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**Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung –
Teil 7-410: Wasserkraftwerke –
Kommunikation für Überwachung, Regelung und Steuerung
(IEC 57/1091/CDV:2010);
Englische Fassung FprEN 61850-7-410:2010**

Communication networks and systems for power utility automation –
Part 7-410: Hydroelectric power plants –
Communication for monitoring and control
(IEC 57/1091/CDV:2010);
English version FprEN 61850-7-410:2010

Réseaux et systèmes de communication pour l'automatisation des systèmes électriques –
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Communication pour contrôle et commande
(CEI 57/1091/CDV:2010);
Version anglaise FprEN 61850-7-410:2010

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2011-10-04 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise als Datei per E-Mail an dke@din.de in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/stellungnahme oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
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- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (Hausanschrift: Stresemannallee 15, 60596 Frankfurt am Main).

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 54 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Nationales Vorwort

Die englische Fassung des europäischen Dokuments FprEN 61850-7-410:2010 „Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung – Teil 7-410: Wasserkraftwerke – Kommunikation für Überwachung, Regelung und Steuerung“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 57/1091/CDV:2010 „Communication networks and systems for power utility automation – Part 7-410: Hydroelectric power plants – Communication for monitoring and control“ unverändert in den Entwurf FprEN 61850-7-410:2010 übernommen worden.

Das internationale Dokument wurde vom TC 57 „Power systems management and associated information exchange“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Für diesen Norm-Entwurf ist das nationale Arbeitsgremium K 952 „Netzleittechnik“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

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.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Benutzer des vorliegenden Norm-Entwurfs der englischen Sprache als Fachsprache bedienen, wird die englische Fassung der E DIN EN 61850-7-410 veröffentlicht. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Norm-Entwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Änderungen

Gegenüber DIN EN 61850-7-410:2008-04 wurden folgende Änderungen vorgenommen:

- a) Komplette fachliche Überarbeitung.

INTRODUCTION TO Edition 2

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6 The Logical Nodes in IEC 61850-7-410 Ed.1, that where not specific to hydropower plants,
7 have been transferred to Edition 2 of IEC 61850-7-4. Such Logical Nodes are removed from
8 this Edition 2 of IEC 61850-7-410.

9 The definitions of Logical Nodes in IEC 618590-7-410 Ed. 2 are updated to the format
10 introduced in IEC 61850-7-4 Ed.2.

11 Most of the modelling examples and background information that was included in IEC-61850-
12 7-410 Ed.1 are transferred to a technical report, TR 61850-7-510.

13 However Edition 2 of IEC 61850-7-410 includes additional general-purpose logical nodes, not
14 included in IEC 61850-7-4 (Ed.2), required in order to represent the complete control and
15 monitoring system of a hydropower plant.

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-410:

Hydroelectric power plants – Communication for monitoring and control

1 Scope

This document is part of the IEC 61850 series. The document specifies the additional common data classes, logical nodes and data objects required for the use of IEC 61850 in a hydropower plant.

Note: All Logical Nodes with names not starting with the letter “H” might be included in a future edition of IEC 61850-7-4. When that document is published, the Logical Nodes in IEC 61850-7-4 (Ed. n) will take precedence over Logical Nodes with the same name in this part 7-410.

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 61850-2, *Communication networks and systems in substations – Part 2: Glossary*

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

IEC 61850-6, *Communication networks and systems in substations – Part 6: Configuration description language for communication in electrical substations related to IEDs*

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

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

IEC 61850-7-3 Ed.2, *Communication networks and systems in substations – Part 7-3: Basic communication structure for substations and feeder equipment – Common data classes*

IEC 61850-7-4 Ed.2, *Communication networks and systems in substations – Part 7-4: Basic communication structure for substations and feeder equipment – Compatible logical node classes*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 61850-2 apply.

4 Abbreviated terms

The following terms are used to build concatenated Data Object Names in this document. For further abbreviations, see also IEC 61850-7-4. Note: Data Object Names in the Logical Nodes representing PSS filter functions does as closely as possible follow names in IEEE 421.5. These names are not included in the following list.

Table 1 – Abbreviated terms

Term	Description	Term	Description
Act	Action, active	Mn	Minimum
Alm	Alarm	Mnt	Maintenance
Amp	Ampere, current	Mst	Master, overriding function
Atr	Actuator	Mx	Maximum
Blk	Block (from operation)	Ndl	Needle (used in Pelton turbines)
Brg	Bearing	Ng	Negative
Brk	Brake	Nhd	Net head
BtB	Back-to-Back	Nrm	Normal
Chg	Change (- position)	Off	Device disengaged (= off)
Cam	Cam, e.g. rotating non-circular disk	Ofs	Offset
Cap	Capacity, capability	On	Device applied (= on)
Cbr	Calibration	Op	Trip order to circuit-breaker
Cls	Close, closed	Operate	Operate order to any device
Cm	Centimetres	Opn	Open, opened
Cmd	Command	Ov	Over
Cmpl	Completed, completion, complete	Pc	Percent
Cnd	Condenser, synchronous compensator	Pmp	Pump
Cnt	Counter	Pos	Position
Crl	Correlation	Prec	Precondition, initial status
Crp	Creeping, slow movement	Pres	Pressure
Crv	Curve	Ps	Positive
Cwb	Crowbar	Psk	Penstock
Dev	Deviation	Pss	PSS, power system stabiliser function
Deg	Degrees, for angle indication in °	Pwr	Power
Dfl	Deflector (used in Pelton turbines)	R	Raise
Dir	Direction	Rb	Runner blade
Dith	Dither	Ref	Reference
DI	Delay,	Rng	Range
Dn	Down, below, downstream, lowest	Rot	Rotation, rotor
Drtb	Draft tube	Rpt	Repeat, repetition
Dtc	Detection	Rs	Reset
Dvc	Device	Rtg	Rating, rated
Emg	Emergency	Rwy	Runaway, e.g. in runaway speed
Ena	Enable, allow operation	Sel	Select
Err	Error	Set	Setting
Ext	Excitation, external	Seq	Sequence
Fa	“Fire all” sequence (to thyristors)	Sft	Soft (as in soft start)
Fbc	Field breaker configuration	Shft	Shaft
Flm	Flame	SI	Select
Flsh	Flashing (e.g. field flashing)	Sld	Solidity
Flt	Fault	SM	Servo, servo-motor
Flw	Flow, flowing	Smk	Smoke
Fst	Fast	SNL	Speed-no-load, connected but not generating
Gdv	Guide vane	Spd	Speed, normally rotational speed
Gte	Gate, dam gate	Spir	Spiral
Hi	High, indicating high level	Spt	Process set-point
Hd	Head	Srv	Service
Hwt	Headwater, water level at intake	Sta	Station, overall function at plant level
Hdr	Hydrological, hydro, water	Stat	Status, position in sequence
Hys	Hysteresis	Stl	Still, not moving
Ind	Indication	Stnd	Stand, standing
Iner	Inertia	Stp	Step, stepwise
Incr	Increment	Str	Start, starting of process
Int	Integration	Stuck	Cannot move, device stuck
Ind	Indication	Syn	Synchronous, synchronism
Key	Key, physical control device	Tw	Tailwater, water level at outlet
L	Lower (action)	Tm(--)	Time, followed by unit (m, s, ms)
Ld	Load	Tmp	Temperature
Lev	Level	Tot	Total, summation

Term	Description	Term	Description
Lft	Lifting, lift	Trb	Turbine
Lim	Limit, limitation	Sld	Solidity
Lo	Lower (position)	Trg	Trigger
Loc	Local	Trs	Transient
Lkd	Locked	Typ	Type, reference to list of types
Lft	Lifting, lift	Unt	Unit, production unit
Lkg	Leakage	Up	Up, above, upstream, upper
Lub	Lubrication	V	Voltage
Man	Manual (- operation selected)	Val	Value, setting value
		Vlm	Volume

157

158 **5 Logical Node Classes**159 **5.1 Logical Node groups**

160 Logical Nodes are grouped together with nodes of similar or related functions having the
161 same first letter. Table 2 shows presently assigned letters, letters marked “reserved” may be
162 used in future extensions to the standard series. Names of Logical Nodes shall start with the
163 letter of the group to which the LN belongs. E.g. most of the Logical Nodes, defined in this
164 document, are specific for hydropower use and does thus have names that start with the letter
165 H.

166 **Table 2 – List of Logical Node groups**

167	A	Automatic control functions
168	C	Control functions
169	D	Functions specific to distributed energy resources (DER)
170	E	Reserved
171	F	Logical nodes representing functional blocks
172	G	Generic references
173	H	Functions specific to hydropower plants
174	I	Interface and archiving functions
175	J	Reserved
176	K	Kinetic energy, mechanical devices and equipment
177	L	Physical devices and common logical nodes
178	M	Metering and measurement
179	N	Reserved
180	O	Reserved
181	P	Electrical protections
182	R	Protection related functions
183	S	Supervision and monitoring
184	T	Sensors and transmitters (including instrument transformers)
185	U	Reserved
186	V	Reserved
187	W	Functions specific to wind power plants
188	X	Switchgear
189	Y	Power transformers
190	Z	Power system equipment

191

192 **5.2 Interpretation of Logical Node tables**

193 Note: The following text is an extract from IEC 61850-7-4, repeated here for quick reference. See also IEC 61850-
 194 7-4 item 5.2 for a more complete description.

195 The interpretation of the headings for the logical node tables is presented in Table 3.

196 **Table 3 – Interpretation of Logical Node tables**

Column heading	Description
Data Object Name	Name of the Data Object
Common Data Class	Common Data Class that defines the structure of the Data Object. See IEC 61850-7-3.
Explanation	Short explanation of the data and how it is used.
T	Transient Data – the status of data with this designation is momentary and must be logged or reported to provide evidence of their momentary state. Some T may be only valid on a modelling level. The TRANSIENT property of DATA only applies to BOOLEAN process data attributes (FC=ST) of that DATA. Transient DATA is identical to normal DATA, except that for the process state change from TRUE to FALSE no event may be generated for reporting and for logging.
M/O	This column defines whether data, data sets, control blocks or services are mandatory (M) or optional (O) for the instantiation of a specific Logical Node. NOTE The attributes for data that are instantiated may also be mandatory or optional based on the CDC (Attribute Type) definition in IEC 61850-7-3. Where the letter C is used for “conditional”, at least one of the items of data labelled with C shall be used from each category where C occurs.

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198 All Data Object Names are listed alphabetically in Clause 8. Despite some overlapping, the
 199 data in the Logical Nodes Classes are grouped for the convenience of the reader into some of
 200 the following categories.

201 *Common Logical Node Information*

202 is information independent of the dedicated function represented by the LN class. Mandatory
 203 data (M) are common to all LN classes; optional data (O) are valid for a reasonable subset of
 204 LN classes.

205 *Status Information*

206 is data which shows either the status of the process or of the function allocated to the LN
 207 class. This information is produced locally and cannot be changed remotely unless
 208 substitution is applicable. Data such as “start” or “trip” are listed in this category. Most of
 209 these data are mandatory. The data can only be read and not set from an external source.

210 *Settings*

211 are data which are needed for the function to operate. Since many settings are dependent on
 212 the implementation of the function, only a commonly agreed minimum is standardised. They
 213 may be changed remotely, but normally not very often. The setting can not always be read
 214 back; whether it is possible or not depends on the Data Class used for the setting.

215 *Measured values*

216 are analogue data measured from the process or calculated in the functions such as currents,
 217 voltages, power, etc. This information is produced locally and cannot be changed remotely
 218 unless substitution is applicable.

219 *Controls*

are data which are changed by commands such as switchgear state (ON/OFF), tap changer position or reset-able counters. They are typically changed remotely, and are changed during operation much more than Settings. Data Objects under Controls cannot be read back.

5.3 Summary of logical nodes to be used in hydropower plants

5.3.1 General

This document specifies the compatible Logical Node classes to be used in hydropower plants listed in the following tables, tables 4 to 12. For other Logical Node Classes that might be of use also in hydropower plants see IEC 61850-7-4.

5.3.2 Group A – Automatic functions

Table 4 – Logical nodes for automatic functions

LN Class	Description
AEXR	Excitation regulation. Overall LN for excitation control
AJCL	Joint control function, to balance total power from different sources

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5.3.3 Group F – Functional blocks

Table 5 – Logical nodes representing functional blocks

LN Class	Description
FHBT	Heart-beat. This LN represents the heart-beat function of a controlling device. I.e. the function used to ensure that a specific device or program in a device is running.
FSCH	Scheduler. This LN represents a task scheduler that will perform predefined tasks at given times.

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5.3.4 Group H – Hydropower specific logical nodes

Table 6 – Hydropower specific logical nodes

LN Class	Description
HBRG	Turbine – generator shaft bearing. This LN holds data pertaining to bearings, such as temperatures and lubrication oil flows.
HCOM	Combinator (3D-CAM or 2D-CAM), optimises the relation between net head, guide vanes and runner blades. It is used in power plants with Kaplan turbines with moveable runner blades. The combinatory function will also use the FCSD LN to hold the relation curves for different net heads.
HDAM	Hydropower dam. A logical node that is used to represent the physical aspects of the dam.
HDFL	Deflector control. This logical node represents the deflector control of a Pelton turbine
HDLS	Dam leakage supervision. Represents a device that will supervise and give alarm in case of dam leakage. The actual measurement can be based on water flow.
HEBR	Electrical brake. This logical node represents an electrical brake system of a turbine.
HGPI	Gate position indicator. A device that provides the position of a dam gate. The position is given either as an angular displacement in case of sector gates or as distance from fully closed position in case of straight gates. For aperture gates and valves where the position is given as percent of full opening, either the HVLV or the SPOS logical nodes are recommended.
HGOV	Governor control. A logical node that represents the overall control of a turbine governor and the various control modes.
HGTE	Dam gate. This LN is intended to hold information about the gate. It can also present a calculated water flow through the gate, in which case the FCSD LN must be include in the same logical device, to provide the relations. Note that in this LN the position set-point is listed under <i>Controls</i> instead of <i>Settings</i> . The normal way of control a gate is to send a position set-point.

HITG	Intake gate. This LN can be used to represent intake gates. The gates will almost never be placed in any other position than fully closed or fully open. However to cater for step-wise or other controls, the gate is normally provided with a number of position switches.
HJCL	Power plant joint control function. In plants with more than one gate or several turbines, this LN will represent the joint control function that is used to supervise the total water flow or to maintain a constant water level. The LN shall be instantiated to provide one instance for each gate and each turbine to be supervised.
HLKG	Leakage supervision. This LN can be used to measure any leakage in the plant, it is more generic than HDLS
HLVL	Water level indicator. The LN represents the water level sensing device. The output is a distance including an offset from a base level (commonly the distance above sea).
HMBR	Mechanical brake for the generator shaft. This is a LN for the brake control. The brake is used for stopping the unit during shut-down and to hold the shaft still, once the unit is stopped.
HNDL	Needle control. A specialised LN that represents the control of needles in Pelton turbines.
HNHD	Net head data. A LN that can be used to present the calculated net head data (difference between upper and lower water levels) in a hydropower plant.
HOTP	Dam overtopping protection. A protection function that will act by opening one or more gates in case of a risk for overflow. The protection will sometimes include its own water measurement device; hence an optional measured value for water level. If the protection shall trip a unit or not depends on the layout of the plant, if there is a risk of flooding if the dam overflows.
HRES	Water reservoir. A logical node that is used to represent the logical function of a reservoir. If the content is to be calculated, the FSCD LN shall be used to provide the relation between water level and content.
HSEQ	Start / stop sequencer. A simple LN that only presents what the sequencer is doing (inactive – starting – stopping) and in case it is active, what step it is presently working on.
HSPD	Speed monitoring. This LN is normally located in a stand-alone logical device, separated from but monitoring the turbine governor. It will also act as a placeholder for various speed limits and set-points used by the start sequencer and other control functions.
HTGV	Guide vanes (wicket gate). This logical node represents the physical device of guide vanes in a hydropower turbine.
HTRB	Runner blades. This logical node represents the physical device of runner blades in e.g. a Kaplan turbine where the runner blades can be controlled.
HTRK	Trash rack, used to prevent floating debris getting into the turbine.
HTUR	Turbine. This logical node holds extended rating plate data for a turbine in a hydropower plant.
HUNT	Hydropower production unit. This LN represents the physical device of the turbine and generator combination in a hydropower plant. It is intended as an extended rating plate that allows temporary settings of data. It also acts as a placeholder for the current operating conditions of the unit.
HVLV	Valve. This logical node represents a large valve, e.g. a valve in a penstock, butterfly or ball type valve.
HWCL	Water control function. This LN will represent one physical device that can modify the water flow through the plant, either a gate or a turbine. In case of a plant with a joint control function, the HJCL LN will provide the flow set-point to be used by HWCL.

236

237 **5.3.5 Group I – Interface and archiving**

238

Table 7 – Logical nodes for interface and archiving

LN Class	Description
IFIR	Generic fire detection and alarm function
IHND	Generic physical human – machine interface. E.g. a push-button or another physical device that can be used as input to a controller.

5.3.6 Group K – Mechanical and non-electrical primary equipment

Table 8 – Logical nodes for mechanical and non-electric primary equipment

LN Class	Description
KHTR	Heater. The LN represents a heater, cubicle heater or any other heater that can be controlled.

5.3.7 Group P – Protection functions

Note: Most of the logical nodes that represent protective functions are defined in the substation part of the document series.

Table 9 – Logical nodes for protections

LN Class	Description
PRTR	Rotor protection. Field short-circuit protection using the 6 th harmonic (300Hz).

5.3.8 Group R – Protection related functions

Table 10 – Logical nodes for protection related functions

LN Class	Description
RFBC	Field breaker configuration.
RPSS	PSS Control. Common information of a PSS function.
RPST	PSS 2A/B filter. Represents a filter according to IEEE 421.5-2005
RPSF	PSS 4B filter. Represents a filter according to IEEE 421.5-2005

5.3.9 Group S – Supervision and monitoring

Table 11 – Logical nodes for supervision and monitoring

LN Class	Description
SFLW	Media flow supervision. This logical node represents a generic media flow supervision system that can provide alarm and trip signals. In an application, the LN shall be instantiated with one instance per flow being measured.
SLEV	Media level supervision. This logical node represents a generic level supervision system that can provide alarm and trip signals. In an application, the LN shall be instantiated with one instance per surface being measured.
SPOS	Device position supervision. This logical node represents a generic position supervision system that can provide alarm and trip signals. In an application, the LN shall be instantiated with one device being measured.
SPRS	Media pressure supervision. This logical node represents a generic pressure supervision system that can provide alarm and trip signals. In an application, the LN shall be instantiated with one instance per pressure point being measured.

5.3.10 Group X – Switchgear

Table 12 – Logical nodes for switchgear

LN Class	Description
XFFL	Field flashing. A logical node to represent the switching control for start excitation (field flashing) of a generator.

257 5.4 Automatic control Logical Nodes LN group A

258 5.4.1 Modelling remarks

259 Logical nodes in this group are intended for automatic control functions of general use, i.e.
260 not for any specific area of technology.

261 Note: Logical Nodes specified in 5.4 are likely to be included in a later edition of IEC 61850-7-4. When published,
262 Logical Nodes specified IEC 61850-7-4 shall take precedence over Logical Nodes in 5.4.

263 5.4.2 LN: Excitation regulation

Name: AEXR

264 Logical Node AEXR shall be used to present information about different control modes of an
265 excitation regulating system. One Logical Node AEXR must be created for each available
266 control mode.

AEXR class				
Data Object Name	Common Data Class	Explanation	T	M/O
LNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19		
Data Objects				
LocKey	SPS	Local or remote key		O
LocSta	SPC	Remote control blocked		O
Loc	SPS	Local control behaviour		O
Status information				
Flt{inst}	SPS	Fault in the controller {inst}		M
Controls				
ModAct	SPC	If TRUE this mode is active		M

267

268 5.4.3 LN: Joint control

Name: AJCL

269 The joint control logical node is used to co-ordinate the power production of a power plant
270 with more than one production unit. The joint control function will normally try to optimise the
271 power production between units already in operation. In this control mode, the power plant
272 can be controlled as a single unit. The data attributes shall be instantiated to provide one
273 instance per generating unit to be included in the joint control. Compare also with the HJCL
274 logical node, which can be used to control water flow through a single object of a hydropower
275 plant. Instantiated parts shall be defined in the extended private parts.

AJCL class				
Data Object Name	Common Data Class	Explanation	T	M/O
LNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19		
Data Objects				
LocKey	SPS	Local or remote key		O
LocSta	SPC	Remote control blocked		O
Loc	SPS	Local control behaviour		O
Status information				
Unt{inst}	SPS	Generation unit contributing (true = contributing)		O
RSpt{inst}	SPS	Raise setpoint in IED for unit {inst}	T	O
LSpt{inst}	SPS	Lower setpoint in IED for unit {inst}	T	O
Settings				
Measured values				
PwrOut	MV	Contributing power output of the plant (included in the joint control)		O
PwrOutTot	MV	Total power output of the plant		O
Controls				
UntSpt{inst}	APC	Setpoint for unit {inst}		O
UntStr{inst}	SPC	Generation unit {inst} start		O
UntStop{inst}	SPC	Generation unit {inst} stop		
Blk	SPC	Block operation		O

276 Notes. Controlling active power depends on if the logical node HJCL is used also for active
277 power control. In that case only one of the attributes can be active. Use prefixes W for active
278 power and Var for reactive power control. E.g. W_AJCL and Var_AJCL.

5.5 Functional Logical Nodes LN Group F**5.5.1 Modelling remarks**

This group of logical nodes represents various types of control function blocks. Logical Node classes of this type do include some form of control algorithm. The LN's will normally be part of a logical device providing overall functionality within the system.

Note: Logical Nodes specified in 5.5 are likely to be included in a later edition of IEC 61850-7-4. When published, Logical Nodes specified IEC 61850-7-4 shall take precedence over Logical Nodes in 5.5.

5.5.2 LN: Functional Heart Beat**Name: FHBT**

Logical Node FHBT shall be used to represent a heartbeat. This logical node is used to validate that a task is still running. Could be used with e.g. FXOT on the receiving end as a watchdog, setVal is equal to zero.

FHBT class				
Data Object Name	Common Data Class	Explanation	T	M/O
LNNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19		
Data Objects				
Status information				
Bt	SPS	Heartbeat		M
Settings				
BtDIOOn	ASG	Delay on		O
BtDIOff	ASG	Delay Off		O
Controls				

5.5.3 LN: Scheduling Tasks**Name: FSCH**

Logical Node FSCH shall be used to represent a task scheduler. The task scheduler is used to replace the operator when their repetitive tasks or tasks on set dates in a calendar.

FSCH class				
Data Object Name	Common Data Class	Explanation	T	M/O
LNNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19		
Data Objects				
Loc	SPS	Local control behaviour		O
Status information				
Task{inst}On	SPS	Task {inst} ON		M
Settings				
Datestr{inst}	TSG	Start Date for task {inst}		M
Controls				
Auto	SPC	Automatic or manual control		M

5.6 Hydropower specific Logical Nodes**LN group H****5.6.1 Modelling remarks**

This group of Logical Nodes covers functions that are specific for hydropower plants. Some may also be used for utility water supply systems or other types of larger reservoirs.

302 **5.6.2 LN: Turbine - generator shaft bearing****Name: HBRG**

303 Logical Node HBRG shall be used to represent the physical device bearing. It can be used to
 304 represent both thrust and guide bearings. One instance shall be used per bearing.

HBRG class																				
Data Object Name	Common Data Class	Explanation	T	M/O																
LNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19																		
Data Objects																				
OpTmh	INS	Operation time		O																
Status information																				
BrgTyp	ENS	Type of bearing <table border="1"><thead><tr><th>Value</th><th>Bearing type</th></tr></thead><tbody><tr><td>1</td><td>Generator thrust</td></tr><tr><td>2</td><td>Generator guide</td></tr><tr><td>3</td><td>Turbine thrust</td></tr><tr><td>4</td><td>Turbine guide</td></tr><tr><td>5</td><td>Combined guide and thrust</td></tr><tr><td>6</td><td>Gear-box</td></tr><tr><td>7</td><td>Clutch</td></tr></tbody></table>	Value	Bearing type	1	Generator thrust	2	Generator guide	3	Turbine thrust	4	Turbine guide	5	Combined guide and thrust	6	Gear-box	7	Clutch		M
Value	Bearing type																			
1	Generator thrust																			
2	Generator guide																			
3	Turbine thrust																			
4	Turbine guide																			
5	Combined guide and thrust																			
6	Gear-box																			
7	Clutch																			
TmpAlm	SPS	Bearing temperature alarm		O																
OilTmpHi	SPS	Lubrication oil temperature alarm		O																

305

306

307 **5.6.3 LN: Combinator****Name: HCOM**

308 Logical Node HCOM shall be used to represent the function that optimises the relation
 309 between net head, guide vane and runner blade positions in order to achieve best possible
 310 efficiency. It is normally a part of the governor logical device and the functionality is based on
 311 one or more 2-D curves. If more than one curve is defined, one instance shall be used per
 312 curve.

HCOM class				
Data Object Name	Common Data Class	Explanation	T	M/O
LNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19		
Data Objects				
Loc	SPS	Local control behaviour		O
Status information				
CrIAIm	SPS	Correlation deviation alarm		O
RbPos	APC	Runner blade position setting		M
Settings				
CrvSet	CSG	Definition of three-dimensional curve		O
Controls				
Auto	SPC	Automatic or manual control		M
Blk	SPC	Block the function from operation		O

313

314 **5.6.4 LN: Hydropower dam****Name: HDAM**

315 Logical Node HDAM shall be used to represent the dam of a hydropower plant. It is basically
 316 used to provide a reference tag for the dam holding basic design information. In case the
 317 functional aspect of the dam shall be represented, the Logical Node HRES shall be used, see
 318 7.3.16.

HDAM class								
Data Object Name	Common Data Class	Explanation	T	M/O				
LNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19)						
Data Objects								
Status information								
DamTyp	ENS	Type of dam (construction)		M				
		<table><tr><th>Value</th><th>Dam Type</th></tr><tr><td></td><td></td></tr></table>	Value	Dam Type				
Value	Dam Type							

			1	Concrete structure		
			2	Stone core		
			3	Earth core		
			4	Mixed or special design		
			5	Fused dam		

319

320 5.6.5 LN: Deflector control

Name: HDFL

321 Logical node HDFL shall be used to represent the deflector control of a Pelton turbine.

HDFL class				
Data Object Name	Common Data Class	Explanation	T	M/O
LNNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data Objects				
Common Logical Node Information				
LocKey	SPS	Local or remote key		O
LocSta	SPC	Remote control blocked		O
OpCnt	INS	Operation counter		O
Loc	SPS	Local operation selected		M
Status information				
ClsPos	SPS	Closed end position reached (deflector cannot move further)		C ¹
OpnPos	SPS	Open end position reached (deflector cannot move further)		C ¹
Mvm	SPS	Deflector is moving		O
Stuck	SPS	Deflector is blocked (cannot move from present position)		O
DflMan	SPS	Manual operation of deflector is active		O
Settings				
OpnLim	ASG	Opening limit of deflector position (temporary restriction)		O
ClsLim	ASG	Closing limit of deflector position (temporary restriction)		O
Incr	ASG	Increment of position change for open / close commands		O
Measured values				
PosPc	MV	Deflector position given as 0 – 100 %		C ²
PosDeg	MV	Deflector position given as 0 – 90 °		C ²
Flw	MV	Calculated liquid flow through the deflector [m ³ / s]		O
Controls				
PosSpt	APC	Deflector position set-point		O
Opn	SPC	Deflector to full open position		O
Cls	SPC	Deflector to full closed position		O
PosChg	INC	Change deflector position (stop, raise, lower)		C ²
PosChgIncr	INC	Incremental change of position		C ²
BlkOpn	SPC	Block opening of the deflector		O
BlkCls	SPC	Block closing of the deflector		O

322 Note: For data attributes with conditions C¹, one or both may be used, however the use of at
 323 least one is mandatory. Data attributes with conditions C² are optional, but if used, only one
 324 can be selected.

325 5.6.6 LN: Dam leakage supervision

Name: HDLS

326 Logical Node HDLS shall be used to represent a leakage supervision system for a dam.

HDLS class				
Data Object Name	Common Data Class	Explanation	T	M/O
LNNName		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2 clause 19		
Data Objects				
OpCnt	INS	Operation counter		O
Status information				
LkgAlm	SPS	Leakage alarm level reached		M
Settings				
LkgAlmVal	ASG	Alarm level setpoint for leakage		M
Measured values				
Flw	MV	Water flow at point of measurement [m ³ /s]		O
Controls				
Blk	SPC	Block the function from operation		O

327