from regression analysis based on 176 FREY runs: • For an H beam: $$\mathrm{WFFORM} = C_{\mathrm{H}} * f_{\mathrm{H}} * \mathrm{NEL}^{-1.3} * \mathrm{PINJ} * \mathrm{ENBI}^{0.75} * (\mathrm{WTOT} - \mathrm{WFFORM})^{0.5}$$ • For a D beam: $$\mathrm{WFFORM} = C_{\mathrm{D}} * f_{\mathrm{D}} * \mathrm{NEL}^{-1.1} * \mathrm{PINJ} * \mathrm{ENBI} * (\mathrm{WTOT} - \mathrm{WFFORM})^{0.8}$$ Here, C_{H} and C_{D} are estimated constants depending on the target gas, while f_{H} and f_{D} represent estimated temperature effects. Missing temperature profiles are interpolated by regression of the available YAG laser Thomson scattering profiles in the database against IP, BT, NEL, NEV, EVAP and beam gas.	15%
AUG	Default	30%
CMOD	Default	n.a.
COMPASS	Default	n.a.
D3D	$$\mathrm{WFFORM} = 0.55 * P_{\mathrm{b}} * \frac{t_{\mathrm{se}}}{2} * \underbrace{\left(1 + \frac{2}{3} * \left(\frac{v_{\mathrm{c}}}{v_{\mathrm{b}}}\right)^2 * \left(\frac{1}{2} * \ln\left(f(v_{\mathrm{b}}, v_{\mathrm{c}})\right) - \sqrt{3} * \left(\frac{\pi}{6} + \mathrm{atan}\left(g(v_{\mathrm{b}}, v_{\mathrm{c}})\right)\right)\right)\right)}_{(\mathrm{A})},$$ where $$f(v_{\mathrm{b}}, v_{\mathrm{c}}) = \frac{(v_{\mathrm{b}} + v_{\mathrm{c}})^2}{(v_{\mathrm{b}}^2 - v_{\mathrm{b}} * v_{\mathrm{c}} + v_{\mathrm{c}}^2)} \quad \text{and} \quad g(v_{\mathrm{b}}, v_{\mathrm{c}}) = \frac{2 * v_{\mathrm{b}} - v_{\mathrm{c}}}{\sqrt{3} * v_{\mathrm{c}}}$$ Here, the velocities v_{c} and v_{b} are determined from the critical energy and the beam energy, respectively, while P_{b} is the injected neutral beam power. Furthermore, t_{se} is the slowing-down time on electrons, defined by Spitzer: $$t_{\mathrm{se}} = 6.3 \times 10^8 * \frac{A_{\mathrm{b}} * T_{\mathrm{e}}^{1.5}}{Z_{\mathrm{b}}^2 * n_{\mathrm{e}} * \ln(\Lambda_{\mathrm{e}})},$$ where A_{b} and Z_{b} are the atomic mass and charge of the fast ions, T_{e} is the electron temperature in eV, n_{e} is the electron density in cm^{-3} and $\ln(\Lambda_{\mathrm{e}}) \sim 16$ is the Coulomb logarithm. If ion drag were negligible, the factor (A) would be identically 1, but for DIII-D parameters, this factor is a strong function of temperature. Finally, to give better agreement with results from the ONETWO code, the above formula is still multiplied by a factor 0.55.	50%
JET	• For $\mathrm{SHOT} \leq 18760$: $$\mathrm{WFFORM} = 0.16 \times 10^{19} * \frac{\mathrm{PINJ}}{\mathrm{NEV}}$$	50%

TOK	Definition	Error
	• For SHOT $>$ 18760: $$\mathrm{WFFORM} = 10^{19} * \frac{0.16 * P_{80\mathrm{kV}} + 0.3 * P_{140\mathrm{kV}} + 0.02 * P_{\mathrm{He}}}{\mathrm{NEV}}$$	
JFT2M	$\mathrm{WFFORM} = \mathrm{WFPER} + \mathrm{WFPAR}$	Co.
JT60U	Default	20%
PBXM	$\mathrm{WFFORM} = \mathrm{WFPER} + \mathrm{WFPAR}$	Co.
PDX	$\mathrm{WFFORM} = \mathrm{WFPER} + \mathrm{WFPAR}$	Co.
TCV	Default	n.a.
TEXTOR	Default	30%
TFTR	Default	n.a.
TDEV	Default	n.a.
START	Default	20%
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

141. WFANI

Description: Estimate of fraction of perpendicular fast ion energy as compared to the total fast ion energy due to NBI
Definition:

- Default: If WFPER and WFPAR are available, then
$$\mathrm{WFANI} = \frac{\mathrm{WFPER}}{\mathrm{WFPER} + \mathrm{WFPAR}}$$
Zero if no NBI is applied.
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: See table

TOK	Definition	Error
ASDEX	Obtained from regression analysis based on 176 FREY runs: • For an H beam: $$\mathrm{WFFORM} = C_{\mathrm{H}} * \frac{\mathrm{NEL}^{0.04} * \left(\mathrm{NE0} * (\mathrm{ZEFF} - 1)\right)^{0.045}}{\mathrm{ENBI}^{0.14}}$$ • For a D beam:	7%

TOK	Definition	Error
	$$\mathrm{WFFORM} = C_{\mathrm{D}} * \frac{\mathrm{NEL}^{0.12} * \left(\mathrm{NE0} * (\mathrm{ZEFF} - 1)\right)^{0.020}}{\mathrm{ENBI}^{0.14}}$$ Here, C_{H} and C_{D} are estimated constants depending on the target gas. Missing central densities are interpolated by regression of the available central densities in the database against IP, BT, NEL, NEV, EVAP and PINJ. If not measured, ZEFF is assumed to be 3 when $\mathrm{EVAP} = \text{'NONE'}$, 2.5 for carbonized shots and 1.5 for boronised shots.	
AUG	Default	40%
CMOD	Default	n.a.
COMPASS	Default	n.a.
D3D	The fast ion anisotropy is calculated only from geometry; the angles of the beam center line are known relative to the geometric axis of the tokamak and from this the perpendicular and parallel components can be determined.	50%
JET	$\mathrm{WFANI} = 1.16 \times 10^{-2} * \frac{\mathrm{NEL}^{0.11}}{\mathrm{ENBI}^{0.07}}$	50%
JFT2M	Default	Co.
JT60U	Default	n.a.
PBXM	Default	Co.
PDX	Default	Co.
TCV	Default	n.a.
TEXTOR	Default	30%
TFTR	Default	20%
TDEV	Default	n.a.
START	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

---

142. WFICRH

Description: Estimate of the perpendicular fast ion energy content during ICRH heating
Definition:

- Default: Obtained from

$$\mathrm{WFICRH} = \frac{4}{3} * (\mathrm{DWDIA} - \mathrm{DWMHD}),$$

where DWDIA and DWMHD are estimates of the increase of the plasma stored energy due to ICRH, from

diamagnetic measurements and MHD, respectively. Zero if no ICRH is applied.
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, Inf[$
Units: J
Error:
- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
CMOD	Default	50%
JET	Estimated with the PION code	50%

---

143. WFICRHP

Description: Estimate of the parallel fast ion energy content due to ICRH heating
Definition:
- Default: Elementary variable, zero if no ICRH is applied
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, Inf[$
Units: J
Error:
- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
JET	Estimated with the PION code	50%

---

144. WFICFORM

Description: Total fast ion energy due to ICRH estimated from approximate formula
Definition:
- Default: Elementary variable, zero if no ICRH is applied
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, Inf[$
Units: J
Error:
- Default: n.a.

- Exceptions: See table

TOK	Definition	Error
JET	Obtained using the following expression: $\mathrm{WFICFORM} = \frac{0.3}{17} * (\mathrm{TE0} * 10^{-3})^{1.5} * \frac{\mathrm{PICRH}}{\mathrm{NE0} * 10^{-19}}$	50%

---

145. ICFORM

Description: Flag indicating whether WFICFORM was used in confinement calculations
Definition: Elementary variable: See table
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

ICFORM	Definition
0	WFICFORM not used in confinement calculations
1	WFICFORM used in confinement calculations

---

146. WFANIIC

TOK	Error
JET	50%

Description: Estimate of fraction of perpendicular fast ion energy compared to total fast ion energy due to ICRH heating
Definition: Elementary variable, zero if no ICRH is applied
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error:

- Default: n.a.
- Exceptions: See table

Energy confinement times

147. TAUDIA

Description: Total diamagnetic energy confinement time
Definition: Calculated as

$$\mathrm{TAUDIA} = \frac{\mathrm{WDIA}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWDIA}}$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	• Ohmic: 25% • H-mode: 15%	**JET**	• Ohmic: 25% • H-mode: 15%	**TCV**	n.a.	**T10**	25%
AUG	15%	**JFT2M**	20%	**TEXTOR**	15%	**TUMAN3M**	21%
CMOD	n.a.	**JT60U**	15%	**TFTR**	20% for $\mathrm{DWDIA} = 0$	**MAST**	n.a.
COMPASS	15%	**PBXM**	n.a.	**TDEV**	30%	**NSTX**	n.a.
D3D	15%	**PDX**	20%	**START**	n.a.		

---

148. TAUMHD

Description: Total MHD energy confinement time
Definition: Calculated as

$$\mathrm{TAUMHD} = \frac{\mathrm{WMHD}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWMHD}}$$

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: See table

TOK	Error	TOK	Error	TOK	Error	TOK	Error
ASDEX	15%	**JET**	35%	**TCV**	10%	**T10**	25%
AUG	15%	**JFT2M**	20%	**TEXTOR**	20%	**TUMAN3M**	n.a.
CMOD	15%	**JT60U**	n.a.	**TFTR**	20% for $\mathrm{DWMHD} = 0$	**MAST**	n.a.
COMPASS	n.a.	**PBXM**	20%	**TDEV**	30%	**NSTX**	n.a.
D3D	15%	**PDX**	20%	**START**	15%		

149. TAUTH1

Description: Thermal energy confinement time
Definition:

- Default: Calculated as

$$\mathrm{TAUTH1} = \frac{\mathrm{WKIN}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWMHD} - \mathrm{PFLOSS}}$$

- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: See table

TOK	Definition	Error
ASDEX	$\mathrm{TAUTH1} = \frac{\mathrm{WKIN}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWTOT} - \mathrm{PFLOSS}}$, where $\mathrm{DWTOT} = \frac{2}{3} * \mathrm{DWMHD} + \frac{1}{3} * \mathrm{DWDIA}$	Co.
AUG	Default	n.a.
CMOD	Default	Co.
COMPASS	Default	n.a.
D3D	Default	Co.
JET	Default	Co.
JFT2M	Default	n.a.
JT60U	Default	Co.
PBXM	Default	Co.
PDX	Default	Co.
TCV	Default	n.a.
TEXTOR	Default	Co.
TFTR	Default	Co.
TDEV	Default	Co.
START	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.

TOK	Definition	Error
NSTX	Default	n.a.

---

150. TAUTH2

Description: Thermal energy confinement time
Definition:

- Default: Calculated as

$$\mathrm{TAUTH2} = \frac{\mathrm{WMHD} - \mathrm{WFFORM} - \frac{3}{4} * \mathrm{WFICRH}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWMHD} - \mathrm{PFLOSS}}$$

- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: See table

TOK	Definition	Error
ASDEX	$\mathrm{TAUTH2} = \frac{\mathrm{WMHD} - \frac{3}{2} * \mathrm{WFANI} * \mathrm{WFFORM} - \frac{3}{4} * \mathrm{WFICRH}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWTOT} - \mathrm{PFLOSS}}$, where $\mathrm{DWTOT} = \frac{2}{3} * \mathrm{DWMHD} + \frac{1}{3} * \mathrm{DWDIA}$	Co.
AUG	Default	Co.
CMOD	Default	Co.
COMPASS	Default	n.a.
D3D	Default	Co.
JET	Default	Co.
JFT2M	Default	Co.
JT60U	Default	n.a.
PBXM	$\mathrm{TAUTH2} = \frac{\mathrm{WMHD} - \frac{3}{4} * \mathrm{WFPER} - \frac{3}{2} * \mathrm{WFPAR} - \frac{3}{4} * \mathrm{WFICRH}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWMHD} - \mathrm{PFLOSS}}$	Co.
PDX	$\mathrm{TAUTH2} = \frac{\mathrm{WMHD} - \frac{3}{4} * \mathrm{WFPER} - \frac{3}{2} * \mathrm{WFPAR} - \frac{3}{4} * \mathrm{WFICRH}}{\mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWMHD} - \mathrm{PFLOSS}}$	Co.
TCV	Default	n.a.
TEXTOR	Default	Co.
TFTR	Default	Co.

TOK	Definition	Error
TDEV	Default	n.a.
START	Default	n.a.
TUMAN3M	Default	n.a.
MAST	Default	n.a.
NSTX	Default	n.a.

Recommended variables

151. WTOT

Description: Estimated total plasma energy content
Definition: See table
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error: See table

TOK	Definition	Error
ASDEX	$\mathrm{WTOT} = \mathrm{WTH} + \mathrm{WFORM}$	Co.
AUG	$\mathrm{WTOT} = \mathrm{WMHD}$	Co.
CMOD	$\mathrm{WTOT} = \mathrm{WMHD}$	Co.
COMPASS	$\mathrm{WTOT} = \mathrm{WDIA}$	Co.
D3D	$\mathrm{WTOT} = \mathrm{WMHD}$	Co.
JET	• $\mathrm{WTOT} = \mathrm{WTH} + \mathrm{WFPER} + \mathrm{WFPAR} + \mathrm{WFICRH}$ • $\mathrm{WTOT} = \mathrm{WTH} + \mathrm{WFFORM} + \mathrm{WFICRH}$, if WFPER and WFPAR are missing	Co.
JFT2M	$\mathrm{WTOT} = \mathrm{WTH} + \mathrm{WFORM}$	Co.
JT60U	$\mathrm{WTOT} = \mathrm{WDIA}$	Co.
PBXM	$\mathrm{WTOT} = \mathrm{WTH} + \mathrm{WFPER} + \mathrm{WFPAR}$	Co.
PDX	$\mathrm{WTOT} = \mathrm{WTH} + \mathrm{WFPER} + \mathrm{WFPAR}$	Co.
TCV	$\mathrm{WTOT} = \mathrm{WMHD}$	Co.
TEXTOR	$\mathrm{WTOT} = \mathrm{WTH} + \mathrm{WFPER} + \mathrm{WFPAR}$	Co.
TFTR	$\mathrm{WTOT} = 3.14 \times 10^{-7} * \mathrm{RGEO} * \mathrm{IP}^2 * (\mathrm{BEPMHD} + \mathrm{BEPDIA}/2)$	$6\% + 100$ kJ
TDEV	$\mathrm{WTOT} = \mathrm{WKIN}$	Co.
START	$\mathrm{WTOT} = \mathrm{WMHD}$	Co.
T10	$\mathrm{WTOT} = \mathrm{WDIA}$	Co.
TUMAN3M	$\mathrm{WTOT} = \mathrm{WDIA}$	Co.
MAST	$\mathrm{WTOT} = \mathrm{WMHD}$	Co.
NSTX	$\mathrm{WTOT} = \mathrm{WTH}$	Co.

152. WTH

Description: Estimated thermal plasma energy content
Definition: See table
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: J
Error: Co.

TOK	Definition
ASDEX	$\mathrm{WTH} = \mathrm{WDIA} - \frac{3}{2} * \mathrm{WFANI} * \mathrm{WFORM}$
AUG	$\mathrm{WTH} = \mathrm{WMHD} - \frac{3}{4} * \mathrm{WFPER} - \frac{3}{2} * \mathrm{WFPAR}$
CMOD	$\mathrm{WTH} = \mathrm{WTOT} - \mathrm{WFICRH}$
COMPASS	$\mathrm{WTH} = \mathrm{WDIA}$
D3D	$\mathrm{WTH} = \mathrm{WMHD} - \mathrm{WFFORM}$
JET	• $\mathrm{WTH} = \mathrm{WDIA} - \frac{3}{2} * (\mathrm{WFPER} + \mathrm{WFICRH})$ • $\mathrm{WTH} = \mathrm{WDIA} - \frac{3}{2} * (\mathrm{WFANI} * \mathrm{WFFORM} + \mathrm{WFICRH})$, if WFPER is missing
JFT2M	$\mathrm{WTH} = \frac{1}{3} * \mathrm{WDIA} + \frac{2}{3} * \mathrm{WMHD} - \mathrm{WFFORM}$
JT60U	$\mathrm{WTH} = \mathrm{WKIN}$
PBXM	$\mathrm{WTH} = \mathrm{WMHD} - \frac{3}{4} * \mathrm{WFPER} - \frac{3}{2} * \mathrm{WFPAR}$
PDX	$\mathrm{WTH} = \mathrm{WMHD} - \frac{3}{4} * \mathrm{WFPER} - \frac{3}{2} * \mathrm{WFPAR}$
TCV	$\mathrm{WTH} = \mathrm{WMHD}$
TEXTOR	$\mathrm{WTH} = \mathrm{WDIA} - \frac{3}{2} * \mathrm{WFPER}$
TFTR	$\mathrm{WTH} = \mathrm{WDIA} - \frac{3}{2} * \mathrm{WFPER}$
TDEV	$\mathrm{WTH} = \mathrm{WKIN}$
START	$\mathrm{WTH} = \mathrm{WMHD} - \mathrm{WFFORM}$
T10	$\mathrm{WTH} = \mathrm{WDIA}$
TUMAN3M	$\mathrm{WTH} = \mathrm{WDIA}$
MAST	$\mathrm{WTH} = \mathrm{WMHD} - \mathrm{WFFORM}$
NSTX	$\mathrm{WTH} = \mathrm{WKIN}$

153. PL

Description: Estimated loss power not corrected for charge exchange and unconfined orbit losses
Definition: See table
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: Co.

TOK	Definition
ASDEX	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \frac{1}{3} * \mathrm{DWDIA} - \frac{2}{3} * \mathrm{DWMHD}$
AUG	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} + \mathrm{PECRH} - \mathrm{DWMHD}$
CMOD	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PICRH} - \mathrm{DWMHD}$
COMPASS	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PECRH} - \mathrm{DWDIA}$
D3D	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} + \mathrm{PECRH} - \mathrm{DWMHD}$
JET	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} - \mathrm{DWDIA}$
JFT2M	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \mathrm{DWDIA}$
JT60U	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \mathrm{DWDIA}$
PBXM	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \mathrm{DWMHD}$
PDX	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \mathrm{DWMHD}$
TCV	$\mathrm{PL} = \mathrm{POHM} - \mathrm{DWMHD}$
TEXTOR	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} - \mathrm{DWDIA}$
TFTR	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \mathrm{DWDIA}$
TDEV	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PECRH} - \mathrm{DWDIA}$
START	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \mathrm{DWMHD}$
T10	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PECRH} - \mathrm{DWDIA}$
TUMAN3M	$\mathrm{PL} = \mathrm{POHM} - \mathrm{DWDIA}$
MAST	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} - \mathrm{DWMHD}$
NSTX	$\mathrm{PL} = \mathrm{POHM} + \mathrm{PNBI} + \mathrm{PICRH} - \mathrm{DWMHD}$

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154. PLTH

Description: Estimated loss power corrected for charge exchange and unconfined orbit losses

Definition: Calculated as $\mathrm{PLTH} = \mathrm{PL} - \mathrm{PFLOSS}$
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: W
Error: Co.

---

155. TAUTOT

Description: Estimated total energy confinement time
Definition: Calculated as $\mathrm{TAUTOT} = \mathrm{WTOT}/\mathrm{PL}$
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: Co.

---

156. TAUTH

Description: Estimated thermal energy confinement time
Definition: Calculated as $\mathrm{TAUTH} = \mathrm{WTH}/\mathrm{PLTH}$
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: s
Error: Co.

---

157. TAUC92

Description: Correction factor for thermal confinement time TAUTH
Definition: See [Kardaun92]
- Default: $\mathrm{TAUC92} = 1$
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.a.}$
Error:
- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
ASDEX	• $\mathrm{TAUC92} = (1.5 - 0.1 * bo - 0.15 * ca)^{-1}$, for ELMy plasmas • $\mathrm{TAUC92} = (1.2 - 0.1 * bo - 0.15 * ca)^{-1}$, for ELM-free plasmas Here: • $bo = 1$, if $\mathrm{EVAP} = \mathrm{BOROA}$ or $\mathrm{EVAP} = \mathrm{BOROB}$ • $bo = 0$, otherwise and • $ca = 1$, if $\mathrm{EVAP} = \mathrm{CARBH}$ • $ca = 0$, otherwise	10%
JET	$\mathrm{TAUC92} = \frac{1}{0.85}$ if $870101 \leq \mathrm{DATE} \leq 871231$	30%
PDX	$\mathrm{TAUC92} = \left(\frac{1}{3} * \frac{\mathrm{DALFDV}}{\mathrm{DALFMP}}\right)^{-0.4}$, for ELMy plasmas	10%

---

158. TAUC93

Description: Correction factor for thermal confinement time TAUTH
Definition: See [Schissel93]
- Default: $\mathrm{TAUC93} = 1$
- Exceptions and comments: See table

Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n. a.
Error:
- Default: n.a.
- Exceptions: See table

TOK	Definition	Error
ASDEX	• $\mathrm{TAUC93} = (1.5 - 0.1 * bo - 0.15 * ca)^{-1}$, for ELMy plasmas • $\mathrm{TAUC93} = (1.2 - 0.1 * bo - 0.15 * ca)^{-1}$, for ELM-free plasmas Here: • $bo = 1$, if $\mathrm{EVAP} = \mathrm{BOROA}$ or $\mathrm{EVAP} = \mathrm{BOROB}$ • $bo = 0$, otherwise and • $ca = 1$, if $\mathrm{EVAP} = \mathrm{CARBH}$ • $ca = 0$, otherwise	10%
PDX	$\mathrm{TAUC93} = \left(\frac{1}{2} * \frac{\mathrm{DALFDV}}{\mathrm{DALFMP}}\right)^{-0.4}$, for ELMy plasmas	10%

159. H89

Description: Confinement enhancement factor w.r.t. ITER89-P
Definition: Calculated as

$$\mathrm{H89} = \frac{\mathrm{TAUTOT} * \mathrm{TAUC92}}{\mathrm{ITER89\text{-}P}},$$

where ITER89-P is the prediction by the ITER-89P scaling law [Yushmanov90]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n. a.
Error: Co.

---

160. HITERL96

Description: Confinement enhancement factor w.r.t. ITERL96-P
Definition: Calculated as

$$\mathrm{HITERL96} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{ITERL96\text{-}P}},$$

where ITERL96-P is the prediction by the ITERL96-P scaling law [Kaye97]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n. a.
Error: Co.

---

161. H93

Description: Confinement enhancement factor w.r.t. ITERH93-P
Definition: Calculated as

$$\mathrm{H93} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{ITERH93\text{-}P}},$$

where ITERH93-P is the prediction by the ITERH93-P scaling law [Schissel93]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: n. a.
Error: Co.

---

162. HITER92Y

Description: Confinement enhancement factor w.r.t. ITERH92Y
Definition: Calculated as

$$\mathrm{HITER92Y} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{ITERH92Y}},$$

where $\mathrm{ITERH92Y}$ is the prediction by the ITERH92Y scaling law [Kardaun92]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.\,a.}$
Error: Co.

---

163. HEPS97

Description: Confinement enhancement factor w.r.t. HEPS97
Definition: Calculated as

$$\mathrm{HEPS97} = \frac{\mathrm{TAUTH} * \mathrm{TAUC93}}{\mathrm{EPS97(ELMy)}},$$

where $\mathrm{EPS97(ELMy)}$ is the prediction by the EPS97(ELMy) scaling law [Cordey97]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.\,a.}$
Error: Co.

---

164. HIPB98Y

Description: Confinement enhancement factor w.r.t. IPB98(y)
Definition: Calculated as

$$\mathrm{HIPB98Y} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{IPB98(y)}},$$

where $\mathrm{IPB98(y)}$ is the prediction by the IPB98(y) scaling law [IPB99]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.\,a.}$
Error: Co.

---

165. HIPB98Y1

Description: Confinement enhancement factor w.r.t. IPB98(y,1)
Definition: Calculated as

$$\mathrm{HIPB98Y1} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{IPB98(y,1)}},$$

where $\mathrm{IPB98(y,1)}$ is the prediction by the IPB98(y,1) scaling law [IPB99]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.\,a.}$
Error: Co.

---

166. HIPB98Y2

Description: Confinement enhancement factor w.r.t. IPB98(y,2)
Definition: Calculated as

$$\mathrm{HIPB98Y2} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{IPB98(y,2)}},$$

where $\mathrm{IPB98(y,2)}$ is the prediction by the IPB98(y,2) scaling law [IPB99]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.\,a.}$
Error: Co.

---

167. HIPB98Y3

Description: Confinement enhancement factor w.r.t. IPB98(y,3)
Definition: Calculated as

$$\mathrm{HIPB98Y3} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{IPB98(y,3)}},$$

where $\mathrm{IPB98(y,3)}$ is the prediction by the IPB98(y,3) scaling law [IPB99]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.\,a.}$
Error: Co.

---

168. HIPB98Y4

Description: Confinement enhancement factor w.r.t. IPB98(y,4)
Definition: Calculated as

$$\mathrm{HIPB98Y4} = \frac{\mathrm{TAUTH} * \mathrm{TAUC92}}{\mathrm{IPB98(y,4)}},$$

where $\mathrm{IPB98(y,4)}$ is the prediction by the IPB98(y,4) scaling law [IPB99]
Data type: Floating point
Allowed values: $[0, \mathrm{Inf}[$
Units: $\mathrm{n.a.}$
Error: Co.

Standard dataset flags

169. STANDARD

Description: Standard dataset flag for DB1
Definition: Elementary variable: See table. Note: $\mathrm{STANDARD}$ can only be different from zero for observations that are in DB.1.
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

STANDARD	Definition
1	For observations belonging to the standard dataset of ITERH.DB1
0	For all other observations

---

170. SELDB1

Description: Selection variable related to DB1
Definition: Elementary variable, calculated as

$$\mathrm{SELDB1} = \sum_{i=1}^{3} a(I.i) \times 10^{i-1},$$

with criteria variables $a(I.i)$ defined in the table. Note: $\mathrm{SELDB1}$ can only be different from zero for observations that are in DB2.
Data type: Integer
Allowed values: Binary
Units: n.a.
Error: n.a.

Criterion	Variable	Definition
$\boldsymbol{I.1}$	$\boldsymbol{a(I.1)}$	$a(I.1) = 0$ IF (observation also in DB1) $a(I.1) = 1$
$\boldsymbol{I.2}$	$\boldsymbol{a(I.2)}$	$a(I.2) = 0$ IF (observation in DB1 and also satisfies the old DB1 standard selection criteria) $a(I.2) = 1$
$\boldsymbol{I.3}$	$\boldsymbol{a(I.3)}$	$a(I.3) = 0$ IF (observation satisfies the updated DB1 standard selection criteria, including $\mathrm{PHASE} = \mathrm{'H1'}$) $a(I.3) = 1$

171. SELDB2

Description: Selection variable related to DB2
Definition: Elementary variable, calculated as

$$\mathrm{SELDB2} = \sum_{i=1}^{10} a(II.i) \times 10^{i-1},$$

with criteria variables $a(II.i)$ defined in the table.
PABST is defined as

$$\mathrm{PABST} = \mathrm{POHM} + \mathrm{PNBI} + \mathrm{PECRH} + \mathrm{PICRH}.$$

Note: SELDB2 can only be different from zero for observations that are in DB2.
Data type: Integer
Allowed values: Binary
Units: n.a.
Error: n.a.

Criterion	Variable	Definition
$II.1$	$a(II.1)$	**H-mode criterion:** $a(II.1) = 0$ IF (PHASE $=$ 'H') OR (PHASE $=$ 'HSELM') OR (PHASE $=$ 'HGELM') OR (PHASE $=$ 'HGELMH') OR (PHASE $=$ 'H1') $a(II.1) = 1$

$II.2$	$a(II.2)$	**NBI only with H^0 or D^0 injection:**
		$a(II.2) = 0$
		IF (AUXHEAT $=$ 'NB')
		$a(II.2) = 1$
		IF (PINJ > 0) AND (BGASA $\neq 1$) AND (BGASA $\neq 2$)
		$a(II.2) = 0$
		IF (PINJ2 > 0) AND (BGASA2 $\neq 1$) AND (BGASA2 $\neq 2$)
		$a(II.2) = 0$

$II.3$	$a(II.3)$	**Test for missing confinement data:**
		$a(II.3) = 1$
		// TAUMHD check
		IF (TOK $=$ 'AUG') OR (TOK $=$ 'CMOD') OR (TOK $=$ 'D3D') OR (TOK $=$ 'PBXM') OR (TOK $=$ 'PDX')
		IF (TAUMHD missing)
		$a(II.3) = 0$
		// TAUDIA check
		IF (TOK $=$ 'ASDEX') OR (TOK $=$ 'COMPASS') OR (TOK $=$ 'JET') OR (TOK $=$ 'JFT2M') OR (TOK $=$ 'JT60U') OR (TOK $=$ 'TEXTOR')
		IF (TAUDIA missing)
		$a(II.3) = 0$

$II.4$	$a(II.4)$	**No pellet discharges:** $a(II.4) = 1$ IF (PELLET $=$ 'H') OR (PELLET $=$ 'D')

Criterion	Variable	Definition
		$a(II.4) = 0$

$II.5$	$a(II.5)$	**Weak dW/dt:**
		$a(II.5) = 1$
		IF (TOK $=$ 'AUG') OR (TOK $=$ 'CMOD') OR (TOK $=$ 'D3D') OR (TOK $=$ 'PBXM') OR (TOK $=$ 'PDX')
		IF NOT(DWMHD missing) AND NOT($-0.05 \leq$ DWMHD/PABST ≤ 0.35)
		$a(II.5) = 0$
		IF (TOK $=$ 'ASDEX') OR (TOK $=$ 'COMPASS') OR (TOK $=$ 'JET') OR (TOK $=$ 'JFT2M') OR (TOK $=$ 'JT60U') OR (TOK $=$ 'TEXTOR')
		IF NOT(DWDIA missing) AND NOT($-0.05 \leq$ DWDIA/PABST ≤ 0.35)
		$a(II.5) = 0$
		IF (TOK $=$ 'JET') AND (PREMAG $=$ 'NO')
		IF NOT(DWDIA missing) AND NOT($-0.05 \leq$ DWDIA/PABST ≤ 0.35)
		$a(II.5) = 1$

$II.6$	$a(II.6)$	**Radiation criterion:**
		$a(II.6) = 1$
		IF PRAD/PABST > 0.6
		$a(II.6) = 0$
		IF (TOK $=$ 'D3D')
		IF (SHOT $= 62950$) AND (TIME $= 3.10$)
		OR (SHOT $= 64446$) AND (TIME $= 3.45$)
		OR (SHOT $= 64514$) AND (TIME $= 3.15$)
		OR (SHOT $= 64514$) AND (TIME $= 2.05$)
		OR (SHOT $= 64519$) AND (TIME $= 2.06$)
		OR (SHOT $= 64523$) AND (TIME $= 2.02$)
		OR (SHOT $= 62879$) AND (TIME $= 2.49$)
		OR (SHOT $= 67801$) AND (TIME $= 2.50$)
		OR (SHOT $= 62881$) AND (TIME $= 2.44$)
		$a(II.6) = 0$
		IF (TOK $=$ 'JET')
		IF (PRAD missing)
		IF (SHOT $\neq 17010$) AND (SHOT $\neq 22332$) AND (SHOT $\neq 23201$) AND (SHOT $\neq 23206$)
		$a(II.6) = 0$
		IF (TOK $=$ 'JFT2M') AND (PRAD missing)
		$a(II.6) = 0$
		IF (TOK $=$ 'PBXM') AND (PRAD missing)
		$a(II.6) = 0$

$II.7$	$a(II.7)$	**q_{95} or I_p/B_t limit:**
		$a(II.7) = 1$
		IF (TOK $=$ 'JET') AND (Q95 missing)
		$Q95 = \frac{5*AMIN^2*\lvert BT\rvert}{RGEO*\lvert IP\rvert*10^{-6}} \frac{1+KAPPA^2}{2}\left(1+\frac{3*AMIN^2}{2*RGEO^2}\right)$
		IF (TOK $=$ 'ASDEX') OR (TOK $=$ 'AUG') OR (TOK $=$ 'COMPASS') OR (TOK $=$ 'CMOD') OR (TOK $=$ 'JET') OR (TOK $=$ 'JT60U') OR (TOK $=$ 'TEXTOR')
		IF (Q95 < 3.1)
		$a(II.7) = 0$
		IF (TOK $=$ 'D3D') AND ($\lvert$ IP/BT$\rvert > 10^6$ A/T)
		$a(II.7) = 0$
		IF (TOK $=$ 'JFT2M') AND (Q95 < 2.7)
		$a(II.7) = 0$

Criterion	Variable	Definition

$II.8$	$a(II.8)$	**Fast ion energy limit:**
		$a(II.8) = 1$
		IF $((\text{WFFORM} + \text{WFICRH})/\text{WMHD} > 0.4)$
		$a(II.8) = 0$
		IF (TOK $=$ 'D3D') AND (WFFORM missing)
		IF $((\text{WMHD} - \text{WKIN})/\text{WMHD} > 0.4)$
		$a(II.8) = 0$
		IF (TOK $=$ 'JET') AND (PREMAG $=$ NO)
		IF $((\text{WFFORM} + \text{WFICRH})/\text{WDIA} > 0.4)$
		$a(II.8) = 0$

$II.9$	$a(II.9)$	**β limit, no hot ion modes:**
		$a(II.9) = 1$
		$\text{BCR} = 10^{-8} * \frac{\lvert\text{IP}\rvert}{\text{AMIN}*\lvert\text{BT}\rvert}$
		IF (TOK $=$ 'PBXM') AND $(\text{BETMHD} \geq 4 * \text{BCR})$
		$a(II.9) = 0$
		IF (TOK $=$ 'PDX') AND $(\text{BETMHD} \geq 2.8 * \text{BCR})$
		$a(II.9) = 0$
		IF (TOK $=$ 'D3D') AND (TI0 ≥ 8 keV)
		$a(II.9) = 0$
		IF (TOK $=$ 'JET')
		IF (TI0 > 11 keV) AND (TI0 $>$ TE0 $+ 4$ keV)
		$a(II.9) = 0$
		IF (TICX0 > 11 keV) AND (TICX0 $>$ TE0 $+ 4$ keV)
		$a(II.9) = 0$

$II.10$	$a(II.10)$	**No JET 1987 data:** $a(II.10) = 1$ IF (TOK $=$ 'JET') AND $(870101 \leq \text{DATE} \leq 871231)$ $a(II.10) = 0$

---

172. SELDB2X

Description: Selection variable with extra criteria related to DB2
Definition: Elementary variable, calculated as

$$\text{SELDB2X} = \sum_{i=11}^{20} a(II.i) \times 10^{i-11},$$

with criteria variables $a(II.i)$ defined in the table.
PABST is defined as

$$\text{PABST} = \text{POHM} + \text{PNBI} + \text{PECRH} + \text{PICRH}.$$

Note: SELDB2X can only be different from zero for observations that are in DB.2.
Data type: Integer
Allowed values: Binary
Units: n.a.
Error: n.a.

Criterion	Variable	Definition
$II.11$	$a(II.11)$	**High compression ratio (applies only to PDX):** $a(II.11) = 1$ IF (TOK $=$ 'PDX') AND (DALFDV/DALFMP ≤ 4) $a(II.11) = 0$

$II.12$	$a(II.12)$	**No hot ion H-modes:**
		$a(II.12) = 1$
		IF (TOK $=$ 'D3D') AND (TI0 ≥ 8 keV)
		$a(II.12) = 0$
		IF (TOK $=$ 'JET')
		IF (TI0 > 11 keV) AND (TI0 $>$ TE0 $+ 4$ keV)
		$a(II.12) = 0$
		IF (TICX0 > 11 keV) AND (TICX0 $>$ TE0 $+ 4$ keV)
		$a(II.12) = 0$

$II.13$	$a(II.13)$	**ELMs (any kind):** $a(II.13) = 0$ IF (PHASE $=$ 'HGELM') OR (PHASE $=$ 'HSELM') OR (PHASE $=$ 'HGELMH') OR (PHASE $=$ 'H1') $a(II.13) = 1$
$II.14$	$a(II.14)$	**Strong auxiliary heating [Riedel92]:** $a(II.14) = 1$ IF (1 V $\times$ |IP|/PABST ≥ 0.4) $a(II.14) = 0$

$II.15$	$a(II.15)$	**Stationary density [Riedel92]:**
		$a(II.15) = 1$
		IF (TOK $=$ 'AUG') OR (TOK $=$ 'CMOD') OR (TOK $=$ 'D3D') OR (TOK $=$ 'PBXM')
		OR (TOK $=$ 'PDX')
		IF (DNELDT $*$ TAUMHD/NEL ≥ 0.4)
		$a(II.15) = 0$
		IF (TOK $=$ 'ASDEX') OR (TOK $=$ 'COMPASS') OR (TOK $=$ 'JET') OR (TOK $=$ 'JFT2M')
		OR (TOK $=$ 'JT60U') OR (TOK $=$ 'TEXTOR')
		IF (DNELDT $*$ TAUDIA/NEL ≥ 0.4)
		$a(II.15) = 0$

$II.16$	$a(II.16)$	**Strong $\mathrm{d}W/\mathrm{d}t$:**
		$a(II.16) = 1$
		IF (TOK $=$ 'AUG') OR (TOK $=$ 'CMOD') OR (TOK $=$ 'D3D') OR (TOK $=$ 'PBXM')
		OR (TOK $=$ 'PDX')
		IF NOT ($-0.05 \leq$ DWMHD/PABST ≤ 0.2)
		$a(II.16) = 0$
		IF (TOK $=$ 'ASDEX') OR (TOK $=$ 'COMPASS') OR (TOK $=$ 'JET') OR (TOK $=$ 'JFT2M')
		OR (TOK $=$ 'JT60U') OR (TOK $=$ 'TEXTOR')
		IF NOT ($-0.05 \leq$ DWDIA/PABST ≤ 0.2)
		$a(II.16) = 0$

$II.17$	$a(II.17)$	**Old low q_{95} limit (used in DB1 [Christiansen92]):**
		$a(II.17) = 1$
		IF (TOK $=$ 'ASDEX') OR (TOK $=$ 'D3D') OR (TOK $=$ 'JET')
		IF (Q95 < 3.1)
		$a(II.17) = 0$

Criterion	Variable	Definition
		IF $(\mathrm{TOK} = \mathrm{'JFT2M'})$ IF $(\mathrm{Q95} < 2.7)$ $a(II.17) = 0$
$II.18$	$a(II.18)$	**No beryllization:** $a(II.18) = 1$ IF $(\mathrm{EVAP} = \mathrm{'BE'})$ $a(II.18) = 0$
$II.19$	$a(II.19)$	**No boronization:** $a(II.19) = 1$ IF $(\mathrm{EVAP} = \mathrm{'BO'})$ OR $(\mathrm{EVAP} = \mathrm{'BOR'})$ OR $(\mathrm{EVAP} = \mathrm{'BOROA'})$ OR $(\mathrm{EVAP} = \mathrm{'BOROB'})$ OR $(\mathrm{EVAP} = \mathrm{'BOROC'})$ OR $(\mathrm{EVAP} = \mathrm{'B2D6'})$ OR $(\mathrm{EVAP} = \mathrm{'DECABORA'})$ $a(II.19) = 0$
$II.20$	$a(II.20)$	**No carbonization:** $a(II.20) = 1$ IF $(\mathrm{EVAP} = \mathrm{'CARB'})$ OR $(\mathrm{EVAP} = \mathrm{'CARBH'})$ $a(II.20) = 0$

---

173. IAEA92

Description: Standard dataset flag for DB2
Definition: Elementary variable: See table. Note: can only be different from zero for observations that are in DB2.
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

IAEA92	Definition
1	For ELMy observations included in the subset of upon which ITERH92-P(y) is based [Kardaun92]
0	For all other observations

---

174. DB2P5

Description: Standard dataset flag for DB2
Definition: Elementary variable: See table. Note: can only be different from zero for observations that are in DB3v5.
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.

Error: n.a.

DB2P5	Definition
1	For ELMy observations included in the subset DB2.5 as defined in [IPB99]
0	For all other observations

---

175. DB2P8

Description: Standard dataset flag for DB2
Definition: Elementary variable: See table. Note: can only be different from zero for observations that are in DB3v5.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

DB2P8	Definition
1	For ELMy observations included in the subset DB2.8 as defined in [IPB99]
0	For all other observations

---

176. DB3IS

Description: Standard dataset flag for DB2
Definition: Elementary variable: See table. Note: can only be different from zero for observations that are in DB.3v5.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

DB3IS	Definition
1	For ELMy observations included in the subset DB3r(IS) as defined [IPB99]
0	For all other observations

---

177. DB3V5

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. Note: can only be different from zero for observations that are in DB3v5.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

DB3V5	Definition
1	Standard dataset selection for DB3v5 as defined in [IPB99]
0	For all other observations

---

178. IAE2000N

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. See SELDB3X for selection details.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

IAEA2000N	Definition
1	Small IAEA2000 standard dataset as defined in [Kardaun00]
0	For all other observations

---

179. IAE2000X

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. See SELDB3X for selection details.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

IAEA2000X	Definition
1	Large IAEA2000 standard dataset as defined in [Kardaun00]
0	For all other observations

---

180. HMWS2003

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. See SELDB3X for selection details.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

HMWS2003	Definition
1	Deuterium only standard dataset as defined in [Kardaun03]
0	For all other observations

---

181. IAE2004S

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. See SELDB3X for selection details.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

IAE2004S	Definition
1	IAEA2004 standard dataset as defined in [Cordey04]
0	For all other observations

---

182. IAE2004I

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. See SELDB3X for selection details.
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

IAE2004I	Definition
1	ITER-like standard dataset as defined in [Cordey04]
0	For all other observations

---

183. DB3DONLY

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. See SELDB3X for selection details.
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

DB3DONLY	Definition
1	Deuterium-only standard dataset as defined in [McDonald, D.C. et.al. NF]
0	For all other observations

---

184. HMWS2005

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table. See SELDB3X for selection details. Selection procedure:

$\mathrm{HMWS2005} = 0$
IF $(a(III.15) = 1)$
    IF $(1.599999 \leq \mathrm{KAPPA} \leq 2.43)$ AND $(1.6 \leq \mathrm{MEFF} \leq 2.4)$
        $\mathrm{HMWS2005} = 1$
IF $(\mathrm{TOK} = \text{'TCV'})$ OR $(\mathrm{TOK} = \text{'JT60U'})$
    $\mathrm{HMWS2005} = 0$

Data type: Boolean
Allowed values: $0, 1$

Units: n.a.
Error: n.a.

HMWS2005	Definition
1	Standard dataset as defined in [Kaye05], including 36 PBXM points.
0	For all other observations

---

185. OJK2006

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

IAEA2000X	Definition
1	Standard dataset as defined in [Kardaun e.a.]
0	For all other observations

---

186. SELDB3

Description: Selection variable related to DB3
Definition: Elementary variable, calculated as

$$\mathrm{SELDB3} = \sum_{i=1}^{10} a(III.i) \times 10^{i-1},$$

with criteria variables $a(III.i)$ defined in the table.
PABST is defined as

$$\mathrm{PABST} = \mathrm{POHM} + \mathrm{PNBI} + \mathrm{PECRH} + \mathrm{PICRH}.$$

Data type: Integer
Allowed values: Binary
Units: n.a.
Error: n.a.

Criterion	Variable	Definition

$\boldsymbol{III.1}$	$\boldsymbol{a(III.1)}$	**H-mode criterion:**
		$a(III.1) = 0$
		IF (PHASE $=$ 'H') OR (PHASE $=$ 'HSELM') OR (PHASE $=$ 'HSELMH') OR (PHASE $=$ 'H1')
		OR (PHASE $=$ 'HGELM') OR (PHASE $=$ 'HGELM?') OR (PHASE $=$ 'HGELMH')
		OR (PHASE $=$ 'HYSELM') OR (PHASE $=$ 'HYGELM')
		$a(III.1) = 1$
		IF (TOK $=$ 'COMPASS')
		IF (SHOT $= 24787$)
		$a(III.1) = 0$
		IF (AUXHEAT $=$ 'ECOA')
		$a(III.1) = 0$
		IF (TOK $=$ 'AUG')
		IF (SHOT $= 8175$) AND ($1.49 <$ TIME < 1.51)
		$a(III.1) = 0$
		IF (SHOT $= 8255$) AND ($1.64 <$ TIME < 1.66)
		$a(III.1) = 0$

$\boldsymbol{III.2}$	$\boldsymbol{a(III.2)}$	**Test for missing confinement data:** $a(III.2) = 1$ IF (TAUTH $*$ |IP| $*$ |BT| $*$ NEL $*$ PLTH $*$ KAPPA $*$ RGEO $*$ AMIN $*$ MEFF not defined) $a(III.2) = 0$
$\boldsymbol{III.3}$	$\boldsymbol{a(III.3)}$	**No pellet discharges:** $a(III.3) = 1$ IF (PELLET $=$ 'H') OR (PELLET $=$ 'D') OR (PELLET $\neq$ 'NONE') $a(III.3) = 0$

$\boldsymbol{III.4}$	$\boldsymbol{a(III.4)}$	**Weak $\mathbf{d}W/\mathbf{d}t$:**
		$a(III.4) = 1$
		IF (TOK $=$ 'AUG') OR (TOK $=$ 'CMOD') OR (TOK $=$ 'D3D') OR (TOK $=$ 'PBXM')
		OR (TOK $=$ 'PDX') OR (TOK $=$ 'TCV') OR (TOK $=$ 'TDEV') OR (TOK $=$ 'TFTR')
		OR (TOK $=$ 'T10') OR (TOK $=$ 'START') OR (TOK $=$ 'MAST')
		IF NOT(DWMHD missing) AND NOT($-0.05 \leq$ DWMHD/PABST ≤ 0.35)
		$a(III.4) = 0$
		IF (TOK $=$ 'ASDEX') OR (TOK $=$ 'COMPASS') OR (TOK $=$ 'JFT2M') OR (TOK $=$ 'JT60U')
		OR (TOK $=$ 'TEXTOR') OR (TOK $=$ 'TFTR') OR (TOK $=$ 'TUMAN3M')
		IF NOT(DWDIA missing) AND NOT($-0.05 \leq$ DWDIA/PABST ≤ 0.35)
		$a(III.4) = 0$
		IF (TOK $=$ 'JET')
		IF (SHOT ≤ 27968) AND (PREMAG $\neq$ 'NO')
		IF NOT(DWMHD missing) AND NOT($-0.05 \leq$ DWMHD/PABST ≤ 0.35)
		$a(III.4) = 0$
		IF (SHOT > 27968) OR (PREMAG $=$ 'NO')
		IF NOT(DWDIA missing) AND NOT($-0.05 \leq$ DWDIA/PABST ≤ 0.35)
		$a(III.4) = 0$

$\boldsymbol{III.5}$	$\boldsymbol{a(III.5)}$	**Radiation criterion:**
		$a(III.5) = 1$
		IF $PRAD/PABST > 0.6$
		$a(III.5) = 0$
		IF (TOK $=$ 'CMOD')
		IF (SHOT $= 960116029$) AND ($0.85 \leq$ TIME ≤ 0.95)
		$a(III.5) = 0$

Criterion	Variable	Definition

		IF (TOK = 'D3D')
		IF ((SHOT = 62950) AND (3.09 ≤ TIME ≤ 3.11))
		OR ((SHOT = 64446) AND (3.44 ≤ TIME ≤ 3.46))
		OR ((SHOT = 64514) AND (3.14 ≤ TIME ≤ 3.16))
		OR ((SHOT = 64514) AND (2.04 ≤ TIME ≤ 2.06))
		OR ((SHOT = 64519) AND (2.05 ≤ TIME ≤ 2.07))
		OR ((SHOT = 64523) AND (2.01 ≤ TIME ≤ 2.03))
		OR ((SHOT = 62879) AND (2.48 ≤ TIME ≤ 2.51))
		OR ((SHOT = 67801) AND (2.49 ≤ TIME ≤ 2.51))
		OR ((SHOT = 62881) AND (2.43 ≤ TIME ≤ 2.45))
		$a(III.5) = 0$
		IF (TOK = 'JET')
		IF (PRAD missing)
		IF (SHOT ≠ 17010) AND (SHOT ≠ 22332) AND (SHOT ≠ 23201) AND (SHOT ≠ 23206)
		$a(III.5) = 0$
		IF (TOK = 'JFT2M') AND (PRAD missing)
		$a(III.5) = 0$
		IF (TOK = 'PBXM') AND (PRAD missing)
		$a(III.5) = 0$
		IF (TOK = 'START') AND (PRAD missing)
		$a(III.5) = 0$
		IF (TOK = 'TUMAN3M') AND (PRAD missing)
		$a(III.5) = 0$

$III.6$	$a(III.6)$	**q_{95} or I_p/B_t limit:**
		$a(III.6) = 1$
		IF (TOK = 'JET') OR (TOK = 'TUMAN3M')
		IF (Q95 missing)
		$\mathrm{Q95} = \frac{5*\mathrm{AMIN}^2*\lvert\mathrm{BT}\rvert}{\mathrm{RGEO}*\lvert\mathrm{IP}\rvert*10^{-6}} \frac{1+\mathrm{KAPPA}^2}{2}\left(1+\frac{3*\mathrm{AMIN}^2}{2*\mathrm{RGEO}^2}\right)$
		IF (TOK = 'ASDEX') OR (TOK = 'TCV') OR (TOK = 'TFTR') OR (TOK = 'TDEV') OR (TOK = 'T10') OR (TOK = 'TUMAN3M')
		IF (Q95 < 2.2)
		$a(III.6) = 0$
		IF (TOK = 'AUG') OR (TOK = 'CMOD') OR (TOK = 'COMPASS') OR (TOK = 'JET') OR (TOK = 'JT60U') OR (TOK = 'TEXTOR') OR (TOK = 'START') OR (TOK = 'MAST')
		IF (Q95 < 2.5)
		$a(III.6) = 0$
		IF (TOK = 'COMPASS') AND (SHOT = 11768)
		$a(III.6) = 0$
		IF (TOK = 'D3D') AND ($\lvert\mathrm{IP/BT}\rvert > 10^6$ A/T)
		$a(III.6) = 0$
		IF (TOK = 'JFT2M') AND (Q95 < 2.7)
		$a(III.6) = 0$

$III.7$	$a(III.7)$	**Fast ion energy limit:**
		$a(III.7) = 1$
		IF (TOK = 'ASDEX') OR (TOK = 'AUG') OR (TOK = 'CMOD') OR (TOK = 'D3D') OR (TOK = 'JFT2M') OR (TOK = 'PBXM') OR (TOK = 'PDX') OR (TOK = 'TCV') OR (TOK = 'MAST')
		IF ((WFFORM + WFICRH)/WMHD > 0.40)
		$a(III.7) = 0$
		IF (TOK = 'COMPASS') OR (TOK = 'JT60U') OR (TOK = 'TEXTOR')

Criterion	Variable	Definition

		IF ((WFFORM + WFICRH)/WDIA > 0.40)
		$a(III.7) = 0$
		IF (TOK = 'JT60U') AND ((WFFORM + WFICRH)/WDIA < 0.50)
		$a(III.7) = 1$
		IF (TOK = 'D3D') AND (WFFORM missing)
		IF ((WMHD − WKIN)/WMHD > 0.40)
		$a(III.7) = 0$
		IF (TOK = 'JET')
		IF (SHOT ≤ 27968) AND (PREMAG ≠ 'NO')
		AND ((WFFORM + WFICRH)/WMHD > 0.40)
		$a(III.7) = 0$
		IF ((SHOT > 27968) OR (PREMAG = 'NO'))
		AND ((WFFORM + WFICRH)/WDIA > 0.40)
		$a(III.7) = 0$

$III.8$	$a(III.8)$	**β limit:**
		$a(III.8) = 1$
		$\mathrm{BCR} = 10^{-8} * \frac{\lvert \mathrm{IP} \rvert}{\mathrm{AMIN} * \lvert \mathrm{BT} \rvert}$
		IF (TOK = 'PBXM') AND (BETMHD ≥ 4 * BCR)
		$a(III.8) = 0$
		IF (TOK = 'PDX') AND (BETMHD ≥ 2.8 * BCR)
		$a(III.8) = 0$

$III.9$	$a(III.9)$	**No hot ion H-modes:**
		$a(III.9) = 1$
		IF (TOK = 'D3D') AND (TI0 ≥ 8 keV)
		$a(III.9) = 0$
		IF (TOK = 'JET')
		IF (TI0 > 11 keV) AND (TI0 > TE0 + 4 keV)
		$a(III.9) = 0$
		IF (TICX0 > 11 keV) AND (TICX0 > TE0 + 4 keV)
		$a(III.9) = 0$
		IF (TOK = 'TFTR')
		IF (TI0 > 11 keV) AND (TI0 > TE0 + 4 keV)
		$a(III.9) = 0$

$III.10$	$a(III.10)$	**No JET 1987 data:** $a(III.10) = 1$ IF (TOK = 'JET') AND (870101 ≤ DATE ≤ 871231) $a(III.10) = 0$

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187. SELDB3X

Description: Selection variable with extra criteria related to DB3
Definition: Elementary variable, calculated as

$$\mathrm{SELDB3X} = \sum_{i=11}^{16} a(III.i) \times 10^{i-11},$$

with criteria variables $a(III.i)$ defined in the table.

Data type: Integer
Allowed values: Binary
Units: n.a.
Error: n.a.

Criterion	Variable	Definition

$III.11$	$a(III.11)$	**Data withdrawn from current version (SELDB3 $a(III.1) = 0$)**
		$a(III.11) = 0$
		IF (TOK $=$ 'AUG')
		IF (SHOT $= 8175$) AND ($1.49 \leq$ TIME ≤ 1.51)
		$a(III.11) = 1$
		IF (SHOT $= 8255$) AND ($1.64 \leq$ TIME ≤ 1.66)
		$a(III.11) = 1$
		IF (TOK $=$ 'COMPASS')
		IF (SHOT $= 24787$) OR (AUXHEAT $=$ 'ECOA')
		$a(III.11) = 1$

$III.12$	$a(III.12)$	**Strong gas puff data:**
		$a(III.12) = 0$
		IF (PELLET $\neq$ 'NONE')
		$a(III.12) = 1$
		IF (PELLET $=$ 'H') OR (PELLET $=$ 'D')
		$a(III.12) = 0$

$III.13$	$a(III.13)$	**Limited temperature ratio TI0/TE0** $a(III.13) = 0$ IF (TI0 missing) OR (TE0 missing) $a(III.13) = 1$ ELSEIF ($0.4 \leq$ TI0/TE0 ≤ 2.5) $a(III.13) = 1$
$III.14$	$a(III.14)$	**Limited internal inductance:** $a(III.14) = 0$ IF (BEILI2 missing) OR (BEIMHD missing) $a(III.14) = 1$ ELSEIF ($2 *$ (BEILI2 $-$ BEIMHD) ≤ 2) $a(III.14) = 1$

$III.15$	$a(III.15)$	**Large IAEA2000 standard dataset equivalent [Kardaun00]**
		$a(III.15) = 0$
		IF (SELDB3 $= 1111111111$)
		// Usual standard dataset
		$a(III.15) = 1$
		IF ($a(III.11) = 0$) AND ($a(III.12) = 1$) AND (SELDB3 $= 1111111011$)
		// Include gas puff data (SELDB3X $=????????10$)
		$a(III.15) = 1$
		IF (TOK $=$ 'TFTR')
		// Consider all TFTR data
		$a(III.15) = 1$
		IF (TOK $=$ 'TFTR') AND NOT($-0.10 \leq$ DWMHD/PL < 0.35)
		// Weaken the nonstationarity criterion for TFTR
		$a(III.15) = 0$
		IF (PHASE$(1) \neq$ 'H')
		// Only ELMy data
		$a(III.15) = 0$

Criterion	Variable	Definition

		IF (PHASE = 'H')
		$a(III.15) = 0$
		IF (TOK = 'JET')
		// Exclude JET museums shots
		IF (SHOT = 19971) OR (SHOT = 43014)
		$a(III.15) = 0$
		// Limit temperature ratio
		$a(III.15) = a(III.15) * a(III.13)$
		// Exclude shots with high internal inductance
		$a(III.15) = a(III.15) * a(III.14)$

$III.16$	$a(III.16)$	**Small IAEA2000 standard dataset equivalent [Kardaun00]**
		$a(III.16) = 0$
		IF (SELDB3 = 1111111111)
		// Usual standard dataset
		$a(III.16) = 1$
		IF (PHASE(1) ≠ H)
		// Only ELMy data
		$a(III.16) = 0$
		IF (PHASE = 'H')
		$a(III.16) = 0$
		IF (TOK = 'JET')
		// Exclude JET museums shots
		IF (SHOT = 19971) OR (SHOT = 43014)
		$a(III.16) = 0$
		// Limit temperature ratio
		$a(III.16) = a(III.16) * a(III.13)$
		// Exclude shots with high internal inductance
		$a(III.16) = a(III.16) * a(III.14)$
		IF (AUXHEAT = 'NONE')
		// Exclude Ohmic H-mode data
		$a(III.16) = 0$

$III.17$	$a(III.17)$	**Deuterium-only HMWS2003 standard dataset**
		$a(III.17) = 0$
		IF ($a(III.15) = 1$)
		// Select equivalent of large IAEA2000 standard dataset
		$a(III.17) = 1$
		IF (TOK = 'JET')
		IF (SHOT < 30000)
		// Exclude old ELMy JET shots
		$a(III.17) = 0$
		IF (SHOT = 37854) OR (SHOT = 37859)
		// Exclude JET rogue shots
		$a(III.17) = 0$
		IF NOT((1.833 < MEFF < 2.167) AND (PGASA = 2))
		// Limit range in MEFF and PGASA
		$a(III.17) = 0$

$III.18$	$a(III.18)$	**Deuterium-only Ohmic HMWS2003 standard dataset**
		$a(III.18) = 0$
		IF ($a(III.17) = 1$)
		// Select deuterium-only standard set
		$a(III.18) = 1$
		IF (AUXHEAT = 'NONE')

Criterion	Variable	Definition
		// Exclude Ohmic data $a(III.18) = 0$

$\boldsymbol{III.19}$	$\boldsymbol{a(III.19)}$	**ITER-like IAEA 2004 equivalent standard dataset**
		$a(III.19) = 0$
		// Select from large IAEA2000 standard dataset equivalent ($a(III.15) = 1$)
		$\mathrm{SM} = 0$
		$\mathrm{SQ} = 0$
		$\mathrm{SK} = 0$
		IF $a(III.15) = 1$
		IF ($\mathrm{TOK} = \mathrm{'COMPASS'}$)
		$\mathrm{AREA} = \frac{\mathrm{VOL}}{2*\pi*\mathrm{RGEO}}$
		IF ($KAPPAA = \mathrm{'.'}$)
		$k2 = \frac{\mathrm{AREA}}{\pi*\mathrm{AMIN}^2}$
		ELSE
		$k2 = \mathrm{KAPPAA}$
		$\mathrm{QCYL} = 5 * \frac{k2*AMIN^2*\lvert\mathrm{BT}\rvert}{\mathrm{RGEO}*\lvert\mathrm{IP}\rvert*10^{-6}}$
		IF ($1.833 < \mathrm{MEFF} < 2.167$)
		$\mathrm{SM} = 1$
		IF ($1.6 < \mathrm{QCYL} < 2.8$)
		$\mathrm{SQ} = 1$
		IF ($1.4 < k2 < 1.93$)
		$\mathrm{SK} = 1$
		$a(III.19) = \mathrm{SM} * \mathrm{SQ} * \mathrm{SK}$

$\boldsymbol{III.20}$	$\boldsymbol{a(III.20)}$	**HMWS2005 equivalent standard dataset**
		$a(III.20) = 0$
		// Select from large IAEA2000 standard dataset equivalent ($a(III.15) = 1$)
		IF ($a(III.15) = 1$)
		IF ($1.599999 \leq \mathrm{KAPPA} \leq 2.43$) AND ($1.6 \leq \mathrm{MEFF} \leq 2.4$)
		$a(III.20) = 1$
		IF ($\mathrm{TOK} = \mathrm{'TCV'}$) OR ($\mathrm{TOK} = \mathrm{'JT60U'}$)
		$a(III.20) = 0$

188. STD3

Description: Standard dataset flag for DB3
Definition: Elementary variable: See table.
Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

DB3V5	Definition
1	Standard dataset selection for DB3 as defined in [IPB99]

0	For all other observations

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189. SELDB4

Description: Selection variable related to DB4
Definition: Elementary variable, calculated as

$$\text{SELDB4} = \sum_{i=1}^{10} a(IV.i) \times 10^{i-1},$$

with criteria variables $a(IV.i)$ defined in the table.

Criterion	Variable	Definition
$\boldsymbol{IV.1}$	$\boldsymbol{a(IV.1)}$	**Hybrid H-mode criterion:** $a(IV.1) = 0$ IF (HYBRID $=$ 'YES') OR (HYBRID $=$ 'HYBRID') OR (HYBRID $=$ 'IH') $a(IV.1) = 1$

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190. STDDB4V5

Description: Standard dataset flag for DB4
Definition: Elementary variable: See table. Note: can only be different from zero for observations that are in DB4v5.
Data type: Boolean
Allowed values: $0, 1$
Units: n.a.
Error: n.a.

DB3V5	Definition
1	Standard dataset selection for DB4v5 as defined in ...
0	For all other observations

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191. SELDB5

Description: Standard dataset flag for DB5
Definition: Elementary variable: See table. Note: can only be different from zero for observations that are in DB5.

Data type: Boolean
Allowed values: 0, 1
Units: n.a.
Error: n.a.

DB3V5	Definition
1	Standard dataset selection for DB5 as defined in [Verdoolaege21]
0	For all other observations

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