

DIN EN 61400-25-2

ICS 27.180

**Windenergieanlagen –
Teil 25-2: Kommunikation für die Überwachung und Steuerung von
Windenergieanlagen –
Informationsmodelle (IEC 61400-25-2:2006);
Deutsche Fassung EN 61400-25-2:2007, Text Englisch**

Wind turbines –

Part 25-2: Communications for monitoring and control of wind power plants –

Information models (IEC 61400-25-2:2006);

German version EN 61400-25-2:2007, text in English

Eoliennes –

Partie 25-2: Communications pour la surveillance et la commande des centrales

éoliennes –

Modèles d'information (CEI 61400-25-2:2006);

Version allemande EN 61400-25-2:2007, texte en anglais

Gesamtumfang 87 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Beginn der Gültigkeit

Die von CENELEC am 2007-02-01 angenommene EN 61400-25-2 gilt als DIN-Norm ab 2007-11-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 61400-25-2:2006-02.

Für diese Norm ist das nationale Arbeitsgremium K 383 „Windenergieanlagen“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (<http://www.dke.de>) zuständig.

Die enthaltene IEC-Publikation wurde vom TC 88 „Wind turbine systems“ erarbeitet.

K 383 hat festgestellt, dass die Bedingungen des DIN-Präsidialbeschlusses 1/2004 für die vorliegende Norm erfüllt sind. Demnach besteht die Europäische Norm EN 61400-25-3 nur in einer englischen Sprachfassung, weil sie nicht unmittelbar im Zusammenhang mit Rechtsvorschriften steht und nicht als Sicherheitsnorm anzusehen ist. Es kann davon ausgegangen werden, dass die Anwender dieser Norm über hinreichende englische Sprachkenntnisse verfügen. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennung bedienen.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem auf der IEC-Website unter „<http://webstore.iec.ch>“ mit den Daten zu dieser Publikation angegebenen Datum (maintenance result date) unverändert bleiben soll. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

- bestätigt,
- zurückgezogen,
- durch eine Folgeausgabe ersetzt oder
- geändert.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Windenergieanlagen –
Teil 25-2: Kommunikation für die Überwachung und Steuerung von
Windenergieanlagen –
Informationsmodelle
(IEC 61400-25-2:2006)

Wind turbines –
Part 25-2: Communications for monitoring and
control of wind power plants –
Information models
(IEC 61400-25-2:2006)

Eoliennes –
Partie 25-2: Communications pour la
surveillance et la commande des centrales
éoliennes –
Modèles d'information
(CEI 61400-25-2:2006)

Diese Europäische Norm wurde von CENELEC am 2007-02-01 angenommen. Die CENELEC-Mitglieder sind gehalten, die CEN/CENELEC-Geschäftsordnung zu erfüllen, in der die Bedingungen festgelegt sind, unter denen dieser Europäischen Norm ohne jede Änderung der Status einer nationalen Norm zu geben ist.

Auf dem letzten Stand befindliche Listen dieser nationalen Normen mit ihren bibliographischen Angaben sind beim Zentralsekretariat oder bei jedem CENELEC-Mitglied auf Anfrage erhältlich.

Diese Europäische Norm besteht in drei offiziellen Fassungen (Deutsch, Englisch, Französisch). Eine Fassung in einer anderen Sprache, die von einem CENELEC-Mitglied in eigener Verantwortung durch Übersetzung in seine Landessprache gemacht und dem Zentralsekretariat mitgeteilt worden ist, hat den gleichen Status wie die offiziellen Fassungen.

CENELEC-Mitglieder sind die nationalen elektrotechnischen Komitees von Belgien, Bulgarien, Dänemark, Deutschland, Estland, Finnland, Frankreich, Griechenland, Irland, Island, Italien, Lettland, Litauen, Luxemburg, Malta, den Niederlanden, Norwegen, Österreich, Polen, Portugal, Rumänien, Schweden, der Schweiz, der Slowakei, Slowenien, Spanien, der Tschechischen Republik, Ungarn, dem Vereinigten Königreich und Zypern.

CENELEC

Europäisches Komitee für Elektrotechnische Normung
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique

Zentralsekretariat: rue de Stassart 35, B-1050 Brüssel

© 2007 CENELEC – Alle Rechte der Verwertung, gleich in welcher Form und in welchem Verfahren, sind weltweit den Mitgliedern von CENELEC vorbehalten.

Ref. Nr. EN 61400-25-2:2007 D

Vorwort

Der Text des Schriftstücks 88/275/FDIS, zukünftige 1. Ausgabe von IEC 61400-25-2, ausgearbeitet von dem IEC TC 88 „Wind turbines“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2007-02-01 als EN 61400-25-2 angenommen.

Nachstehende Daten wurden festgelegt:

- spätestes Datum, zu dem die EN auf nationaler Ebene durch Veröffentlichung einer identischen nationalen Norm oder durch Anerkennung übernommen werden muss (dop): 2007-11-01
- spätestes Datum, zu dem nationale Normen, die der EN entgegenstehen, zurückgezogen werden müssen (dow): 2010-02-01

Der Anhang ZA wurde von CENELEC hinzugefügt.

Anerkennungsnotiz

Der Text der Internationalen Norm IEC 61400-25-2:2006 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

CONTENTS

Vorwort	2
EINLEITUNG	6
1 Anwendungsbereich	7
2 Normative references	8
3 Terms and definitions	9
4 Abbreviated terms	9
5 General	12
5.1 Overview of logical node classes	12
5.2 Use of logical node classes	14
5.3 Extensions of the information model	14
6 Wind power plant logical node classes	15
6.1 System specific logical nodes	15
6.2 Wind power plant specific logical nodes	17
6.3 Data name semantic	33
7 Common data classes	44
7.1 Basic concepts for common data classes (CDC)	44
7.2 Common data class attributes	47
7.3 Wind power plant specific common data classes (CDC)	52
7.4 Common data classes inherited from IEC 61850-7-3	60
7.5 Common data class attribute semantics	62
Annex A (normative) Information model for statistical data and historical statistical data	67
Annex B (normative) Value range for units and multiplier	73
Annex C (informative) Wind Power Plant Controller	76
Annex D (informative) List of mandatory logical nodes and data	82
Annex ZA (normative) Normative references to International publications with their corresponding European publications	84
Bild 1 – Konzept des Kommunikationsmodells nach Normenreihe IEC 61400-25	8
Figure 2 – Relationship of logical nodes	12
Figure 3 – Use of instances of logical nodes	14
Figure A.1 – Conceptual model of statistical and historical statistical data (1)	68
Figure A.2 – Conceptual model of statistical and historical statistical data (2)	69
Figure C.1 – Conceptual structure of the wind power plant control functions	76
Figure C.2 – Schematic illustration of the active power limitation control function	77
Figure C.3 – Schematic illustration of the gradient power control function	78
Figure C.4 – Schematic illustration of the delta power control function	78
Figure C.5 – Schematic illustration of a combined control – including gradient, delta and active power limitation control	79
Figure C.6 – Schematic illustration of the apparent power control function	79
Figure C.7 – Schematic illustration of the reactive power control function	80
Figure C.8 – Schematic illustration of the power factor control function	81

Figure C.9 – Schematic illustration of the voltage control function using reactive power control 81

Table 1 – System specific logical nodes	12
Table 2 – Wind power plant specific logical nodes	13
Table 3 – Wind turbine specific logical nodes	13
Table 4 – Wind power plant common logical node class.....	15
Table 5 – Logical node zero class	16
Table 6 – Physical device information class.....	16
Table 7 – LN: Wind turbine general information (WTUR)	17
Table 8 – LN: Wind turbine rotor information (WROT)	18
Table 9 – LN: Wind turbine transmission information (WTRM).....	19
Table 10 – LN: Wind turbine generator information (WGEN)	20
Table 11 – LN: Wind turbine converter information (WCNV)	21
Table 12 – LN: Wind turbine transformer information (WTRF)	22
Table 13 – LN: Wind turbine nacelle information (WNAC)	23
Table 14 – LN: Wind turbine yawing information (WYAW)	24
Table 15 – LN: Wind turbine tower information (WTOW)	24
Table 16 – LN: Wind power plant meteorological information (WMET).....	25
Table 17 – LN: Wind power plant alarm information (WALM).....	26
Table 18 – LN: Wind turbine state log information (WSLG).....	26
Table 19 – LN: Wind turbine analogue log information (WALG)	28
Table 20 – LN: Wind turbine report information (WREP)	31
Table 21 – LN: Wind power plant active power control information (WAPC).....	32
Table 22 – LN: Wind power plant reactive power control information (WRPC).....	33
Table 23 – Data name semantic	34
Table 24 – General table structure of a common data class (CDC).....	45
Table 25 – Common data class attributes	46
Table 26 – Conditions for the presence of an attribute	46
Table 27 – CDC: Attribute basic types	47
Table 28 – Analogue value.....	47
Table 29 – TimeStamp type	48
Table 30 – TimeQuality definition	49
Table 31 – TimeAccuracy.....	49
Table 32 – Quality	50
Table 33 – Unit.....	50
Table 34 – Originator	51
Table 35 – Values for orCat	51
Table 36 – Wind power plant specific common data classes	52
Table 37 – CDC: Setpoint value (SPV)	53
Table 38 – CDC: Status Value (STV).....	54
Table 39 – CDC: Alarm (ALM).....	55
Table 40 – CDC: Command (CMD).....	56

Table 41 – CDC: Event counting (CTE)	57
Table 42 – CDC: State timing (TMS)	59
Table 43 – CDC: Alarm Set Status (ASS)	60
Table 44 – Specialized common data classes	61
Table 45 – Device name plate common data class specification WDPL	61
Table 46 – Common data class attribute semantic	62
Table A.1 – Description of Data	70
Table A.2 – Object reference setting group common data class specification	72
Table B.1 – SI units: base units	73
Table B.2 – SI units: derived units	73
Table B.3 – SI units: extended units	74
Table B.4 – SI units: industry specific units	74
Table B.5 – Multiplier	75
Table D.1 – Mandatory system specific logical nodes	82
Table D.2 – Mandatory wind power plant specific logical nodes	82
Table D.3 – Mandatory wind turbine specific logical nodes	82
Table D.4 – Mandatory wind power plant specific common data classes (CDC)	82
Table D.5 – Mandatory common data classes inherited from IEC 61850-7-3	83
Table D.6 – Mandatory common data classes inherited from IEC 61850-7-3 and specialised	83

EINLEITUNG

Die Normenreihe IEC 61400-25 legt die Kommunikation für die Überwachung und Steuerung von Windenergieanlagen fest. Die Modellierungsmethode der Normenreihe IEC 61400-25 ist gewählt worden, um abstrakte Definitionen von Klassen und Diensten bereitzustellen, so dass die Ausführungen unabhängig von spezifischen Protokollstapelspeichern, Implementierungen und Betriebssystemen sind. Die Abbildung dieser abstrakten Klassen und Dienste auf einem spezifischen Kommunikationsprofil liegt außerhalb des Anwendungsbereiches dieses Teils (IEC 61400-25-2) jedoch innerhalb des Anwendungsbereiches von IEC 61400-25-4.¹⁾

Um Interoperabilität zu erreichen, benötigen alle Daten in dem Informationsmodell eine eindeutige Festlegung hinsichtlich der Schreibweise und der Semantik. Die Semantik der Daten wird hauptsächlich durch Namen gewährleistet, die den logischen Knoten und deren enthaltenen Daten zugewiesen werden, wie in diesem Teil der Normenreihe IEC 61400-25 festgelegt. Interoperabilität ist einfacher zu erreichen, wenn so viele Daten wie möglich, verbindlich definiert werden.

Es sollte beachtet werden, dass Daten mit vollständiger Semantik nur einer der erforderlichen Faktoren sind, um Interoperabilität zu erreichen. Seitdem Geräte (IED) die Hostfunktion für Daten und Dienste übernehmen, wird zusammen mit domänenspezifischen Diensten ein geeignetes Gerätemodell benötigt (siehe IEC 61400-25-3).

Dieser Teil wird verwendet, um die **abstrakten Definitionen einer logischen Geräteklasse, logischer Knotenklassen, Datenklassen und abstrakter allgemeiner Datenklassen** festzulegen. Diese abstrakten Definitionen müssen in konkreten Objektdefinitionen abgebildet werden, die für ein bestimmtes Protokoll geeignet sind.

Die Definitionen der Namen von kompatiblen logischen Knoten und der Datennamen, die in diesem Teil vorkommen, und die zugehörige Semantik sind fixiert.

ANMERKUNG Die Leistungsmerkmale „Implementierungen“ der Normenreihe IEC 61400-25 sind anwendungsspezifisch. Die Normenreihe IEC 61400-25 gewährleistet keinen bestimmten Leistungspegel. Das liegt außerhalb des Anwendungsbereiches der Normenreihe IEC 61400-25. Es gibt jedoch keine grundlegenden Einschränkungen für die Kommunikationstechnologie, um Hochgeschwindigkeitsanwendungen (Antworten im Millisekundenbereich) zu unterbinden.

¹⁾ Noch nicht veröffentlicht.

1 Anwendungsbereich

Schwerpunkt der Normenreihe IEC 61400-25 sind die Kommunikationen zwischen den Komponenten der Windenergieanlage wie Windturbinen und Aktoren wie den SCADA-Systemen. Die interne Kommunikation innerhalb der Windenergieanlagen-Komponenten liegt außerhalb des Anwendungsbereiches dieser Norm.

Die Normenreihe IEC 61400-25 wurde für eine durch ein Client-Server-Modell unterstützte Kommunikationsumgebung entwickelt. Es sind drei Bereiche festgelegt, die einzeln entworfen wurden, um die Skalierbarkeit der Implementierungen zu gewährleisten:

- 1) Windenergieanlagen-Informationsmodelle,
- 2) Informationsaustauschmodell und
- 3) Abbildung dieser zwei Modelle auf einem einheitlichen Kommunikationsprofil.

Das Windenergieanlagen-Informationsmodell und das Informationsaustauschmodell stellen zusammen betrachtet eine Schnittstelle zwischen Client und Server dar. In dieser Zusammensetzung dient das Windenergieanlagen-Informationsmodell als Auswertungsframe für die verfügbaren Daten der Windenergieanlage. Das Windenergieanlagen-Informationsmodell wird vom Server verwendet, um dem Client eine einheitliche komponentenbezogene Betrachtung der Windenergieanlagen-Informationsmodelldaten zu bieten. Das Informationsaustauschmodell spiegelt die vollständige aktive Funktionsweise des Servers wider. Die Normenreihe IEC 61400-25 ermöglicht die Anschlussfähigkeit zwischen einer heterogenen Kombination von Clients und Servern von unterschiedlichen Herstellern und Anbietern.

Wie in Bild 1 dargestellt, legt die Normenreihe IEC 61400-25 einen Server unter folgenden Gesichtspunkten fest:

- Die **Information**, die von einer Windenergieanlagen-Komponente zur Verfügung gestellt wird, z. B. die „Drehzahl des Rotors einer Windturbine“ oder die „gesamte Energieerzeugung innerhalb eines bestimmten Zeitintervalls“, wird umgeformt und für den Zugriff verfügbar gemacht.
- Die **Dienste für den Austausch** der Werte der gebildeten Information sind in IEC 61400-25-3 festgelegt.
- Die **Abbildung auf einem Kommunikationsprofil**, das einen Protokollstapelspeicher bereitstellt, um die aus den gebildeten Informationen übermittelten Werte aufzunehmen (IEC 61400-25-4).

Die Normenreihe IEC 61400-25 legt nur fest, wie die Information, der Informationsaustausch und die Abbildung zu speziellen Kommunikationsprotokollen gebildet werden. Die Norm schließt eine Festlegung aus, wie und wo die Kommunikationsschnittstelle, die Schnittstelle für das Anwendungsprogramm und Anwendungsempfehlungen praktisch zu realisieren sind. Zielsetzung dieser Norm ist jedoch, dass die Informationen, die zu einer einzelnen Windenergieanlagen-Komponente (wie z. B. einer Windturbine) gehören, durch ein entsprechendes logisches Gerät erreichbar werden.

Der Teil IEC 61400-25-2 legt das Informationsmodell der Geräte und Funktionen windenergieanlagenbezogener Anwendungen fest. Insbesondere die Namen von kompatiblen logischen Knoten und die Datennamen werden für die Kommunikation zwischen den Windenergieanlagen-Komponenten festgelegt. Dies schließt auch die Beziehung zwischen logischen Geräten, logischen Knoten und Daten ein. Die in der Normenreihe IEC 61400-25 festgelegten Namen werden verwendet, um die hierarchischen Objektreferenzen zu bilden, die für die Kommunikation mit Komponenten in Windenergieanlagen gelten.

Dieser Teil von IEC 61400-25 legt die Attributtypen und allgemeinen Datenklassen für windenergieanlagenbezogene Anwendungen fest. Insbesondere werden allgemeine Datenklassen festgelegt für:

- Vorgabewert,
- Statuswert,
- Alarm,
- Befehl,
- Ereigniszählung,
- Statussynchronisation,
- Alarmauslösungsstatus.

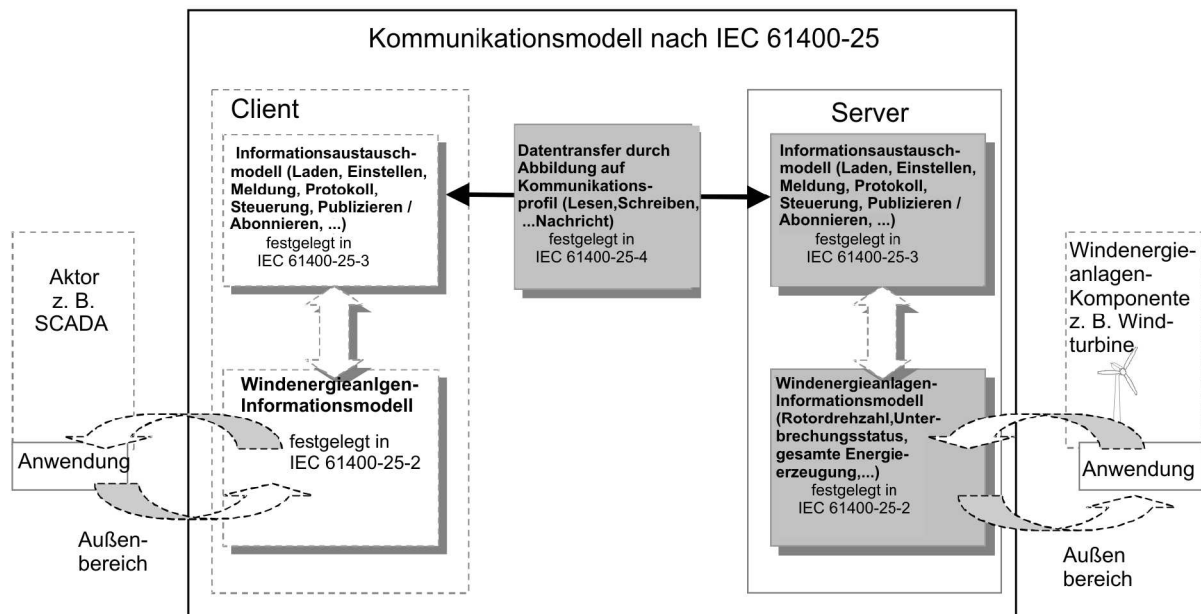


Bild 1 – Konzept des Kommunikationsmodells nach Normenreihe IEC 61400-25

Geräte, welche das Informationsmodell dieses Teils umsetzen, müssen wie durch die Anwendung gefordert jeweils einen oder mehrere Knoten auswählen.

ANMERKUNG 1 Die Normenreihe IEC 61400-25 ist auf die allgemeinen, nicht herstellerspezifischen Informationen gerichtet. Jene Informationseinheiten, die dazu neigen, sich zwischen den herstellerspezifischen Ausführungen stark zu unterscheiden, können zum Beispiel in zweiseitigen Vereinbarungen, Anwendergruppen oder Ergänzungen zu dieser Norm festgelegt werden.

ANMERKUNG 2 Dieser Teil enthält kein Anleitungsmaterial.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61400-25 (all parts), *Wind turbines – Part 25: Communications for monitoring and control of wind power plants*

IEC 61850-5, *Communication networks and systems in substations – Part 5: Communication requirements for functions and device models*

IEC 61850-7-1:2003, *Communication networks and systems in substations – Part 7-1: Basic communication structure for substations and feeder equipment – Principles and models*

IEC 61850-7-2:2003, *Communication networks and systems in substations – Part 7-2: Basic communication structure for substations and feeder equipment – Abstract communication service interface (ACSI)*

IEC 61850-7-3, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substations and feeder equipment – Common data classes*

IEC 61850-7-4, *Communication networks and systems in substations – Part 7-4: Basic communication structure for substations and feeder equipment – Compatible logical node classes and data classes*

ISO 639 (all parts), *Codes for the representation of names of languages*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*

ISO 3166 (all parts), *Codes for the representation of names of countries and their subdivisions*

RFC 2445, *Internet Calendaring and Scheduling Core Object Specification (iCalendar)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61400-25-1 as well as the following apply.

3.1

conditional

attribute of a common data class provided by an implementation of the IEC 61400-25 series if a certain condition corresponding with the attribute is true

3.2

mandatory

defined content shall be provided in compliance with the IEC 61400-25 series

3.3

optional

defined content can be optionally provided in compliance with the IEC 61400-25 series

4 Abbreviated terms

CDC	Common Data Class
DC	Data Class
IED	Intelligent Electronic Device
LCB	Log Control Block
LD	Logical Device
LN	Logical Node
LPHD	Logical node Physical Device Information
RCB	Report Control Block
SBO	Select Before Operate
WPP	Wind Power Plant
WT	Wind Turbine
XML	Extensible Markup Language

Abbreviated terms used to build names of data classes found in LNs shall be as listed below.

EXAMPLE RotPos is constructed by using two names "Rot" which stands for Rotor and "Pos" which stands for "Position". Thus the concatenated name represents a "Rotor Position".

Term	Description
A	Current
AC	AC
Ack	Acknowledge
Acs	Access
Act	Actual
Alm	Alarm
An	Analogue
Ane	Anemometer
Ang	Angle
Alt	Altitude
At	Active (real)
Atv	Activate
Av	Average
Avl	Availability
Az	Azimuth
Bec	Beacon
Bl	Blade
Blk	Blocked
Brg	Bearing
Brk	Brake
Cab	Cable
Calc	Calculation
Ccw	Counter clockwise
Ch	Characteristic
Chg	Change
Chk	Check
Chrg	Charge
Cl	Cooling
Cm	Command
Cnv	Converter
Ct	Counting
Ctl	Control
Cw	Clockwise
d	Description
Dat	Data
Db	Deadband
DC	DC (Direct Current)
Dcl	DC-link
Dec	Decrease
Dehum	De-humidifier
Del	Delta
Det	Detection
Dir	Direction
Disp	Displacement
Dly	Daily
Dmd	Demand
Drv	Drive
Dn	Down
Egy	Energy

Term	Description
Elev	Elevator
Emg	Emergency
En	Enable
Ent	Entrance
Ety	Empty
Evt	Event
Ex	External
Exp	Expired
Ext	Excitation
Flsh	Flash
Flt	Fault
Ftr	Filter
Gbx	Gearbox
Gra	Gradient
Gri	Grid
Gn	Generator
Gs	Grease
Hi	High
Hly	Hourly
Hor	Horizontal
Ht	Heating
Htex	Heat-exchanger
Hum	Humidity
Hy	Hydraulic
Hz	Frequency
Ice	Ice
Id	Identifier
Idl	Idling
Inc	Increase
Inj	Injection
Inl	Inline
Inlet	Inlet
Inst	Instantaneous
Intl	Internal
Lev	Level
Log	Log
Lift	Lift
Lim	Limit
Lo	Low
Lu	Lubrication
Lum	Luminosity
Man	Manual
Max	Maximum
Met	Meteorological
Min	Minimum
Mly	Monthly
Mod	Mode
Mthd	Method
Mul	Multiplier

Term	Description
Mx	Measurement
Nac	Nacelle
Num	Number (size)
Of	Off line
Oil	Oil
Op	Operate, Operating
Oper	Operator
Ov	Over
Per	Period, Periodic
PF	Power factor
Ph	Phase
Pmp	Pump
Pl	Plant
Plu	Pollution
Pos	Position
Pres	Pressure
Prod	Production
Pt	Pitch
Ptr	Pointer
Pwr	Power
q	Quality
Rdy	Ready
Rep	Report
Rms	Root-mean-square
Rng	Range
Roof	Roof
Rot	Rotor (windturbine)
Rs	Reset
React	Reactive
Rtr	Rotor (generator)
Sdv	Standard deviation
Sev	Severity
Seq	Sequence
Shf	Shaft
Smk	Smoke
Smp	Sampled
Sp	Setpoint
Spd	Speed
Src	Source
St	Status
Sta	Stator
Stdby	Standby
Stop	Stop
Str	Start
Sw	Switch
Sys	System
t	Timestamp
Tm	Timer
Tmp	Temperature
Tot	Total

Term	Description
Tow	Tower
Tra	Transient
Trf	Transformer
Trg	Trigger
Torq	Torque
Tur	Turbine
Un	Under
Urg	Urgent
V	Voltage
VA	Apparent power
Val	Value
Vals	Values
Ver	Vertical
Vib	Vibration
Vis	Visibility
Wd	Wind (power)
Wly	Weekly
Wup	Windup
Xdir	X-direction
Ydir	Y-direction
Yly	Yearly
Yw	Yaw

5 General

5.1 Overview of logical node classes

The following two groups of common logical node classes are defined:

- 1) system specific logical nodes,
- 2) wind power plant specific logical nodes.

System specific logical nodes shall include all common information for physical hosting devices and wind power independent information. Wind power plant specific logical nodes shall inherit at least all mandatory information of system logical nodes.

All logical node classes defined in this part of the IEC 61400-25 series inherit their structure from the abstract logical node class (LN, see Figure) defined in 9.1.1 of IEC 61850-7-2. Apart from the logical node class 'Physical Device Information' (LPHD) all logical node classes (LLN0 and wind power plant specific LNs) defined in this part of the IEC 61400-25 series inherit at least the mandatory information of the common logical node (Common LN).

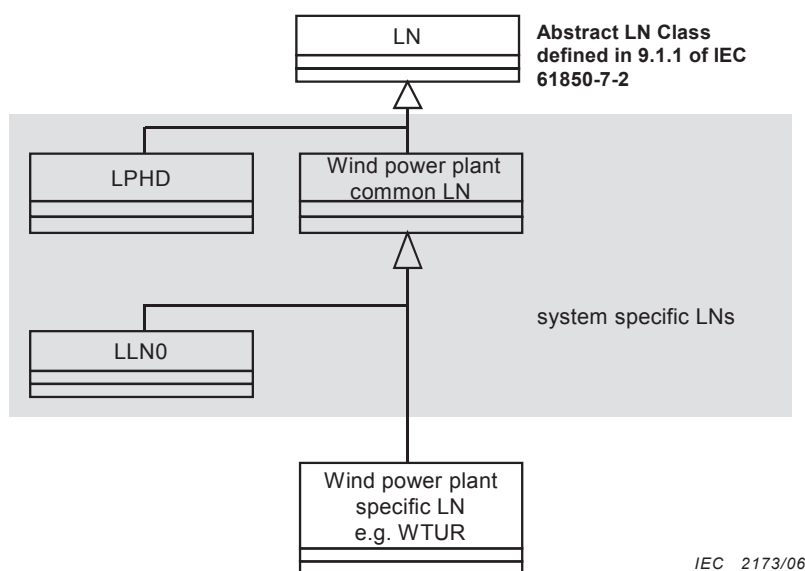


Figure 2 – Relationship of logical nodes

The system specific logical node classes listed in Table 1 are all mandatory. The logical node zero (LLN0) represents common information of the logical device, and the logical node physical device (LPHD) represents common information of the physical devices hosting the logical device (see 8.2 of IEC 61850-7-1).

Table 1 – System specific logical nodes

LN classes	Description	M/O
LLN0	Logical Node Zero	M
LPHD	Physical Device Information	M

Wind power plant information shall be classified in wind power plant specific logical nodes. In principle, classification of wind power plant information in different logical nodes is an arbitrary process and the modelling method offers flexibility. From the viewpoint of standardisation it is preferable that all wind power plant information will be build unambiguously and in a similar way. Table 2 shows the wind power plant information break down into logical nodes.

Table 2 – Wind power plant specific logical nodes

LN classes	Description	M/O
WTUR	Wind turbine general information	M
WALM	Wind power plant alarm information	O
WMET	Wind power plant meteorological information	O
WAPC	Wind power plant active power control information	O
WRPC	Wind power plant reactive power control information	O

A wind power plant consists of several components, including one or more wind turbines. Table 3 shows the breakdown of a wind turbine into logical nodes. Each wind turbine model shall include the mandatory logical nodes listed in Table 3. Despite of the fact that some logical nodes are optional for use, it is highly recommended in the IEC 61400-25 series to deviate as little as possible from the logical nodes as proposed in Table 2 and Table 3.

Table 3 – Wind turbine specific logical nodes

LN classes	Description	M/O
WTUR	Wind turbine general information	M
WROT	Wind turbine rotor information	M
WTRM	Wind turbine transmission information	O
WGEN	Wind turbine generator information	M
WCNV	Wind turbine converter information	O
WTRF	Wind turbine transformer information	O
WNAC	Wind turbine nacelle information	M
WYAW	Wind turbine yawing information	M
WTOW	Wind turbine tower information	O
WALM	Wind power plant alarm information	M
WSLG	Wind turbine state log information	O
WALG	Wind turbine analogue log information	O
WREP	Wind turbine report information	O

As shown in Table 2 and Table 3, information is mainly modelled by a set of LN classes, which are classified by physical turbine decomposition. A useful practical exception involves alarm information; all alarms shall be collected in a separate logical node.

Separate logical nodes for logged events (statuses, alarms, commands, event-counters, state-timers) and logged analogue time series (long period, demands, transient recording), shall model historical logged information.

Besides common information for all turbines (manufacturer independent), most information will, in practice, be determined by the turbine concept, the manufacturer, the site and the state of the art of turbine technology. For this reason, as a modelling guideline, the data class attribute names representing the specific information in the wind power plant specific logical nodes are focussed on the most prevailing modern wind turbine concept, namely 3-bladed, variable speed, active pitch (electric/hydraulic) and gearbox transmission. In case of additional information originated by other wind turbine systems or components, new data classes or specialised data classes to existing LNs could be defined. Additional user-specific LNs could also be defined.

The semantic of the data class names and semantic definitions are alphabetically listed and defined in 6.3. Units and multipliers associated with the data classes are specified in Annex B.

The modelling approach, including the general table structure of a logical node, is described in 6.2.2 of IEC 61400-25-1.

Standardised names for logical node classes are written in capital letters. Data names of the first level in the hierarchy (below the logical node level) start with a capital letter, and attribute names and data names of the second and lower levels in the hierarchy with a small letter.

5.2 Use of logical node classes

The logical node classes defined in this part of the standard, for example, WROT, WTUR, and those referenced from other standards, e. g. XCBR and MMXU from 5.12.1 and 5.10.7 of IEC 61850-7-4, have to be instantiated in real systems. Figure depicts an example of a real wind turbine that uses several instances of logical nodes.

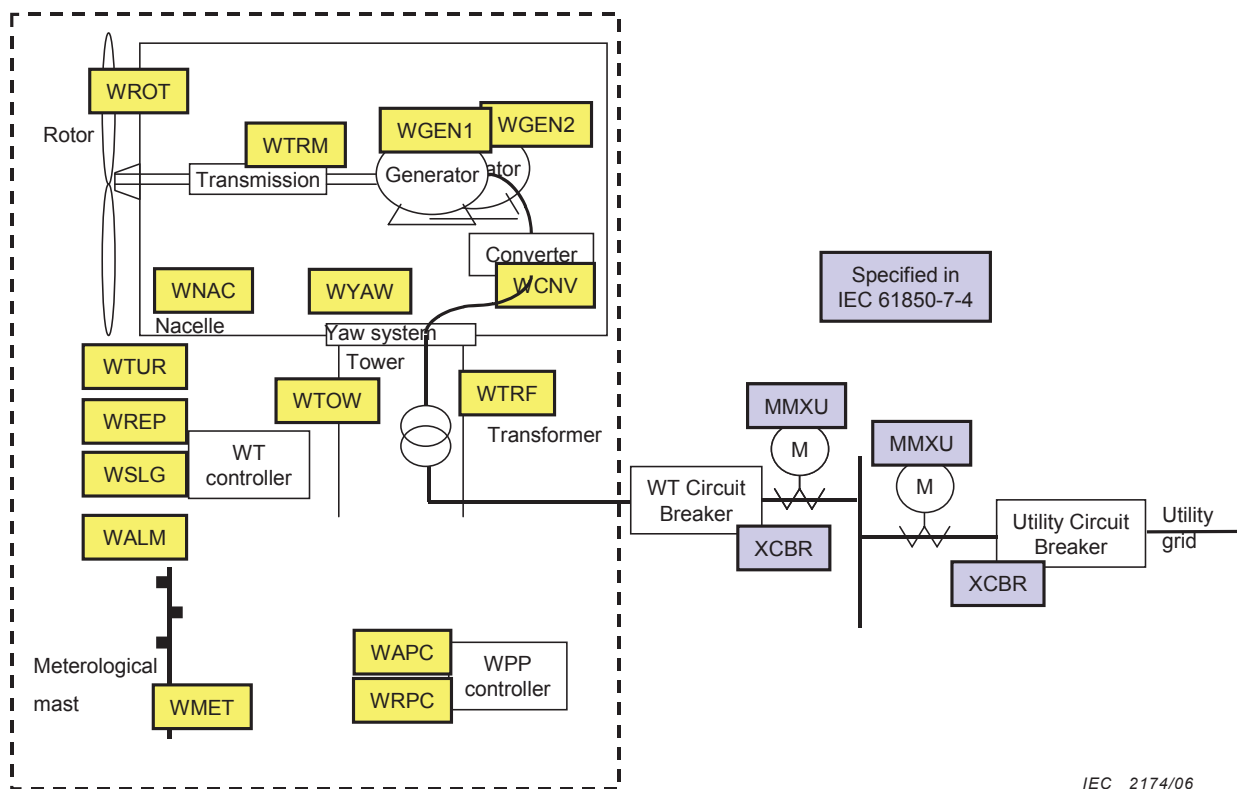


Figure 3 – Use of instances of logical nodes

The logical node instances depicted represent information from wind turbines “WTUR”, yawing system “WYAW”, converter “WCONV”, etc. The instance names, for example of WGEN1 and WGEN2 represent different generators. Figure also illustrates the interfacing electrical system including measurements “MMXU”, circuit breakers “XCBR”, etc. MMXU, XCBR and other logical nodes related to the electrical system are specified in IEC 61850-7-3.

5.3 Extensions of the information model

The information model described in Clause 6 can be extended with additional logical nodes and data for a particular implementation. If a different topology is applied (for example several generators and gearboxes) or more sensors (temperature, current) are used for monitoring purposes, the user is free to assign relevant information to additional data names. Any data can be added to any logical node.

The extension rules for LNs, data classes, and data attributes shall be as defined in Annex A of IEC 61850-7-4. The name space concept defined in Clause 14 of IEC 61850-7-1 allows one to define any extension – the name spaces are differentiated by unique identifiers.

6 Wind power plant logical node classes

6.1 System specific logical nodes

6.1.1 Wind power plant common logical node class

The wind turbine specific compatible logical nodes classes defined in this part of the IEC 61400-25 series are specialisations of the wind turbine common logical node class as defined in Table 4.

Table 4 – Wind power plant common logical node class

Wind power plant common Logical Node class			
Attribute name	Attribute type	Explanation	M/O
LNName		Logical node name. Shall be inherited from Logical-Node Class (see 9.1.1 of IEC 61850-7-2)	
Data			
<i>Mandatory Logical Node Information (Shall be inherited by ALL LN but LPHD)</i>			
NamPlt	LPL	Name plate (inherited from IEC 61850-7-4)	M
<i>Optional Logical Node Information</i>			
Mod	INC	Mode (inherited from IEC 61850-7-4)	O
Beh	INS	Behaviour (inherited from IEC 61850-7-4)	O
Health	INS	Health (inherited from IEC 61850-7-4)	O
Loc	SPS	Local operation (inherited from IEC 61850-7-4)	O
EEHealth	INS	External equipment health (inherited from IEC 61850-7-4)	O
EENam	WDPL	External equipment name plate	O
OpCntRs	INC	Operation counter resetable (inherited from IEC 61850-7-4)	O
OpCnt	INS	Operation counter (inherited from IEC 61850-7-4)	O
OpTmh	INS	Operation time (inherited from IEC 61850-7-4)	O
<i>Information for statistical information</i>			
CalcExp	SPS	Calculation period expired	O
CalcStr	SPC	Start calculation at time operTm (if set) or immediately	O
CalcMthd	ING	Calculation Method of statistical data. Allowed values: PRES MIN MAX TOTMIN TOTMAX AVG SDV	O
CalcPer	ING	Calculation Period of statistical data, shall be in seconds	O
CalcSrc	ORG	Object Reference to Source logical node	O
NOTE All five data for statistical information shall be available if statistical information is supported.			

The data CalcMthd shall be included in any logical node that represents analogue or counting information if the calculation method is unequal PRES. The data CalcExp, CalcStr, CalcPer and CalcSrc shall be included in any logical node that represents statistical data (MIN, MAX, etc.).

A specialisation of this wind power plant Common Logical Node class shall inherit all information required in the wind power plant specific logical nodes (see Table 2). For the optional logical node information, there are three possibilities for specialisation:

- not to inherit a specific information item;
- inherit a specific information item and leave it as optional;

- inherit a specific information item and define it as mandatory.

6.1.2 Logical node zero (LLN0)

The LLN0 class shall be used to address common issues for Logical Devices as defined in Table 5.

Table 5 – Logical node zero class

LLNO class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from wind power plant Common Logical Node Class (see 6.1.1).	M

The LLN0 represents information that is specific for a logical device. The name plate of the LLN0 represents the root name space (logical device namespace, IdNs) for a logical device. The value for the IEC 61400-25 series is "IEC 61400-25:2006". The name space also applies to names inherited from other standards. Only one logical device name space shall be used for each Logical Device, i.e. only one version can be used for a single Logical Device.

6.1.3 Physical device information (LPHD)

The LPHD class shall model common issues for physical devices as defined in Table 6.

Table 6 – Physical device information class

LPHD class			
Attribute name	Attribute type	Explanation	M/O
LNName		Logical node name. Shall be inherited from Logical-Node Class (see IEC 61850-7-2)	
Data			
PhyNam	WDPL	Physical device name plate (see 7.4.2.2)	M
PhyHealth	INS	Physical device health (inherited from IEC 61850-7-4)	M
OutOv	SPS	Output communications buffer overflow (inherited from IEC 61850-7-4)	O
Proxy	SPS	Indicates if this LD is a proxy (inherited from IEC 61850-7-4)	M
InOv	SPS	Input communications buffer overflow (inherited from IEC 61850-7-4)	O
NumPwrUp	INS	Number of Power ups (inherited from IEC 61850-7-4)	O
WrmStr	INS	Number of Warm Starts (inherited from IEC 61850-7-4)	O
WacTrg	INS	Number of watchdog device resets detected (inherited from IEC 61850-7-4)	O
PwrUp	SPS	Power Up detected (inherited from IEC 61850-7-4)	O
PwrDn	SPS	Power Down detected (inherited from IEC 61850-7-4)	O
PwrSupAlm	SPS	Power supply alarm (inherited from IEC 61850-7-4)	O
RsStat	SPC	Reset device statistics (inherited from IEC 61850-7-4)	O

6.2 Wind power plant specific logical nodes

6.2.1 Wind turbine general information (WTUR)

The logical node comprises the data classes that represent the wind turbine general information as listed in Table 7. This logical node shall be mandatory, which means that at least all mandatory defined data classes shall be available for compliance with this part of the IEC 61400-25 series.

Table 7 – LN: Wind turbine general information (WTUR)

WTUR class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
AvlTmRs	TMS	Turbine availability time (vendor-specific)	O
OpTmRs	TMS	Operation time (vendor-specific)	O
StrCnt	CTE	Number of turbine starts (vendor-specific)	O
StopCnt	CTE	Number of turbine stops (vendor-specific)	O
TotWh	CTE	Total (net) active energy production	M
TotVArh	CTE	Total (net) reactive energy production	O
DmdWh	BCR	Active (real) energy demand (default demand direction: energy flow from a substation busbar away and towards the wind turbine)	O
DmdVArh	BCR	Reactive energy demand (default demand direction: energy flow from a substation busbar away and towards the wind turbine)	O
SupWh	BCR	Active (real) energy supply (default supply direction: energy flow from the wind turbine and towards a substation busbar)	O
SupVArh	BCR	Reactive energy supply (default supply direction: energy flow from the wind turbine and towards a substation busbar)	O
<i>Status information</i>			
TurSt	STV	Turbine status	M
<i>Analogue information</i>			
W	MV	Active power generation	M
VAr	MV	Reactive power generation	O
<i>Control information</i>			
SetTurOp	CMD	Wind turbine operation command	M
VArOvW	CMD	Windturbine reactive priority over active command	O
VArRefPri	CMD	Windturbine reactive setpoint priority command	O
DmdW	SPV	Turbine active power generation setpoint	O
DmdVAr	SPV	Turbine reactive power generation setpoint	O
DmdPF	SPV	Turbine power factor setpoint	O

6.2.2 Wind turbine rotor information (WROT)

This logical node shall comprise the data classes that represent the wind turbine rotor information. This logical node is mandatory, and at least all mandatory defined data classes in Table 8 shall be available for compliance with the IEC 61400-25 series.

The data classes focus on a three bladed rotor and active electric/hydraulic pitch control. For active pitch control it is highly recommended to model the pitch angle of at least one rotor blade (reference).

In case of a divergent rotor topology (for example tip brakes, two bladed) or different mounted equipment (for example sensors for ice or lightning detection, blade position detection, UPS equipment), the user is free to assign relevant rotor information to additional data names.

Table 8 – LN: Wind turbine rotor information (WROT)

WROT class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
<i>Status information</i>			
RotSt	STV	Status of rotor	O
BIStBI1	STV	Status of blade 1 (reference)	O
BIStBI2	STV	Status of blade 2	O
BIStBI3	STV	Status of blade 3	O
PtCtlSt	STV	Status of pitch control	O
<i>Analogue information</i>			
RotSpd	MV	Value of rotor speed at rotor side	O
RotPos	MV	Angular rotor position	O
HubTmp	MV	Temperature in the rotor hub	O
PtHyPresBI1	MV	Pressure of hydraulic pitch system for blade 1 (reference)	O
PtHyPresBI2	MV	Pressure of hydraulic pitch system for blade 2	O
PtHyPresBI3	MV	Pressure of hydraulic pitch system for blade 3	O
PtAngSpBI1	MV	Pitch angle set points for blade 1 (reference)	O
PtAngSpBI2	MV	Pitch angle set points for blade 2	O
PtAngSpBI3	MV	Pitch angle set points for blade 3	O
PtAngValBI1	MV	Pitch angle for blade 1 (reference)	O
PtAngValBI2	MV	Pitch angle for blade 2	O
PtAngValBI3	MV	Pitch angle for blade 3	O
<i>Control information</i>			
BlkRot	CMD	Set rotor to blocked position	O
PtEmgChk	CMD	Check emergency pitch system	O

6.2.3 Wind turbine transmission information (WTRM)

This logical node shall comprise the data classes that represent wind turbine (mechanical) transmission information. The logical node is optional. Table 9 shows the data classes for a usual transmission topology, consisting of a slow speed shaft, multistage gearbox, a fast shaft and a (hydraulically driven) mechanical brake.

In case of a divergent transmission topology (for example direct drive, single stage gearbox) or different mounted equipment (for example sensors, electromechanical brake), the user is free to adapt or extend the data classes as shown in Table 9.

Table 9 – LN: Wind turbine transmission information (WTRM)

WTRM class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
<i>Status information</i>			
BrkOpMod	STV	Status of shaft brake	O
LuSt	STV	Status of gearbox lubrication system.	O
FtrSt	STV	Status of filtration system	O
CISt	STV	Status of transmission cooling system	O
HtSt	STV	Status of heating system	O
OilLevSt	STV	Status of oil level in gearbox sump	O
OfFltSt	STV	Status of offline filter	O
InlFltSt	STV	Status of inline filter	O
<i>Analogue information</i>			
TrmTmpShfBrg1	MV	Measured temperature of shaft bearing 1	O
TrmTmpShfBrg2	MV	Measured temperature of shaft bearing 2	O
TrmTmpGbxOil	MV	Measured temperature of gearbox oil	O
TrmTmpShfBrk	MV	Measured temperature of shaft brake (surface)	O
VibGbx1	MV	Measured gearbox vibration of gearbox 1	O
VibGbx2	MV	Measured gearbox vibration of gearbox 2	O
GsLev	MV	Grease level for lubrication of main shaft bearing	O
GbxOilLev	MV	Oil level in gearbox sump	O
GbxOilPres	MV	Gear oil pressure	O
BrkHyPres	MV	Hydraulic pressure for shaft brake	O
OfFlt	MV	Offline filter contamination	O
InlFlt	MV	Inline filter contamination	O

6.2.4 Wind turbine generator information (WGEN)

This logical node shall comprise the data classes that represent wind turbine generator information. This logical node shall be mandatory, which means that at least all mandatory defined data classes in Table 10 shall be available for compliance with the IEC 61400-25 series.

The data classes focus on the operation of a variable speed double fed induction generator or on a (dc-excited) synchronous generator.

If a different topology is applied (for example constant speed, two speed, multi-pole, permanent magnet rotor, multi-phase generator) or more sensors (temperature, current, air-gap distances) are used for monitoring purposes, the user is free to assign relevant generator information to additional data names.

In case two generators (low speed, high speed) are installed in a wind turbine, it is recommended to use two logical nodes: WGEN1, WGEN2.

Table 10 – LN: Wind turbine generator information (WGEN)

WGEN class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
OpTmRs	TMS	Generator operation time	O
<i>Status information</i>			
GnOpMod	STV	Operation mode of generator	O
CISst	STV	Status of generator cooling system	O
<i>Analogue information</i>			
Spd	MV	Generator speed	M
W	WYE	Generator active power	O
VAr	WYE	Generator reactive power	O
GnTmpSta	MV	Temperature measurements for generator stator	O
GnTmpRtr	MV	Temperature measurements for generator rotor	O
GnTmpInlet	MV	Temperature measurement for inlet air/water temperature at generator	O
StaPPV	DEL	Generator stator 3 phase phase-to-phase voltage	O
StaPhV	WYE	Generator stator 3 phase phase-to-ground voltage	O
StaA	WYE	Generator stator 3 phase current	O
RtrPPV	DEL	Generator rotor 3 phase phase-to-phase voltage	O
RtrPhV	WYE	Generator rotor 3 phase-to-ground voltage	O
RtrA	WYE	Generator rotor 3 phase current	O
RtrExtDC	MV	Generator rotor dc excitation	O
RtrExtAC	MV	Generator rotor ac excitation	O

6.2.5 Wind turbine converter information (WCNV)

This logical node shall comprise the data classes that represent the wind turbine converter information. This logical node shall be optional, but if used, the mandatory defined data classes in Table 11 shall be available for compliance with the IEC 61400-25 series.

The data names listed in Table 11 are focussed on a back-to-back converter (AC-DC-AC) for variable speed operation of a (rotor-fed) induction generator or a synchronous generator.

If other converting topologies are used (for example soft-starter for constant speed generator, d.c. rotor excitation) or more equipment mounted for monitoring (for example sensors for temperature, current, voltage), the user is free to add or modify extra data names.

In case of two (parallel) converters, it is recommended to use two logical nodes: WCNV1, WCNV2.

Table 11 – LN: Wind turbine converter information (WCNV)

WCNV class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
OpTmRs	TMS	Converter operation hours	O
<i>Status information</i>			
CnvOpMod	STV	Operation mode of converter	M
CISst	STV	Status of converter cooling system	O
<i>Analogue information</i>			
Hz	MV	Frequency value	O
Torq	MV	Torque value	O
GnPPV	DEL	Generator side 3 phase phase-to-phase voltage	O
GnPhV	WYE	Generator side 3 phase-to-ground voltage	O
GnA	WYE	Generator side 3 phase current	O
GnPF	WYE	Generator side 3 phase power factor	O
GriPPV	DEL	Grid side 3 phase phase-to-phase voltage	O
GriPhV	WYE	Grid side 3 phase-to-ground voltage	O
GriA	WYE	Grid side 3 phase current	O
GriPF	WYE	Grid side 3 phase power factor	O
CnvTmpGn	MV	Converter - Generator side temperature	O
CnvTmpDclink	MV	Temperature inside the converter	O
CnvTmpGri	MV	Converter - Grid side temperature	O
DclVol	MV	DC-link voltage inside converter	O
DclAmp	MV	DC-link current inside converter	O

6.2.6 Wind turbine transformer information (WTRF)

This logical node shall comprise the data classes that represent the wind turbine transformer information. This logical node shall be optional, but if used, the mandatory defined data classes in Table 12 shall be available for compliance with the IEC 61400-25 series.

Table 12 – LN: Wind turbine transformer information (WTRF)

WTRF class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
TrfOpTmRs	TMS	Transformer operation time (vendor specific)	O
<i>Status information</i>			
TrfCISt	STV	Status of transformer cooling system	O
OilLevSt	STV	Oil level information for oil filled transformers.	O
MTPresSt	STV	Gas pressure of main tank for oil filled transformers.	O
<i>Analogue information</i>			
TrfTurPPV	DEL	Transformer turbine side 3 phase phase-to-phase voltage	O
TrfTurPhV	WYE	Transformer turbine side 3 phase-to-ground voltage	O
TrfTurA	WYE	Transformer turbine side 3 phase current	O
TrfGriPPV	DEL	Transformer grid side 3 phase phase-to-phase voltage	O
TrfGriPhV	WYE	Transformer grid side 3 phase-to-ground voltage	O
TrfGriA	WYE	Transformer grid side 3 phase current	O
TrfTmpTrfTur	MV	Transformer temperature on turbine side	O
TrfTmpTrfGri	MV	Transformer temperature on grid side	O
<i>Control information</i>			
AtvGriSw	CMD	Activation command to main grid switch	O

6.2.7 Wind turbine nacelle information (WNAC)

This logical node shall comprise the data classes that represent information concerning the wind turbine nacelle. Table 13 shows the data classes for common equipment in or at the nacelle: vibration measurements and beacon equipment. This logical node is mandatory and at least the mandatory defined data classes in Table 13 shall be available for compliance with the IEC 61400-25 series.

Table 13 – LN: Wind turbine nacelle information (WNAC)

WNAC class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
BecTmRs	TMS	Operation hours of beacon	O
<i>Status information</i>			
BecBulbSt	STV	Status of beacon	O
WdHtSt	STV	Status of heater for wind sensor.	O
IceSt	STV	Status of ice detection	O
AneSt	STV	Status of primary anemometer /secondary anemometer.	O
<i>Analogue information</i>			
Dir	MV	Nacelle orientation	O
WdSpd	MV	Wind speed outside nacelle	O
WdDir	MV	Wind direction outside nacelle	O
ExTmp	MV	Temperature outside nacelle	M
IntlTmp	MV	Temperature inside nacelle	O
IntlHum	MV	Humidity inside nacelle	O
BecLumLev	MV	Value of luminosity level of beacon	O
Vis	MV	Visibility outside nacelle	O
Ice	MV	Thickness of ice	O
DispXdir	MV	Tower displacement (longitudinal direction)	O
DispYdir	MV	Tower displacement (lateral direction)	O
<i>Control information</i>			
SetBecMod	CMD	Set modus of beacon	O
SetBecLev	SPV	Set bulb light level of beacon	O
SetFlsh	SPV	Set value of flash duty cycle of beacon	O

6.2.8 Wind turbine yawing information (WYAW)

This logical node shall comprise the data classes that represent the wind turbine yawing information. This logical node shall be mandatory, which means that at least all mandatory defined data classes in Table 14 shall be available for compliance with the IEC 61400-25 series.

The listed data classes of Table 14 focus on hydraulically or electrically driven nacelle yawing and cable wind up detection.

If different equipment is installed (for example multiple drives or hydraulic cylinders, speed controllers), the user is free to assign relevant generator information to additional data names.

Table 14 – LN: Wind turbine yawing information (WYAW)

WYAW class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
CwTm	TMS	Clockwise yawing operation hours	O
CcwTm	TMS	Counter clockwise yawing operation hours	O
<i>Status information</i>			
YwSt	STV	Mode of yaw system	O
YwBrakeSt	STV	Mode of the yaw brake	O
<i>Analogue information</i>			
YwSpd	MV	Yawing speed	O
Tmp	MV	Yawing motor/gear temperature	O
YawAng	MV	Yaw bearing rotation angle relative to nominal true North	M
CabWup	MV	Cable windup	M
SysGsLev	MV	Grease level for lubrication of yaw system	O
BrkPres	MV	Yaw brake pressure	O
<i>Control information</i>			
AtvYw	CMD	Command to yaw	O

6.2.9 Wind turbine tower information (WTOW)

This logical node shall comprise the data classes that represent information concerning the wind turbine tower structure. Table 15 shows the data classes for common equipment related to the tower. This logical node shall be optional; but when used, at least the mandatory defined data classes shall be available for compliance with the IEC 61400-25 series.

Table 15 – LN: Wind turbine tower information (WTOW)

WTOW class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
<i>Status information</i>			
LiftSt	STV	Status of lift system	O
DehumSt	STV	Status of de-humidifier	O
HtexSt	STV	Status of heat-exchanger	O
<i>Analogue information</i>			
LiftPos	MV	Lift position	O
IntlHum	MV	Humidity inside tower	O

6.2.10 Wind power plant meteorological information (WMET)

This logical node shall comprise the data classes that represent meteorological information.

The data classes as shown in Table 16 focus on met station meteorological information.

If meteorological equipment has been installed at more than one altitude at a Met Station, this logical node can be extended by additional groups MetAlt2, MetAlt3, etc.

If additional or divergent measurement equipment (for example ice growth, rainfall, wave elevation, lightning) have been installed, this logical node can be extended by additional data names.

In case of different met stations, it is recommended to use more logical nodes: WMET1, WMET2 etc.

Table 16 – LN: Wind power plant meteorological information (WMET)

WMET class			
Attribute name	Attribute type	Explanation	M/O
		LN shall inherit all Mandatory Data from Wind Power Plant Common Logical Node Class (see 6.1.1)	M
Data			
<i>Common information</i>			
<i>Analogue information</i>			
MetAlt1Alt	MV	Meteorological altitude 1 - Sensor altitude	O
MetAlt1HorWdSpd	MV	Meteorological altitude 1 - Horizontal wind speed	O
MetAlt1VerWdSpd	MV	Meteorological altitude 1 - Vertical wind speed	O
MetAlt1HorWdDir	MV	Meteorological altitude 1 - Horizontal wind direction	O
MetAlt1VerWdDir	MV	Meteorological altitude 1 - Vertical wind direction	O
MetAlt1Tmp	MV	Meteorological altitude 1 - Temperature	O
MetAlt1Hum	MV	Meteorological altitude 1 - Humidity	O
MetAlt1Pres	MV	Meteorological altitude 1 - Pressure	O

6.2.11 Wind power plant alarm information (WALM)

This logical node shall comprise the data classes that represent alarm information of a wind power plant. This logical node shall be mandatory, which means that at least all mandatory defined data classes in Table 17 shall be available for compliance with the IEC 61400-25 series.

If discrimination between alarm groups, alarm levels, warnings, events is favourable, the logical node WALM can be differentiated into several alarm logical nodes: WALM1, WALM2, etc.

Only data of the type ASS can be used for a dedicated application of LN WALM.