IET Inspec

Numerical Data Indexing

Numerical indexing in Inspec allows the searcher to retrieve all records matching search criteria within a given range – overcoming the challenge of finding matching records due to the variety of ways in which an author may express a particular value.

Contents

Introduction

The ability to search numerical data that is important to the theme of a document can be useful. Numerical Data Indexing aims to make this type of information more searchable by standardising its representation in the Inspec record.

Cases where numerical data is likely to be important include where it describes:

- Relevant and essential operating characteristics of actual or potential devices, instruments, equipment, machines or systems for which thesaurus terms are assigned. Characteristics of particular importance include frequency, wavelength, power and energy.
- Relevant and important criteria of effects, phenomena and processes for which thesaurus terms are assigned. This is likely to be the experimental or operating conditions, measured values or observations.Temperature, pressure and frequency or wavelength are criteria of particular importance.

Barriers to being able to search numerical data successfully revolve around inconsistencies in the way that this information is represented by authors. These inconsistencies arise through several factors but common causes include: variation in units used (for example, several scales can be used to describe temperature including Kelvin, Centigrade, and Fahrenheit); and variation in magnitude used (for example, electrical power can be quoted in milliwatts, watts, kilowatts, megawatts etc.).

Some key facts about Inspec Numerical Data Indexing:

- Inspec Numerical Data Indexing can be searched within records from January 1987 onwards.
- Only where actual numbers are described is Numerical data indexed. No attempt is made to index implied ranges such as "millimeter waves," "UV region," "VHF," etc.
- Numerical information in the format used within the original document can also be found within the Inspec Free Indexing (or supplementary terms, uncontrolled terms, etc.) field.
- Numerical Data Indexing is applied to Inspec records in cases where numerical data appears in the original Title or Abstract of a document; or where it is encountered in the normal processing of the original document and where it appears to be important to the context of the discussion.

Each Numerical Data Indexing term has the following format:

Quantity Value (to Value) Unit

In this format:

1. 'Quantity' represents the physical quantity, for example temperature.
2. 'Unit' is the unit of measurement. Irrespective of which units are used by the author, all converted to SI units (International System of Units). For length measurements described by the author in Feet are converted to the SI unit metre (m).
3. 'Value' is the actual numerical value or range. For the purpose of Inspec, numerical data indexing it is converted to floating point format.

Numerical Data Indexing Thesaurus

The Numerical Data Indexing Thesaurus is used as an authority file to control the quantities and units appearing in the Inspec database. This booklet contains:

- The Inspec Numerical Data Indexing Thesaurus,
- An explanation of its entries,
- A table of multiplying prefixes.

The information in this booklet is intended to aid users in determining:

- which quantities to search for,
- which units their search data should be in,
- how to convert data to these units should their data be in other units, and
- how to use Inspec Numerical Data Indexing with each Inspec Vendor search system.

1.0 Thesaurus Entries

There are two types of entry within the Numerical Data Thesaurus: Preferred Quantity/Unit and Lead-in.

1.1 Preferred Quantity/Unit Entries

Preferred Quantity or Unit Entries are of the form:

Quantity: Unit (Name)

Scope Note

Unit Information

where:

1. "Quantity: Unit" is the preferred quantity and unit combination,
2. "Name" is the full name where 'unit' is an abbreviation
3. "Scope Note" is any additional information on the use of this quantity,
4. "Unit Information" is information about units other than the preferred unit and how to convert data in these units to the preferred unit.

e.g. temperature: K (kelvin)
Used for absolute temperatures and not temperature differences

C *use* K	[K = C + 273.15]
Deg.C *use* K	[K = Deg.C + 273.15]
F *use* K	[K = (F + 459.67) x 0.5555556]
Deg.F *use* K	[K = (Deg.F + 459.67) x 0.5555556]
Deg.K *use* K	

Unless otherwise stated (see for example Byte rate… 1989-), all quantities are searchable in records added to Inspec from January 1987 onwards.

Unit information can be of two types:

1) Unit Synonym Information: These point to preferred units from numerically identical units for preferred quantities. They are of the form:

   Unit *use* Unit P

   where Unit P is the preferred unit, e.g. deg.C *use* K.

2) Unit Conversion Information: These point to preferred units from other units for given quantities. The numerical relationship between the two units is given. These are of the form:

   Unit L *use* Unit P [Unit P = F(Unit L)]

   where Unit L is the listed unit and Unit P is the preferred unitand [F(Unit L)] is the equation for converting Unit L into Unit P,
   e.g. deg.C *use* K [K = deg.C + 273.15]

1.2 Lead-in Entries

These entries point to preferred quantities from either units or non-preferredquantities. They are of the form either:

1. Quantity: *use* Quantity P (e.g., electric potential *use* voltage)

2. Unit: *see* Quantity P (e.g., hour *see* time)

2.0 Thesaurus

age : yr (year)	Used for cosmological, geological, archaeological and biological timescales.
altitude : m (metre)	Measured from surface (liquid or solid) for Earth and all planetary bodies. Measured from photosphere for Sun. For negative values usedepth. feet *use* m [m = feet x 0.3048] yard *use* m [m = yard x 0.9144] mile *use* m [m = mile x 1609.344]
amp	*see* current
apparent power : VA (volt-amps)	Used for power apparatus, equipment, etc. when power ratings orlevels are given in VA.
astronomical unit	*see* heliocentric distance
atmosphere	*see* pressure
bandwidth : Hz (hertz)	Use frequency where specific ranges are given.
bar	*see* pressure
becquerel	*see radioactivity*
bit	*see* storage capacity or word length
bit rate: bit/s (bits per second)	Used for digital communication rates given in bit/s.
breadth	*see* size
Byte	*see* memory size
byte rate : byte/s (bytes per second)	Used for digital communication rates given in Byte/s; 1989-
calorie	*see* energy capacitance : F (farad)
celsius	*see* temperature
centigrade	*see* temperature
characters per second	*see* printer speed
cm Hg	*see pressure*
communications rate	*use* bit rate or byte rate
computer execution rate: IPS (instructions per second)	
computer speed : FLOPS	Used for floating point operations per second.
conductance : S (siemen)	mho use S
conductivity, electrical	*use* electrical conductivity
coulomb per kilogram	*see* radiation exposure critical
critical dimensions	*use* size
curie	*see* radioactivity
current: A (amp)	Not used for accelerator beam currents.
day	*see* time
decibel	*see* gain, loss or noise figure
degrees C, F, or K	*see* temperature
depth : m (metre)	Measured from surface (liquid or solid) for Earth and all planetary bodies. Measured from the photosphere (optical depth 1) for Sun. Fornegative values use "altitude". feet *use* m [m=feet x 0.3048] yard *use* m [m = yard x 0.9144] fathom *use* m [m=fathom x 1.8288] mile *use* m [m=mile x 1609.344]
diameter	*see* size

distance : m (metre)	feet *use* m [m=feet x 0.3048] yard *use* m [m = yard x 0.9144] fathom *use* m [m=fathom x 1.8288] mile *use* m [m=mile x 1609.344]
Earth radii	*see* geocentric distance
efficiency : percent (%)	Not used for quantum efficiency.
electric current	*use* current
electric potential	*use* voltage
electrical conductivity : S/m (siemens per metre)	mho/m *use* S/m ohm m^{-1} *use* S/m
electrical resistivity	*use* resistivity
electron volt energy : eV (electron volt)	Used: for atomic and molecular parameters, for high energy cosmic radiation, in nuclear and particle physics for device parameters, i.e.accelerators, beam transport equipment, etc. Not used: for projectile energies, for level energies, for particle masses.emf *use* voltage
energy : J (joule)	cal *use* J [J = cal * 4.1868] kWh *use* J [J = kWh * 3600000]
energy, electron volts	*use* electron volt energy
eV energy	*use* electron volt energy
farad	*see* capacitance
fathom	*see depth*
fahrenheit	*see temperature*
feature size	*use* size
feet	*see* altitude, depth, distance or size
floating point operations per second	*see* computer speed
flops	*see* computer speed
frequency : Hz (hertz)	Used for all waves: electromagnetic, acoustic, gravitational, etc.
gain : dB (decibel)	For negative values use loss.
galactic distance : pc (parsec)	Used for interstellar distances measured from solar system, not fromgalactic centre (not galactocentric distances), and for intergalactic distances. Within the solar system, use heliocentric distance. ly *use* pc [pc = ly * 0.3066]
gauss	*see* magnetic flux density
geocentric distance : m (metre)	Used for magnetospheric scale out to about 100 Earth radii. Foratmospheric scale use altitude. AU *use* m [m = AU * 149597870000] Earth radii *use* m [m=Earth radii * 6378140]
geological age	*use* age
gram	*see* mass
gray	*see* radiation absorbed dose
heat	*use* energy
height	*use* size

heliocentric distance : AU (astronomical unit)	For distances beyond the solar system use galactic distance. solar radii *use* AU [AU = solar radii * 0.00465424]
hertz	*see* bandwidth or frequency
horsepower	*see* powerhour *see* time
inch	*see* distance or size
instructions per second	*see* computer execution ratejoule *see* energy
joule	*see energy*
joule per kilogram	*see* radiation absorbed dose
K	*see memory size or temperature*
kayser	*see* wavelength
kelvin	*see temperature*
kilogram force/m2	*see* pressure
kWh	*see energy*
length	*use* size
light year	*see* galactic distance
loss : dB (decibel)	Used for attenuation. For negative values use gain.
magnetic flux density : T (tesla)	1989- gauss *use* T [T = gauss * 0.0001] Wb/m2 *use* T
mass : kg (kilogram)	1989- oz *use* kg [kg = oz * 0.028349] lb *use* kg [kg = lb * 0.45359237] ton *use* kg [kg = ton * 1016.05] tonne *use* kg [kg = tonne * 1000]
memory size : byte	K *use* byte [byte = K * 1024]
metre	*see* altitude, depth, distance, geocentric distance, size or wavelength
mho	*see* conductance
mho/m	*see* electrical conductivity
mile	*see* altitude, depth, distance or size
minute	*see* time
mm Hg	*see* pressure
newtons per square metre	*see* pressure
noise figure : dB (decibel)	
ohm	*see* resistance
ohm metre	*see* resistivity
ohm m-1	*see* electrical conductivity
optical loss	*use* loss
ounce	*see* mass
parsec	*see* galactic distance
pascal	*see* pressure
percent	*see* efficiency
picture size : pixel (picture element)	
pound	*see* mass
power : W (watt)	hp *use* W [W = hp * 745.7]
power, apparent	*use* apparent power
power, reactive	*use* reactive power
pressure : Pa (pascal)	*Not used for partial pressure.*

	atm *use* Pa [Pa = atm * 101325] bar *use* Pa [Pa = bar * 100000] cm Hg *use* Pa [Pa = cm Hg * 1333.22] kgf/m2 *use* Pa [Pa = kgf/m2 * 9.80665] lbf/in2 *use* Pa [Pa = lbf/in2 * 6894.76] mm Hg *use* Pa [Pa = mm Hg * 133.322] N/m2 *use* Pa psi *use* Pa [Pa = psi * 6894.76] torr *use* Pa [Pa = torr * 133.322]
printer speed : cps (characters per second)	
psi	*see* pressure
rad	*see* radiation absorbed dose
radiation absorbed dose : Gy (gray)	J/kg *use* Gy rad *use* Gy [Gy = rad * 0.01]
radiation dose equivalent : Sv (sievert)	rem *use* Sv [Sv = rem * 0.01]
radiation exposure : C/kg (coulomb per kilogramme)	roentgen *use* C/kg [C/kg = roentgen * 0.000258]
radioactivity : Bq (becquerel)	curie *use* Bq [Bq = curie * 37000000000]
radius	*use* size
reactive power : VAr (volt-amp (reactive))	Used for power apparatus, equipment, etc. when power ratings orlevels are given in VAr.
rem	*see* radiation dose equivalent
resistance : W (ohm)	
resistivity : ohmm (ohm metre)	
roentgen	*see* radiation exposure sampling
rate	*use* frequency
second	*see* time
siemens	*see* conductance
siemens per metre	*see* electrical conductivity
sievert	*see* radiation dose equivalent
signal to noise ratio	*use* noise figure
size : m (metre)	Not used for elementary particle or nuclei size. inch *use* m [m = inch * 0.0254] feet *use* m [m = feet * 0.3048] yard *use* m [m = yard * 0.9144]
size, memory	*use* memory size
size, picture	*use* picture size
solar mass	*see* stellar mass
solar radii	*see* heliocentric distance
speed	*use* velocity
stellar mass : Msol (solar mass)	Used for stars only, i.e. not nebulae, star clusters, galaxies, etc.
storage capacity : bit	
temperature : K (kelvin)	Used for absolute temperatures and not temperature differences. degC *use* K [K = degC + 273.15] C *use* K [K = C + 273.15] degF *use* K [K=(degF+459.67) * 0.5555556]

	F *use* K [K = (F + 459.67) * 0.5555556] degK *use* K
tesla	*see* magnetic flux density
thickness	*use* size
time : s (second)	minute *use* s [s = minute * 60] hour *use* s [s = hour * 3600] day *use* s [s = day * 86400] week *use* s [s = week * 604800] year *use* s [s = year * 31557600]
ton	*see* mass
tonne	*see* mass
torr	*see* pressure
transmission speed	*use* bit rate or byte rate
transconductance	use conductance (if units are in S) or electrical conductivity (if units are in S/length)
velocity : m/s (metres per second)	1989-
volt-amp	*see* apparent power
volt-amp (reactive)	*see* reactive power
voltage : V (volt)	
watt	*see* power
wave number	*see* wavelength
wavelength : m (metre)	Used for all waves: electromagnetic, acoustic, gravitational, etc. Used for fibre optical communications and related devices/equipmentincluding the wavelengths of optical emitters and detectors. *If a wavelength is given as a wave number either in cm-1 or in kayser,then use the following to convert to wavelength in m:* cm^{-1} *use* m [m = (1/cm^{-1}) * 0.01] kayser *use* m [m = (1/kayser) * 0.01]
webers per square metre	*see* magnetic flux density
week	*see* time
width	*use* size
word length : bit	Not used for ADC resolution.
yard	*see* altitude, depth, distance or size
year	*see* age or time

2.1 Multiplying Prefixes

Prefix	Abbrev.	Factor	Prefix	Abbrev.	Factor
exa	E	10^{18}	deci	D	10-01
peta	P	10^{15}	centi	c	10-02
tera	T	10^{12}	milli	m	10-03
giga	G	10^{09}	micro	mu	10-06
mega	M	10^{06}	nano	n	10-09
kilo	k	10^{03}	pico	p	10-12
hecto	h	10^{02}	femto	f	10-15
deca	da	10^{01}	atto	a	10-18

The exception to this rule is in the area of computer memories, where theirphysical and logical layout means that their sizes are powers of 2. Thus, in specifications of memory size or storage capacity, the multiplying prefixes 'K', 'M' and 'G' have non-standard meanings as follows:

Prefix	Multiplying Factor	As a power of 2
K	1,024	2^{10}
M	1,048,576	2^{20}
G	1,073,741,824	2^{30}

Thus, a 64 KB memory will be numerically indexed as:

memory size 6.6E+04 bytes

because 6.6E+04 is 65536 to two significant figures.

3.0 Inspec Numerical Data Indexing Search Guide

3.1 Table of Vendor Search Examples

Inspec Vendor	Inspec Database including Numerical Data Indexing	Numerical Data Indexing Search Field	Numerical Data Indexing Search Examples
ProQuestDialog	Inspec	*Properties, and units of measurement* use NITYPE (Command Line Search) *Values/Ranges* use individual fields* (Command Line Search)	NITYPE(WAVELENGTH) NITE(3.73E2); NITE(2.73E+02); NITE(273) NITE=5.0E-02 NISM(>=1.1E+01) AND NISM(<=1.1E+01) NITE<5.33E02 (also >=, <=, >)
EbscoHOST	Inspec	*To search properties, or units of measurement.* use NI (Basic search) *To search values* use NI (Basic search) Form based Advanced search option also available. In this case select Numerical data from drop down menu, and enter query omitting NI at the beginning	NI TEMPERATURE NI K NI 6.73E+02 K NI "TEMPERATURE 6.73E+02 K" NI TEMPERATURE 6.73E+02 *N.B.: Results returned only where the exact value, or range of values, searched appears on the Inspec record.*
Elsevier Engineering Village	Inspec	To search properties, or units of measurement use WN NI (Expert search) To search values use WN NI (Expert search)	*TEMPERATURE WN NI Hz WN NI* *"3.73E+02 K" WN NI* *{3.73E-02 K} WN NI* *"3.73E+02 5.33E+02 K" WN NI*

		Refine options for a subset of properties are available on search results screen. Full range functionality available here.	*N.B.: Results returned only where the exact value, or range of values, searched appears on the Inspec record. Unit of measurement, + or –, and preceding zeros must be included in query.*
Inspec Direct	Inspec	To search properties, or units of measurement To search values (Form based Advanced Search)	N/A TEMPERATURE = 2.730E002 TEMPERATURE >= 2.73E002 TEMPERATURE between 2.73E002 2.93E002 Full range searching available
Clarivate Web of Science	Inspec	*To search properties, or units of measurement* *Values/Ranges* use individual fields* (Advanced Search) Form based options also available in Basic Search.	N/A TE=(3.73E+02) TE=(373) TE=(GTE 3.73E09) TE=(GT 3.73E09) TE=(LTE 3.73E-09) TE=(LT 1) TE=(2.73E000 2.93E000) *N.B.: GTE, GT, LTE and LT represent Greater Than or Equal To, "Greater Than", "Less Than or Equal To" and "Less Than" respectively* Full range search available
Ovid SP	Inspec	*To search properties, or units of measurement* use .ND *To search values* use .ND	TEMPERATURE.ND K.ND "3.73E+02".ND "TEMPERATURE 3.73E+02 K".ND "TEMPERATURE 3.73E+02 TO 5.33E+02".ND "TEMPERATURE 3.73E+02".ND "3.73E+02 K".ND *N.B.: Results returned only where the exact value, or range of values, searched appears on the Inspec record.* *Unit of measurement, + or –, and preceding zeros in the value, must be included in query*
STN	Inspec	*To search properties, or units of measurement* use /PHP	S WAVELENGTH/PHP *N.B: Online thesaurus available for /PHP e.g. E FREQUENCY/PHP.* *Units of measurement can be tailored using SET UNIT command. (e.g. To search*

		To search values/ranges use individual fields*	*temperature values in Degrees Centigrade instead of the default Kelvin)* *S 3.73E02/TEMP* *S 3.73E2-5.33E2/TEMP* *S TEMP>3.73E+02 (also >=, <=, <) S TEMP<3.73E-02* Full range search available

** For individual numerical indexing search fields, see the Table below, or the individual Vendor data sheet for Inspec.*

3.2 Table of Vendor-Specific Numerical Data Indexing Search Fields

Quantity	Unit	ProQuest Dialog	Clarivate Web of Science	STN
Age	yr	NIAG	AG=	/AGE
Altitude	m	NIAL	AL=	/ALT
apparent power	VA	NIAP	AP=	/POA
bandwidth	Hz	NIBW	BW=	/BAW
bit rate	bit/s	NIBI	BI=	/BIR
byte rate	Byte/s	NIBY	BY=	/BYR
capacitance	F	NICA	CA=	/CAP
computer executionrate	IPS	NICE	CE=	/COE
computer speed	FLOPS	NICM	CM=	/COS
conductance	S	NICD	CD=	/CON
Current	A	NICU	CU=	/CUR
Depth	m	NIDP	DP=	/DEP
Distance	m	NIDI	DI=	/DIS
Efficiency	percent	NIEF	EF=	/EFF
electrical conductivity	S/m	NIEL	EL=	/ECND
electron volt energy	eV	NIEV	EV=	/EEV
Energy	J	NIEN	EN=	/ENE
Frequency	Hz	NIFR	FR=	/FRE
Gain	dB	NIGA	GA=	/GAI
galactic distance	pc	NIGD	GD=	/GAD
geocentric distance	m	NIGE	GE=	/GED
heliocentric distance	AU	NIHD	HD=	/HED
Loss	dB	NILS	LS=	/LOS
magnetic flux density	T	NIMD	MD=	/MFD
Mass	kg	NIMA	MA=	/M
memory size	Byte	NIMS	MS=	/MES
noise figure	dB	NINF	NF=	/NOF
picture size	pixel	NIPX	PX=	/PIS
power	W	NIPO	PO=	/POW
pressure	Pa	NIPR	PR=	/PRES
printer speed	cps	NIPS	PS=	/PRSP
radiation dose equivalent	Sv	NIRD	RD=	/RADE
radiation exposure	C/kg	NIRX	RX=	/RAE
radioactivity	Bq	NIRY	RY=	/RAD
reactive power	VAr	NIRP	RP=	/POR
resistance	ohm	NIRE	RE=	/RES
resistivity	ohmm	NIER	ER=	/EREST
size	m	NISI	SI=	/SIZ
stellar mass	Msol	NISM	SM=	/STM
storage capacity	bit	NISR	SR=	/SCA
temperature	K	NITE	TE=	/TEMP
time	s	NITM	TM=	/TIM
velocity	m/s	NIVE	VE=	/VEL
voltage	V	NIVO	VO=	/VOLT
wavelength	m	NIWA	WA=	/WVL
word length	bit	NIWL	WL=	/WOL