Application Descriptions

7

Common Functional Blocks

1

System Clock

1

Summary

This document specifies the mechanism to synchronise local clocks in the system by one single master clock.

The Functional Block ‘System Clock’ can be configured as:

- clock master that provides system clock information to the system
- clock slave that receives clock information from the master and synchronises its local clock
- autonomous clock

This Functional Block is common for different application domains.

Version 01.04.03 is a KNX Approved Standard.

This document is part of the KNX Specifications v2.1.

Document updates

Version	Date	Modifications
0.8	01.11.2001	resolution of comments by TFI; Release for Final Voting
1.0	2002.03.25	Preparation of the Approved Standard.
1.1	2007.03.19	Editorial update - Interpretation of value 0 for field DayOfWeek in DPT_DateTime changed from “any day” to “no day”. - Specification of DPT_SCLOMode (20.001) removed: is meanwhile integrated in Chapter 3/7/2 “Datapoint Types”.
1.2	2008.09.08	**1. AN106 "Phasing out TP0"** integrated. **2. AN107 "Phasing out LT-R"** integrated. **3. AN108 "Phasing out LT-S"** integrated. **4. AN109 "Phasing out PL132"** integrated. **5. AN110 "Phasing out A-Mode"** integrated.
1.2	2009.04.20	Editorial update in preparation of inclusion in KNX Specifications v2.0.
1.3	2010.11.23	Definition of RelToGMT and GMTimeOffsetRefClock corrected
1.3.00	2011.02.22	Publication of the Approved Standard.
01.04.01	2013.09.04	**AN150 “FB Profiles for existing FBs”** integrated.
01.04.02	2013.10.29	Editorial updates for the publication of KNX Specifications 2.1.
01.04.03	2013.11.29	Editorial updates.

References

[01] Chapter 6/30/1 “Runtime Profiles”

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Contents

1 Functional Block ‘System Clock’ (SCLO)

1.1 Aims and objectives

One device in the system may be assigned to provide accurate system time & date information and synchronise the local clocks of other devices in the system.

The system clock information is generated and distributed by the Functional Block ‘System Clock’ (SCLO) that is configured as master clock.

On the other hand SCLO Functional Block may be configured as slave clock. In this case system clock information from the master clock is received and the local clock of the SCLO is synchronised. It is important to note that also the slave clocks are real clocks: they shall contain an internal clock to keep the time (using some oscillator, crystal, mains signal …)!

System clock information from a master clock may also be input to other Functional Blocks.

There must be a possibility to run the clock in the SCLO autonomously i.e. no system clock information is sent and reception of system clock information is disabled. In this case the SCLO Functional Block is configured as autonomous clock.

SCLO mode may be activated automatically or by configuration. Normally the device containing a SCLO with the most accurate clock will be configured as master. Whereas SCLOs in other devices are configured as slaves or autonomous clocks.

The “System Clock” application provides mechanisms to enable plug & play operation of master and slave clocks.

The “System Clock” application provides mechanisms to detect / avoid the presence of more than one master clock in the system.

System Clock functionality is not restricted to one application domain. Therefore the Functional Block SCLO is common for multiple applications.

As for every Functional Block, the SCLO may be part of a complex device (e.g. an apartment controller) or may be located in an “intelligent” clock device connected to the bus.

1.2 Functional specification

1.2.1 Common Clock functionality

The main functionality of SCLO can be configured by the parameter SCLOMode as a:

- master clock,
- slave clock or
- autonomous clock

Depending on SCLOMode parameter setting, DPs in the SCLO become mandatory or optional and alternative flowcharts are activated in the device.

The parameter SCLOMode is always mandatory. It is allowed to have this parameter only as ‘read only’. It can be set at factory and is not changeable because SCLO may have a fixed functionality (e.g. a DCF77 Radio Clock will be always a master clock)

The Functional Block SCLO has to maintain its own-standing local clock using e.g. crystal oscillator, DCF77, videotext etc. which may be set or synchronised from outside. Generation of the local clock information in the SCLO is device/company specific and not part of this specification.

Not all types of SCLO may provide full calendar information. Therefore the local clock of the SCLO may be a:

- Year clock (supporting full calendar functionality, daylight saving time, leap year etc.)
- Weekly clock (supporting only weekday and time)
- Daily clock (supporting only time)

Other flavours of clock information are not allowed!

Faults in the local clock of the SCLO data must be detected and the corresponding 'Fault' attribute must be set in the clock information (e.g. corrupted time after installation or a long power down).

1.2.2 Master Clock functionality

The Functional Block SCLO configured as master clock shall derive system clock information from its local clock and provide the signal 'SystemClock' periodically for the system (heartbeat).

The heartbeat period is fixed for "Automatic" or "Easy" systems to 10 minutes. This is a compromise between busload and maximum waiting time for the installer to get a 'SystemClock' update after installation of e.g. a new device[*)]. For engineered systems the heartbeat period can be set by an optional parameter 'SystemClockHeartbeat' with the default value of 10 minutes.

[*)] *Optional slave feature: read out of the 'SystemClock' Output is also possible. This is, a newly installed slave may ask for 'SystemClock' information in order to get immediate master clock information.*

Depending on the capabilities of SCLO, Year clock or Weekly clock or Daily clock information may be provided. In order to have only one type of 'SystemClock' message, empty data fields shall be marked as 'void' (flexible, scalable Datapoint type DPT_DateTime).

Backwards compatibility with existing slave clock devices

Existing products do not support the new DPT_DateTime. In order to guarantee Interworking with existing products, the SCLO master clock shall provide 'Time' and optionally 'Date' Output information (2 DPs) in addition. Details see clause 1.4.1.

Optional System Clock Master Setting feature

The local clock of the master SCLO may be set/adjusted locally or via bus. The SCLO has a corresponding data Input 'SystemClockSetting' that is directly written to the local clock of the SCLO. With an optional parameter 'EnableSystemClockSetting' the SCLO can be configured during runtime, that it will not react on reception of the 'SystemClockSetting' Input.

After setting of the local clock of SCLO, the new 'SystemClock' / 'Date' / 'Time' information is either immediately provided for the system (COV) or sent after expiration of the normal heartbeat period (manufacturer specific behaviour)

1.2.3 Slave Clock functionality

The local clock of slave SCLO shall be synchronised by reception of a 'SystemClock' information from the master SCLO. Generation of the local clock information in the slave SCLO is device/company specific and not part of this specification.

Backwards compatibility with existing master clock devices

Existing products do not support the new DPT_DateTime. In order to guarantee Interworking with existing products, the SCLO slave clock shall support 'Time' and optionally 'Date' Inputs (2 DPs) in addition. Details see clause 1.4.2.

Handling of 'SystemClock' input

Not all types of master or slave SCLO may support full calendar information. This leads to the situation that the 'SystemClock' message from master SCLO may contain more or less information than required for synchronisation of the local clock in the slave SCLO. Usually the system will be configured in a way that 'SystemClock' information from a master SCLO will be "richer" or same as in slave SCLO.

Slave SCLO is "poorer": fields in the 'SystemClock' message not used by slave SCLO are ignored.

Slave SCLO is "richer": The slave SCLO will extract the valid fields in the 'SystemClock' message and update only part of its local clock information (e.g. hh:mm:ss only). Allowed combinations of fields and test criteria are defined in the DPT_DateTime specification.

If the Fault attribute in the 'SystemClock' message is set, the local clock of the slave SCLO is unchanged.

If SCLO is configured as a slave, presence of an external master SCLO is monitored by checking the periodical 'SystemClock' update.

Timeout Condition: during normal operation, the 'SystemClock' message is provided periodically. Therefore valid 'SystemClock' messages should be received within a timeout period
standard timeout = 2 x heartbeat + 1 min = 21 min

The timeout is fixed for "Automatic" or "Easy" systems to 21 minutes. For engineered systems the timeout can be set by an optional parameter 'SystemClockTimeout' with the default value of 21 minutes.

Error Handling: If Timeout Condition or Fault in 'SystemClock' occurs, the master SCLO is either removed or defective or bus communication is seriously disturbed or e.g. a Radio clock has no proper reception of the DCF77 signal.
⇒ use free-running local clock in SCLO
⇒ optional manufacturer specific error handling

In some applications it is necessary to know if the local clock in the slave SCLO was just synchronised by 'SystemClock' within ± N seconds (e.g. N < 30 s) or master clock information was changed due to user settings (e.g. clock dependent HVAC optimisation functions are temporarily disabled due to clock setting).
This detection of time "hops" is part of the slave SCLO and manufacturer specific.

1.2.4 Autonomous Clock functionality

The Functional Block SCLO configured as autonomous clock maintains its local clock but ignores 'SystemClock' or 'SystemClockSetting' signals. The local clock can be set locally or remotely via bus setting the 'LocalClock' property using individual addressing.

Autonomous SCLO shall not provide 'SystemClock' / 'Date' / 'Time' output signal.

1.3 Constraints

Only one master SCLO is allowed per system in order to avoid time "hops" on the slaves.

Optional 'Multiple Master Detection' Feature

Master SCLO is optionally able to receive 'SystemClock' input message from another device in order to detect multiple SCLO masters. If the source individual address in the received 'SystemClock' message is different from the own individual address, there is a SCLO master conflict in the system. This means that two or more master SCLO are present in the system.

This conflict can be resolved automatically:

- 1st criterion:
  if a master SCLO sends its output with CLQ [1)] = 0 and receives 'SystemClock' with CLQ = 1 from another device, it deactivates its own 'SystemClock' output. If a master SCLO sends its output with CLQ = 1 and receives 'SystemClock' with CLQ = 0 from another device, its own 'SystemClock' output remains active.
- 2nd criterion:
  if two (or more) master SCLO send and receive 'SystemClock' with the same value in CLQ bit, the SCLO with the higher Individual Address deactivates its own 'SystemClock' output.
- 'SystemClock' output of a deactivated SCLO remains deactivated as long as the external 'SystemClock' message is received (from the same device!). Reception is checked by timeout ('SystemClockTimeout'). Timeout Timer is retriggered with each reception of 'SystemClock' input.
- A master SCLO with deactivated 'SystemClock' output changes not its local date & time to the value received with 'SystemClock' input.
- If timeout condition occurs, the 'SystemClock' output is activated again.
- This mechanism leads to a racing situation after start-up.
- If an active master SCLO is changed to a slave or an autonomous SCLO, timeout condition will occur in the deactivated SCLO(s). Then, the remaining (deactivated) master SCLO will become the active master SCLO. If there are still more than one master SCLO, one of these remaining master SCLOs will become the only new active master SCLO after a racing situation (1st and then 2nd criterion have to be considered).
- In case of SCLO master conflict detection, additional company specific exception handling may be executed, e.g. generate an error indication etc.

This mechanism is only possible if:

- the received system clock message causes an update of 'system clock' data in the application.
- the 'source address' in the received system clock message (= individual address of the source device) is given upwards to the application.

If a multiple SCLO master conflict is detected in a plant and if not all of the involved SCLOs support automatic resolution of the conflict, resolution must be done manually, e.g. by use of an installation tool.

The possibility to set/adjust the local clock of the SCLO locally or via bus is optional and e.g. not necessary in DCF77 or videotext controlled clocks.

Besides slave SCLO also other Functional Blocks may receive 'SystemClock' information. These Functional Blocks have to maintain a local free-running clock because of the slow heartbeat period of the synchronisation message. 'SystemClock' information is not suitable to be displayed directly on an MMI etc.

1) CLQ: "Quality of Clock" information bit in Datapoint type "Date & Time"; 0 = clock without external synchronisation, 1 = clock with external synchronisation, e.g. a DCF77 or videotext controlled clock.

1.4 Functional Block diagram

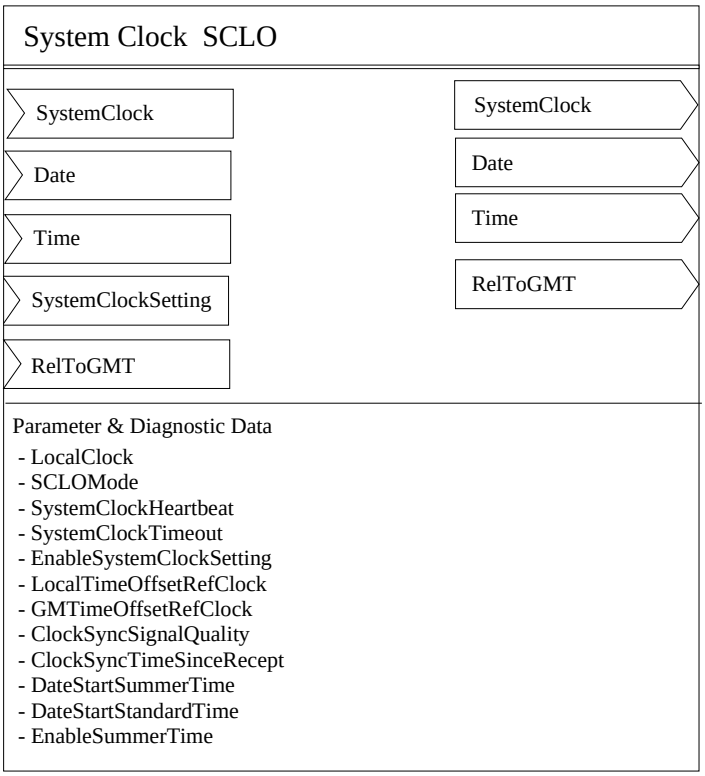

Figure 1 - SCLO FB diagram: superset of Datapoints for all SCLO modes

The SCLO FB diagram shows the superset of all possible inputs, outputs, parameters and diagnostic data. For each SCLO mode only a subset of these Datapoints is reasonable or allowed. This means that depending on parameter settings, DPs become mandatory or optional or are not allowed and alternative data interfaces are activated in the device. This behaviour is specified by the following clauses.

Datapoint overview:

Datapoint	Description	DPT_Name	DPT_ID
Outputs			
SystemClock	provided by master SCLO for time & date synchronisation of other clocks in the system	DPT_DateTime	19.001
Time	provided by master SCLO for time synchronisation of clocks in the system	DPT_Time	10.001
Date	provided by master SCLO for date synchronisation of clocks in the system	DPT_Date	11.001
RelToGMT	Relation between UTC *) / GMT (Greenwich Mean Time) and the SystemClock time. Range: -13 hours…+13 hours e.g. Germany RelToGMT=+2 hours (summer time) RelToGMT=+1 hour (winter time) e.g. Los Angeles RelToGMT = -8 hours The value may change twice a year, if summertime differs from standard time. RelToGMT may be useful for e.g. sunblind control applications *) in the context of KNX systems GMT can be considered equivalent to UTC (Universal Time Coordinated)	DPT_DeltaTimeMin	8.006
Inputs			
SystemClock	received SystemClock information from master SCLO	DPT_DateTime	19.001
Time	input for time synchronisation of clocks in the system	DPT_Time	10.001
Date	input for date synchronisation of clocks in the system	DPT_Date	11.001
SystemClockSetting	used for remote setting of the local clock in the master SCLO. The source of the signal may be “any” FB which supports SystemClockSetting, e.g. user interface, management station.	DPT_DateTime	19.001
RelToGMT	received RelToGMT information from the master SCLO	DPT_DeltaTimeMin	8.006
Parameters			
SCLOMode	System Clock Mode: autonomous / slave / master	DPT_SCLOMode	20.001
SystemClockHeartbeat	Heartbeat period [min] for master SCLO	DPT_TimePeriodMin	7.006
SystemClockTimeout	Receiver timeout [min] for slave SCLO	DPT_TimePeriodMin	7.006

EnableSystemClockSetting	enable/disable SystemClockSetting input in master SCLO	DPT_Enable	1.003
LocalTimeOffsetRefClock	Time zone Offset between Local Political Time to the reference clock (e.g. external clock sync signal like DCF77 signal)) (referencing to standard time, see below)	DPT_DeltaTimeMin	8.006
GMTimeOffsetRefClock	Time zone relation between GMT (Greenwich Mean Time) and the local clock/ system clock	DPT_DeltaTimeMin	8.006
DateStartSummerTime	first possible date for standard ⇒ summer time switching	DPT_DateTime	19.001
DateStartStandardTime	first possible date for summer ⇒ standard time switching	DPT_DateTime	19.001
EnableSummerTime	summer ↔ standard time switching enabled/disabled	DPT_Enable	1.003
Diagnostic Data			
LocalClock	local own standing clock	DPT_DateTime	19.001
ClockSyncSignQual	actual signal quality of external clock sync signal like DCF77 etc.	DPT_RelValue_Z	202.001
ClockSyncTimeSinceRecept	time since last proper reception of external clock sync signal like DCF77 etc.	DPT_TimePeriodMin_Z	203.006

1.4.1 Master Clock: data interface [2)]

Features and options	Basic FB	*Standard Mode* FB profile 1 = System Clock Master
// Inputs		
Input SystemClock	O	(GO)
Input SystemClockSetting	O	(GO)
Input Date	O	(GO)
Input Time	O	(GO)
Input RelToGMT	X	X
// Outputs		
Output SystemClock	O	(GO)
IF time information is available {		
Output Time	M	GO
}		
IF date information is available {		
Output Date	M	GO
}		
Output RelToGMT	O	(GO)

Table 1 - Master Clock: FB Flavours for Configuration Modes

Properties (of Interface Objects or memory mapped)

Parameter	**SCLOMode**	M
	SystemClockHeartbeat	O
	SystemClockTimeout	O
	EnableSystemClockSetting	O
	LocalTimeOffsetRefClock	O
	GMTimeOffsetRefClock	O
	DateStartSummerTime	O
	DateStartStandardTime	O
	EnableSummerTime	O
Diagnostic Data	**LocalClock**	O
	ClockSyncSignQual	O
	ClockSyncTimeSinceRecept	O

2) Please refer to [28] for the definition of the syntax and symbols used in this FB Profile definition.

1.4.2 Slave Clock: data interface [3)]

Features and options	Basic FB	*Standard Mode* FB profile 1 = System Clock Slave
// Inputs		
Input SystemClock	O	(GO)
Input SystemClockSetting	X	X
IF time information is supported {		
Input Time	M	GO
}		
IF date information is supported {		
Input Date	M	GO
}		
Input RelToGMT	O	(GO)
// Outputs		
Output SystemClock	X	X
Output Date	X	X
Output Time	X	X
Output RelToGMT	X	X

Table 2 - Slave Clock: FB Flavours for Configuration Modes

Properties (of Interface Objects or memory mapped)

Parameter	**SCLOMode**	M
	SystemClockHeartbeat	NA
	SystemClockTimeout	O
	EnableSystemClockSetting	NA
	LocalTimeOffsetRefClock	NA
	GMTimeOffsetRefClock	O
	DateStartSummerTime	O
	DateStartStandardTime	O
	EnableSummerTime	O
Diagnostic Data	**LocalClock**	O
	ClockSyncSignQual	NA
	ClockSyncTimeSinceRecept	NA

[3)] Please refer to [28] for the definition of the syntax and symbols used in this FB Profile definition.

1.4.3 Autonomous Clock: runtime Interworking data interface

Runtime Interworking :

None of the ‘SystemClock’, ‘Time’, ‘Date’ inputs/outputs or ‘SystemClockSetting’ input are available in any configuration mode.

Table 3 - Autonomous Clock: FB Flavours for Configuration Modes

Properties (of Interface Objects or memory mapped)		
Parameter	**SCLOMode**	M
	SystemClockHeartbeat	NA
	SystemClockTimeout	NA
	EnableSystemClockSetting	NA
	LocalTimeOffsetRefClock	O
	GMTimeOffsetRefClock	O
	DateStartSummerTime	O
	DateStartStandardTime	O
	EnableSummerTime	O
Diagnostic Data	**LocalClock**	O
	ClockSyncSignQual	O
	ClockSyncTimeSinceRecept	O

1.5 Datapoints

1.5.1 Output SystemClock

Standard mode

DP Name:	SystemClock (Output)	Abbr.:		Mandatory	☐ [1]
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The SystemClock signal is provided to synchronise the clocks of other Functional Blocks like slave SCLO in the system. At time of transmission, it contains the local clock of the master SCLO.

Datapoint Type

DPT_Name:	DPT_DateTime		
DPT Format:	8 octet structured format	DPT_ID:	19.001

Field	Description	Supp.	Range	Unit	Default
Year		O	0 to 255	Year	[2]
Month		O	1 to 12	Month	[2]
Day of Month		O	1 to 31	day of month	[2]
Day of Week	0 = no day; 1 = Mon, … , 7 = Sun	O	0 to 7	day of week	[2]
hours		M	0 to 23	hour of day	[2]
minutes		M	0 to 59	minutes	[2]
seconds		M	0 to 59	seconds	[2]
Attributes [3]		[3]			[2], [3]
- F	fault / normal (no fault)	O	{0,1}	Boolean	normal
- WD	Bank day / Working day	O	{0,1}	Boolean	Bank Day (0)
- NWD	WD field valid / not valid	M	{0,1}	Boolean	no WD
- NY	Year field valid / not valid	M	{0,1}	Boolean	no year
- ND	Month and Day of Month fields valid / not valid	M	{0,1}	Boolean	no date
- NDoW	Day of week field valid / not valid	M	{0,1}	Boolean	no weekday
- NT	Hour of day, Minutes and Seconds fields valid / not valid	M	{0,1}	Boolean	no time
- SUTI	Summertime	O	{0,1}	Boolean	stand. Time
- CLQ	Clock quality bit (without/with external synchronisation)	O	{0,1}	Boolean	without [6]

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		MinRepTime:	
		Cyclic	☒	Period:	10 min. [4]		
Request	☐						

continued on next page

DP Name:	SystemClock (Output)	Abbr.:		Continued
Communication Type				
♦ Group Object Datapoint			Mandatory:	☒
Default Group Address:	F3FEh			
♦ Interface Object Property Datapoint			Mandatory:	☐
• Server	Object_type:	1001d (SCLO)	PID:	51d
	Start_index:	1	Nr_of_elements:	1
Dynamics				
Power down:	Save:	☐		
Power up:	Value:	No initialisation: ☐	Default value:	☐
		Saved value: ☐	Actual value (not for input):	☒
	Transmit on bus (only for output):	☒ 5)	Read from bus (only for input):	☐
Exception Handling				
Multiple Master SCLO: exception handling see clause 1.3.				
Special Features				

1) optional in SCLO master (mandatory on the S-Mode Interface of LTE-Devices including SCLO master); not present in slave or autonomous SCLO, see clause 1.4.1 - 1.4.3

2) master SCLO sends ‘void’ as long as there was no setting of the system clock (local clock of SCLO master device) by external synchronisation, with signal SystemClockSetting from the bus or by local setting of the local clock, actual value of local clock after setting of the system clock;
value ‘void’: date and time info shall be set to ‘0’ for supported fields;
fields not supported are always set to ‘0’.

3) Attributes: ‘valid’ bits must be supported; default values for ‘valid bits’ see note 2).
Allowed flavours of time (depending on implemented clock):
- daily clock (supporting only time: NY = not valid, ND = not valid, NDoW = not valid)
- weekly clock (supporting only weekday and time; NY = not valid, ND = not valid)
- Year clock (supporting full calendar functionality, all fields valid)

4) standard heartbeat 10 min; can be changed with (optional) parameter
IMPORTANT: Periodical heartbeat transmission shall always be triggered at second ss=25..30 to avoid time „hops“. ’SystemClock’ transmission is maintained if clock information is corrupted (Fault attribute set)

5) Power-Up: start heartbeat transmission at second 25..30

6) after a power-up, a master SCLO with an external synchronisation (e.g. DCF77 radio clock signal) sends CLQ = 0 (without synchronisation) until the first reception of the external synchronisation signal.

LTE-mode:

Not available as LTE-process Datapoint.

1.5.2 Output Time

Standard mode

DP Name:	Time (Output)	Abbr.:		Mandatory	☒ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The Time signal is provided to synchronise the clocks of other Functional Blocks like slave SCLO in the system. It contains time of day information of the local clock of the master SCLO at time of transmission.

Datapoint Type

DPT_Name:	DPT_TimeOfDay				
DPT Format:	3 octet structured format		DPT_ID:	10.001	
Field	Description	Supp.	Range	Unit	Default
Day of Week	0 = no day; 1 = Mon, … , 7 = Sun	O	0 to 7	day of week	2)
hours		M	0 to 23	hour of day	2)
minutes		M	0 to 59	minutes	2)
seconds		M	0 to 59	seconds	2)

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		MinRepTime:	
		Cyclic	☒	Period:	10 min. 3)		
Request	☐						

Communication Type

♦ Group Object Datapoint				Mandatory:	☒
Default Group Address:	---				

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☒
	Transmit on bus (only for output):	☒ 4)		Read from bus (only for input):	☐

Exception Handling

Special Features

1) mandatory in SCLO master; not present in slave or autonomous SCLO, see clause 1.4.1 - 1.4.3

2) master SCLO shall send '0' as long as there was no setting of the system clock (local clock of SCLO master device) by external synchronisation, with signal SystemClockSetting from the bus or by local setting of the local clock, actual value of local clock after setting of the system clock;

3) standard heartbeat 10 min; can be changed with (optional) parameter
IMPORTANT: Periodical heartbeat transmission shall always be triggered at second ss=25..30 to avoid time „hops". 'SystemClock' transmission is maintained if clock information is corrupted (Fault attribute set)

4) Power-Up: start heartbeat transmission at second 25 … 30

LTE-mode:

Not available as LTE- process Datapoint.

1.5.3 Output Date

Standard mode

DP Name:	Date (Output)	Abbr.:		Mandatory	☐ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The Date signal is provided to synchronise the clocks of other Functional Blocks like slave. It contains date information of the local clock of the master SCLO at time of transmission.

Datapoint Type

DPT_Name:	DPT_Date		
DPT Format:	3 octet structured format	DPT_ID:	11.001

Field	Description	Supp.	Range	Unit	Default
Day of Month		M	1 to 31	day of month	2)
Month		M	1 to 12	month	2)
Year	Encoding: see specification of DPT_Date	M	0 to 99	year	2)

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		MinRepTime:	
		Cyclic	☒	Period:	10 min. 3)		
Request	☐						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☒
	Transmit on bus (only for output):	☒ 4)		Read from bus (only for input):	☐

Exception Handling

Special Features

1) optional in SCLO master (mandatory on the S-Mode Interface of LTE-Devices including SCLO master); not present in slave or autonomous SCLO, see clause 1.4.1 - 1.4.3

2) master SCLO shall send ‘0’ as long as there was no setting of the system clock (local clock of SCLO master device) by external synchronisation, with signal SystemClockSetting from the bus or by local setting of the local clock, actual value of local clock after setting of the system clock;

3) standard heartbeat 10 min; can be changed with (optional) parameter
IMPORTANT: Periodical heartbeat transmission shall always be triggered at second ss=25..30 to avoid time „hops“. ’SystemClock’ transmission is maintained if clock information is corrupted (Fault attribute set)

4) Power-Up: start heartbeat transmission at second 25 … 3

LTE-mode:

Not available as LTE-process Datapoint.

1.5.4 Output RelToGMT

Standard mode

DP Name:	RelToGMT (Output)	Abbr.:		Mandatory	☐ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The signal indicates the number of minutes (-780 to +780) offset between local standard time contained in SystemClock and Universal Time Coordinated. The time zones to the west of the zero degree meridian shall be negative values, and those to the east shall be positive values. The value of RelToGMT may change twice a year, if summertime is different from standard time. The signal is e.g. used for sunblind control applications

Datapoint Type

DPT_Name:	DPT_DeltaTimeMin				
DPT Format:	V_{16}		DPT_ID:	8.006	
Field	Description	Supp.	Range	Unit	Default
Minutes	Delta Time in minutes, max. ± 13 h	M	[-780 to 780]	1 min.	cs

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☒	Δ-Value:	1 min.	MinRepTime:	
		Cyclic	☐	Period:			
Request	☒						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		
♦ Interface Object Property Datapoint		Mandatory:	☐

• Server	Object_type:	1001d (SCLO)	PID:	53d
	Start_index:	1	Nr_of_elements:	1

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☒
	Transmit on bus (only for output):		☒	Read from bus (only for input):	☐

Exception Handling

Special Features

1) optional in master SCLO, not present in slave or autonomous SCLO, see clause 1.4.1 – 1.4.3

LTE-mode:

FB: **SCLO**	**LTE Server Output Name:** **RelToGMT**	Mandatory ☐ Optional [1] ☒

Description:

The signal indicates the number of minutes (-780 to +780) offset between local standard time contained in SystemClock and Universal Time Coordinated. The time zones to the west of the zero degree meridian shall be negative values, and those to the east shall be positive values. The value of RelToGMT may change twice a year, if summertime is different from standard time. The signal is e.g. used for sunblind control applications

DPT:	Name	DPT_DeltaTimeMin	DPT ID	8.006	Datatype format	V_{16}

Field	Description	Sup.	Range	Unit	COV	Default
Minutes	Delta Time in minutes, max. ± 13 h	M	[-780 to 780]	min	1 min	--

Communication:

Binding Group:

Class	Type	Default
Geographical ☐		
Application Specific ☐		
Unassigned ☐	Broadcast ☒ Configurable ☐	

DP Address:	IO Type(ID): 1001 (SCLO)	Property ID: 53
LTE-Services (event):	COV ☒ MinRepTime --- sec	Heartbeat: --- min
InfoReport ☒	Output per default communicating ☐	Binding Group Wildcard allowed ☐
	Tx Prio: High ☐ Normal ☒ Low ☐	
(LTE Read-Response polling of the output shall always be supported)	Transm after Powerup: Stored Value ☐ Act Value ☒ Default Value ☐	
Property-Service (individual access):	Read only ☒ Read/Write ☐	

Exception Handling: Save at Powerdown ☐

Special Features:

[1] optional in master SCLO, not present in slave or autonomous SCLO, see clause 1.4.1 - 1.4.3

1.5.5 Input SystemClock

Standard mode

DP Name:	SystemClock (Input)	Abbr.:		Mandatory	☐ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

This input signal is used by SCLO slave to synchronise its local clock: i.e. SystemClock information is copied to LocalClock.
This input signal can be used by the master SCLO to detect multiple instances of master SCLO in the system.

Datapoint Type

DPT_Name:	DPT_DateTime		
DPT Format:	8 octet structured format	DPT_ID:	19.001

Field	Description	Supp.	Range	Unit	Default
Year		O	0 to 255	Year	2)
Month		O	1 to 12	Month	2)
Day of Month		O	1 to 31	day of month	2)
Day of Week	0 = no day; 1 = Mon, … , 7 = Sun	O	0 to 7	day of week	2)
hours		M	0 to 23	hour of day	2)
minutes		M	0 to 59	minutes	2)
seconds		M	0 to 59	seconds	2)
Attributes 3)		3)			3)
- F	fault / normal (no fault)	O	{0,1}	Boolean	normal
- WD	Bank day / Working day	O	{0,1}	Boolean	Bank Day (0)
- NWD	WD field valid / not valid	M	{0,1}	Boolean	no WD
- NY	Year field valid / not valid	M	{0,1}	Boolean	no year
- ND	Month and Day of Month fields valid / not valid	M	{0,1}	Boolean	no date
- NDoW	Day of week field valid / not valid	M	{0,1}	Boolean	no weekday
- NT	Hour of day, Minutes and Seconds fields valid / not valid	M	{0,1}	Boolean	no time
- SUTI	Summertime	O	{0,1}	Boolean	stand. time
- CLQ	Clock quality bit (without/with external synchronisation)	O	{0,1}	Boolean	without

Access Type

♦ Output

N → this	☐	1 → this	☒		
Spontaneous	☒	Cyclically:	☒	Time-out:	21 min. 4)
Request	☐	Polling:	☐	Period:	

DP Name:	SystemClock (Input)	Abbr.:		Continued

Communication Type

♦ Group Object Datapoint				Mandatory:	☒
Default Group Address:	F3FEh				
♦ Interface Object Property Datapoint				Mandatory:	☐
• Client	Object_type:	1001d (SCLO)	PID:	51d	
	Start_index:	1	Nr_of_elements:	1	

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☒ 2)
		Saved value:	☐	Actual value (not for input):	☒ 2)
	Transmit on bus (only for output):	☐		Read from bus (only for input):	☐

Exception Handling

Multiple Master SCLO: exception handling see clause 1.3.

DP Name:	SystemClock (Input)	Abbr.:		Mandatory	☐ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Special Features

1) mandatory on the S-Mode Interface of LTE-Devices including SCLO slave; optional in master SCLO, not present in autonomous SCLO, see clause 1.4.1 - 1.4.3
2) initialisation value is 'void' until first reception of 'SystemClock'; date & time fields can be company specific, usually set to '0', attributes see note 3);
fields not supported are always set to '0'
3) Attributes: until first reception of a 'valid' SystemClock input, all 'valid bits' are set to 'not valid'
4) standard timeout 21 min; can be changed with (optional) parameter

LTE-mode

Not available as LTE-process Datapoint.

1.5.6 Input Time

Standard mode

DP Name:	Time (Input)	Abbr.:		Mandatory	☒ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The Time signal is provided to synchronise the clocks of other Functional Blocks like slave SCLO in the system. It contains time of day information of the local clock of the master SCLO at time of transmission.

Datapoint Type

DPT_Name:	DPT_TimeOfDay				
DPT Format:	3 octet structured format			DPT_ID:	10.001
Field	**Description**	**Supp.**	**Range**	**Unit**	**Default**
Day of Week	0 = no day; 1 = Mon, … , 7 = Sun	O	0 to 7	day of week	2)
hours		M	0 to 23	hour of day	2)
minutes		M	0 to 59	minutes	2)
seconds		M	0 to 59	seconds	2)

Access Type

♦ Input

N → this	☐	1 → this	☒		
Spontaneous	☒	Cyclically:	☒	Time-out:	21 min. 3)
Request	☐	Polling:	☐	Period:	

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:			

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☒ 2)
		Saved value:	☐	Actual value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

Special Features

1) mandatory in SCLO slave; optional in master SCLO, not present in autonomous SCLO, see clause 1.4.1 - 1.4.3
2) intialisation value is 'void' until first reception of 'Time'; time fields shall be set to '0'
3) standard timeout 21 min; can be changed with (optional) paramete

LTE-mode

Not available as LTE-process Datapoint.

1.5.7 Input Date

Standard mode

DP Name:	Date (Input)	Abbr.:		Mandatory	☐ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The Date signal is provided to synchronise the clocks of other Functional Blocks like slave. It contains date information of the local clock of the master SCLO at time of transmission.

Datapoint Type

DPT_Name:	DPT_Date		
DPT Format:	3 octet structured format	DPT_ID:	11.001

Field	Description	Supp.	Range	Unit	Default
Day of Month		M	1 to 31	day of month	2)
Month		M	1 to 12	month	2)
Year	Encoding: see specification of DPT_Date	M	0 to 99	year	2)

Access Type

♦ Input

N → this	☐	1 → this	☒			
Spontaneous	☒	Cyclically:	☒	Time-out:	21 min. 3)	
Request	☐	Polling:	☐	Period:		

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☒ 2)
		Saved value:	☐	Actual value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

Special Features

1) optional in SCLO slave (mandatory on the S-Mode Interface of LTE-Devices including SCLO slave); optional in master SCLO, not present in autonomous SCLO, see clause 1.4.1 - 1.4.3

2) intialisation value is ‘void’ until first reception of ‘Date’, date fields shall be set to ‘0’

3) standard timeout 21 min; can be changed with (optional) parameter

LTE-mode

Not available as LTE-process Datapoint.

1.5.8 Input SystemClockSetting

Standard mode

DP Name:	SystemClockSetting	Abbr.:		Mandatory	☐ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The 'SystemClockSetting' input signal is used to set/adjust the local clock of the master SCLO via bus: i.e. SystemClockSetting information is copied to LocalClock.
The source of the signal may be "any" FB which supports SystemClockSetting, e.g. user interface, management station.

Datapoint Type

DPT_Name:	DPT_DateTime		
DPT Format:	8 octet structured format	DPT_ID:	19.001

Field	Description	Supp.	Range	Unit	Default
Year		O	0 to 255	Year	2)
Month		O	1 to 12	Month	2)
Day of Month		O	1 to 31	day of month	2)
Day of Week	0 = no day; 1 = Mon, … , 7 = Sun	O	0 to 7	day of week	2)
hours		M	0 to 23	hour of day	2)
minutes		M	0 to 59	minutes	2)
seconds		M	0 to 59	seconds	2)
Attributes 3)		3)			3)
- F	fault	O	{0,1}	Boolean	normal
- WD	Bank day / Working day	O	{0,1}	Boolean	Bank Day (0)
- NWD	WD field valid / not valid	M	{0,1}	Boolean	no WD
- NY	Year field valid / not valid	M	{0,1}	Boolean	no year
- ND	Month and Day of Month fields valid / not valid	M	{0,1}	Boolean	no date
- NDoW	Day of week field valid / not valid	M	{0,1}	Boolean	no weekday
- NT	Hour of day, Minutes and Seconds fields valid / not valid	M	{0,1}	Boolean	no time
- SUTI	Summertime	O	{0,1}	Boolean	stand. time
- CLQ	Clock quality bit (without/with external synchronisation)	NA	{0,1}	Boolean	without

Access Type

♦ Input

N → this	☐	1 → this	☒		
Spontaneous	☒	Cyclically:	☐ 4)	Time-out:	4)
Request	☐	Polling:	☐	Period:	

continued on next page

DP Name:	SystemClockSetting	Abbr.:		Continued
Communication Type				
♦ Group Object Datapoint			Mandatory:	☒
Default Group Address:	---			
♦ Interface Object Property Datapoint			Mandatory:	☐
• Server	Object_type:	1001d (SCLO)	PID:	52d
	Start_index:	1	Nr_of_elements:	1

Dynamics						
Power down:	Save:	☐				
Power up:	Value:	No initialisation:	☐	Default value:	☒ 2)	
		Saved value:	☐	Actual value (not for input):	☐	
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐	

Exception Handling

If ‘SystemClockSetting‘ is “richer” i.e. contains more information than the local clock in the master SCLO is providing, the unused fields are ignored. E.g. master SCLO has weekly clock only whereas ‘SystemClockSetting‘ contains full Year clock information.
If ‘SystemClockSetting‘ contains less information than the local clock in the master SCLO is supporting, only valid and „useful“ information is copied to the local clock (e.g. hh:mm:ss).
With the optional parameter EnableSystemClockSetting this SystemClockSetting input can be disabled during runtime.

Special Features

1) optional in master SCLO, not present in slave or autonomous SCLO, see clause 1.4.1 - 1.4.3

2) initialisation value is ‘void’; fields shall be set to ‘0’
input value becomes ‘valid’ with reception of ‘SystemClockSetting’,
the received value is copied to the local clock of the SCLO master device (as new “system clock”).
Immediately after this action, input value of ‘SystemClockSetting’ becomes ‘void’ again (→ set in the property server by receiving SCLO master Functional Block). ‘Void’ value is signalised with the attributes;
fields not supported are always set to ‘0’

3) Attributes: all date & time fields are ‘not valid’, except between reception of the signal and coping new values to local clock

4) no timeout because the signal has no heartbeat

LTE-mode:

FB: **SCLO**	**LTE Server Input Name:** **SystemClockSetting**	Mandatory ☐ Optional [1)] ☒

Description:

The 'SystemClockSetting' input signal is used to set/adjust the local clock of the master SCLO via bus: i.e. SystemClockSetting information is copied to LocalClock
The source of the signal may be "any" FB which supports SystemClockSetting, e.g. user interface, management station.

DPT:	Name	DPT_DateTime	DPT ID	19.001	Datatype format	8 octet

Field	Description	Sup.	Unit	Default
Year	Date.Year information valid if NY=0 and Fault=0	O		[2)]
Month	Date.Month information valid if ND=0 and Fault=0	O		[2)]
DayofMonth	Date.DayofMonth information valid if ND=0 and Fault=0	O		[2)]
DayofWeek	Day of Week information valid if NdoW=0 and Fault=0	O		[2)]
Hour	Time.Hour, valid if Fault=0	M	h	[2)]
Minutes	Time.Minutes, valid if Fault=0	M	min	[2)]
Seconds	Time.Seconds, valid if Fault=0	M	s	[2)]
Attributes	Bitset containing status info			[3)]
– Fault	local clock information Normal {0} / Disturbed {1}	M	Boolean	normal
– WD	bank day {0} / working day {1}	O	Boolean	Bank Day (0)
– NWD	validity of WD field invalid {1} / valid {0}	O	Boolean	no WD
– NY	validity of Year field invalid {1} / valid {0}	M	Boolean	no year
– ND	validity of Month and DayofMonth fields invalid {1} / valid {0}	M	Boolean	no date
– NdoW	validity of DoW field invalid {1} / valid {0}	M	Boolean	no weekday
– NT	validity of Hour, Minutes, Seconds fields invalid {1} / valid {0}	M	Boolean	no time
– SUTI	summertime {1} / standard time {0} flag	M	Boolean	stand. time
– CLQ	clock quality bit: with {1} / without {0} external synchronisation	O	Boolean	without

continued on next page

FB: SCLO	LTE Server Input Name: SystemClockSetting	Continued

Communication:

Binding Group:

Class	Type	Default
Geographical ☐		
Application Specific ☐		
Unassigned ☐	Broadcast ☒ Configurable ☐	
DP Address:	IO Type(ID): 1001 (SCLO)	Property ID: 52
LTE-Service (event): Write ☒	Timeout: [4)]	Min
Property-Service (individual access):	Read only ☐ Read/Write ☒	

Value after Powerup: Default Value ☒ Stored Value ☐

Exception Handling: Save at Powerdown ☐

If 'SystemClockSetting' is "richer" i.e. contains more information than the local clock in the master SCLO is providing, the unused fields are ignored. E.g. master SCLO has weekly clock only whereas 'SystemClockSetting' contains full Year clock information.
If 'SystemClockSetting' contains less information than the local clock in the master SCLO is supporting, only valid and „useful" information is copied to the local clock (e.g. hh:mm:ss).
With the optional parameter EnableSystemClockSetting this SystemClockSetting input can be disabled during runtime.

Special Features:

[1)] see clause 1.4.1 - 1.4.3

[2)] initialisation value is 'void'; fields shall be set to '0'
input value becomes 'valid' with reception of 'SystemClockSetting',
the received value is copied to the local clock of the SCLO master device (as new "system clock").
Immediately after this action, input value of 'SystemClockSetting' becomes 'void' again (→ set in the property server by receiving SCLO master Functional Block). 'Void' value is signalised with the attributes;
fields not supported are always set to '0'

[3)] Attributes: all date & time fields are 'not valid', except between reception of the signal and coping new values to local clock

[4)] no timeout because the signal has no heartbeat

1.5.9 Input RelToGMT

Standard mode

DP Name:	RelToGMT (Input)	Abbr.:		Mandatory	☐ 1)
FB Name:	SystemClock (SCLO)			Can be internal	☐

Description

The signal indicates the number of minutes (-780 to +780) offset between local standard time contained in SystemClock and Universal Time Coordinated. The time zones to the west of the zero degree meridian shall be negative values, and those to the east shall be positive values. The value of RelToGMT may change twice a year, if summertime is different from standard time. The signal is e.g. used for sunblind control applications

Datapoint Type

DPT_Name:	DPT_DeltaTimeMin				
DPT Format:	V_{16}		DPT_ID:	8.006	
Field	Description	Supp.	Range	Unit	Default
Minutes	Delta Time in minutes, max. ± 13 h	M	[-780 to 780]	1 min.	cs

♦ Input

N → this	☐	1 → this	☒			
Spontaneous	☒	Cyclically:	☐	Time-out:		
Request	☒	Polling:	☐	Period:		

Communication Type

♦ Group Object Datapoint				Mandatory:	☒
Default Group Address:	---				
♦ Interface Object Property Datapoint				Mandatory:	☐
• Client	Object_type (server):	1001 (SCLO)	PID (property server):	53	
	Start_index:	1	Nr_of_elements:	1	

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☐
	Transmit on bus (only for output):	☐		Read from bus (only for input):	☒ 2)

Exception Handling

Special Features

1) optional in slave SCLO, not present in master or autonomous SCLO, see clause 1.4.1 - 1.4.3

2) after powerup: wait a few minutes, then read value from the bus if not yet received.

LTE-mode

FB: SCLO	LTE Client Input Name: RelToGMT	Mandatory ☐ Optional 1) ☒

Description:

see 1.5.4

DPT:	Name	DPT_DeltaTimeMin	DPT ID	8.006	Datatype format	V_{16}

Field	Description	Sup.	Unit	Default
Minutes	Minutes Offset	M	min	--

Communication:

Binding Group:

Class	Type	Default
Geographical ☐		
Application Specific ☐		
Unassigned ☐	Broadcast ☒ Configurable ☐	

DP Address:	IO Type(ID):	1001 (SCLO)	Property ID:	53
LTE-Service (event): InfoReport ☒	InfoReport Sniffer on Binding Group:	--		
	Timeout:	---	Min	
LTE-Service (polling): Read – Response ☒	Read Wildcard / Resp Sniffer on Binding Group:	--		

Value after Powerup: 1) Default Value ☐ Stored Value ☐

Exception Handling: Save at Powerdown ☐

Special Features:

1) optional in slave SCLO, not present in master or autonomous SCLO, see clause 1.4.1 - 1.4.3
2) after powerup: wait a few minutes, then read value from the bus if not yet received

1.5.10 Diagnostic Data LocalClock

FB: SCLO	Property Name (Server): LocalClock	Mandatory 1) ☐ Optional 1) ☐

Description:

Value of the local own standing clock in SCLO

DPT:	Name	DPT_DateTime	DPT ID	19.001	Datatype format	8 octet

Field	Description	Sup.	Range	Unit	Default
same as SystemClock	see SystemClock output; supported fields according to the features of the local clock				

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	120
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒ 3)	

Exception Handling: Value after Powerup: Stored Value ☐ Act Value ☐ Default Value ☐

Corrupted clock information e.g. due to power down must be detected and the Fault attribute must be set.

Special Features:

1) See clause 1.4.1 - 1.4.3.
2) Backup of clock information during power down and recovery after power up is manufacturer specific.
3) Write access is optional. If LocalClock property is written in master SCLO the same mechanisms apply as for reception of SystemClockSetting

1.5.11 Parameter SCLOMode

FB: SCLO	Property Name (Server): SCLOMode	Mandatory 1) ☒ Optional ☐

Description:

Mode of the SCLO, see clause 1.2.1

DPT:	Name	DPT_SCLOMode	DPT ID	20.001	Datatype format	enum N_8

Field	Description	Sup.	Range	Unit	Default
SCLOMode	configured Mode of SCLO 0 = autonomous 1 = slave 2 = master	M	{0..2}		0

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	110
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒	Read/Write ☒ 1)		

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) It is allowed to have this parameter as read-only (set at factory).

1.5.12 Parameter SystemClockHeartbeat

FB: SCLO	Property Name (Server): SystemClockHeartbeat	Mandatory ☐ Optional 1) ☒

Description:

Heartbeat period for SystemClock, Time and date output signals

DPT:	Name	DPT_TimePeriodMin	DPT ID	7.006	Datatype format	U_{16}

Field	Description	Sup.	Range	Unit	Default
SystemClockHeartbeat	repetition period	M	1 to 1 440	min	10

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	111
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒	Read/Write ☒ 2)		

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) Optional parameter in master SCLO only, see clause 1.2.2 and 1.4.1 - 1.4.3.

2) It is allowed to have this parameter as read-only (set at factory).

1.5.13 Parameter SystemClockTimeout

FB: SCLO	Property Name (Server): SystemClockTimeout	Mandatory ☐ Optional 1) ☒

Description:

Timeout period for SystemClock, Time and Date input signals

DPT:	Name	DPT_TimePeriodMin	DPT ID	7.006	Datatype format	U_{16}

Field	Description	Sup.	Range	Unit	Default
SystemClockTimeout	timeout period	M	3 to 1 445	min	21

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	112
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒ 2)	

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) Optional parameter in master and slave SCLO only, see clause 1.2.2, 1.2.3 and 1.4.1 - 1.4.3.

2) It is allowed to have this parameter as read-only (set at factory).

1.5.14 Parameter EnableSystemClockSetting

FB: SCLO	Property Name (Server): EnableSystemClockSetting	Mandatory ☐ Optional 1) ☒

Description:

Enables reception / reaction on SystemClockSetting input on master SCLO. If enabled, setting of local clock in the master SCLO via SystemClockSetting input is allowed

DPT:	Name	DPT_Enable	DPT ID	1.003	Datatype format	Boolean

Field	Description	Sup.	Range	Unit	Default
bit Enable/Disable	if enabled, SystemClockSetting input is accepted	M	{0,1}		enabled

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	113
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒	

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) Optional parameter in master SCLO only, see clause 1.2.2, and 1.4.1 - 1.4.3

1.5.15 Parameter LocalTimeOffsetRefClock

FB: SCLO	Property Name (Server): LocalTimeOffsetRefClock	Mandatory ☐ Optional 1) ☒

Description:

Time zone in relation to external clock sync signal like DCF77 signal etc. (MEZ, SummerMEZ) For radio clocks etc. only

DPT:	Name	DPT_DeltaTimeMin	DPT ID	8.006	Datatype format	V_{16}

Field	Description	Sup.	Range	Unit	Default
TimeOffset	see above	M	–720 to 720	minutes	0

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	114
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒ 2)	

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) Optional parameter in master or autonomous SCLO, see clause 1.2.2 and 1.4.1 - 1.4.3

2) read only if local setting by jumper/dip-switch or read/write if stored in non volatile RAM or EEPROM

1.5.16 Parameter GMTimeOffsetRefClock

FB: SCLO	Property Name (Server): GMTimeOffsetRefClock	Mandatory ☐ Optional 1) ☒

Description:

Time zone relation between GMT (Greenwich Mean Time) and the local clock/ systemclock. The time zones to the west of the zero degree meridian shall be negative values, and those to the east shall be positive values.

Example for Hong Kong: UTC+8 hours => GMTimeOffsetRefClock = + 480 minutes

DPT:	Name	DPT_DeltaTimeMin	DPT ID	8.006	Datatype format	V_{16}

Field	Description	Sup.	Range	Unit	Default
TimeOffset	see above	M	–780 to 780	minutes	0

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	118
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒	

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) Optional parameter in master or autonomous SCLO, see clause 1.2.2 and 1.4.1 - 1.4.3

1.5.17 Parameter DateStartSummerTime

FB: SCLO	Property Name (Server): DateStartSummerTime	Mandatory ☐ Optional ☒

Description:

First possible date for standard ⇒ summer time switching according to official regulations. If the actual date is equal or later than the DateStartSummerTime and the day is a Sunday, the clock shall switch to summertime. This Sunday, which is given by this condition, is the first possible date (E.g. in EU March 25th) to switch to summer time. This DateStartSummerTime changes at politicians will. The more fields of this flexible Datapoint are supported the better is the chance to adapt a device to politicians will or to use it outside of Europe.

DPT:	Name	DPT_DateTime	DPT ID	19.001	Datatype format	8 octet

Field	Description	Sup.	Range	Unit	Default
Year	The field "Year" shall be invalid (NY=1)	NA	--		--
Month	Date.Month information, valid if ND=0 and Fault=0	M	1 to 12		03
DayofMonth	Date.DayofMonth information, valid if ND=0 and Fault=0	M	1 to 31		25
DayofWeek	Day of Week information, valid if NdoW=0 and Fault=0	O [2])	1 to 7		[2]) – or 7
Hour	Time.Hour, valid if NT=0 and Fault=0	O [1])	0 to 23	h	[1]) – or 02
Minutes	Time.Minutes, valid if NT=0 and Fault=0	O [1])	0 to 59	min	[1]) – or 00
Seconds	Time.Seconds, valid if NT=0 and Fault=0	O [1])	0 to 59	s	[1]) – or 00
Attributes	Bitset containing status info				*) fixed
– Fault	local clock information Normal {0} / fault {1}	M	fault/ok	bool	normal *)
– WD	bank day {0} / working day {1}	M	true/false	bool	bank day *)
– NWD	validity of WD field invalid {1} / valid {0}	M	true/false	bool	no WD *)
– NY	validity of Year field invalid {1} / valid {0}	M	true/false	bool	no year *)
– ND	validity of Month & DayofMonth fields invalid {1} / valid {0}	M	true/false	bool	date valid *)
– NdoW	validity of DoW field invalid {1} / valid {0}	M	true/false	bool	DoW valid
– NT	validity of Hour, Minutes, Seconds fields invalid {1} / valid {0}	M	true/false	bool	time valid
– SUTI	summertime {1} / standardtime {0} flag	M	true/false	bool	standard *)
– CLQ	clock quality bit: with {1} / without {0} external synchronization	NA	with / without	bool	without *)

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	115
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒	

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) Support of Time information is optional. Switching hour may be fixed in the firmware and this information could be hidden in the Datapoint (i.e. NT=1)
if supported, the default standard ⇒ summertime switching hour is at 02:00 → 03:00

2) Support of DayOfWeek information is optional. Switching day may be fixed in the firmware and this information could be hidden in the Datapoint (i.e. NDoW=1),
if supported, the field shall be set to Sunday per default

1.5.18 Parameter DateStartStandardTime

FB: SCLO	Property Name (Server): DateStartStandardTime	Mandatory ☐ Optional ☒

Description:

First possible date for summer time→ standard time switching according to official regulations. If the actual date is equal or later than the DateStartStandardTime and the day is a Sunday, the clock shall switch to standard time. This Sunday, which is given by this condition, is the first possible date (E.g. in EU October 25th) to switch to standard time. This DateStartStandardTime changes at politicians will. The more fields of this flexible Datapoint are supported the better is the chance to adapt a device to politicians will or to use it outside of Europe

DPT:	Name	DPT_DateTime	DPT ID	19.001	Datatype format	8 octet

Field	Description	Sup.	Range	Unit	Default
Year	The field "Year" shall be invalid (NY=1)	NA	--		--
Month	Date.Month information, valid if ND=0 and Fault=0	M	1 to 12		10
DayofMonth	Date.DayofMonth information, valid if ND=0 and Fault=0	M	1 to 31		25
DayofWeek	Day of Week information, valid if NdoW=0 and Fault=0	O 2)	1 to 7		2) – or 7
Hour	Time.Hour, valid if NT=0 and Fault=0	O 1)	0 to 23	h	1) – or 03
Minutes	Time.Minutes, valid if NT=0 and Fault=0	O 1)	0 to 59	min	1) – or 00
Seconds	Time.Seconds, valid if NT=0 and Fault=0	O 1)	0 to 59	s	1) – or 00
Attributes	Bitset containing status info				*) fixed
– Fault	local clock information Normal {0} / Disturbed {1}	M	fault/ok	bool	normal *)
– WD	bank day {0} / working day {1}	M	true/false	bool	bank day *)
– NWD	validity of WD field invalid {1} / valid {0}	M	true/false	bool	no WD *)
– NY	validity of Year field invalid {1} / valid {0}	M	true/false	bool	no year *)
– ND	validity of Month & DayofMonth fields invalid {1} / valid {0}	M	true/false	bool	date valid *)
– NdoW	validity of DoW field invalid {1} / valid {0}	M	true/false	bool	DoW valid
– NT	validity of Hour, Minutes, Seconds fields invalid {1} / valid {0}	M	true/false	bool	time valid
– SUTI	summertime {1} / standardtime {0} flag	M	true/false	bool	summer *)
– CLQ	clock quality bit: with {1} / without {0} external synchronization	NA	with / without	bool	without *)

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	116
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒	

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1) Support of Time information is optional. Switching hour may be fixed in the firmware and this information could be hidden in the Datapoint (i.e. NT=1)
if supported, the default summer time → standard time switching hour is at 03:00 → 02:00

2) Support of DayOfWeek information is optional. Switching day may be fixed in the firmware and this information could be hidden in the Datapoint (i.e. NDoW=1),
if supported, the field shall be set to Sunday per default

1.5.19 Parameter EnableSummerTime

FB: SCLO	Property Name (Server): EnableSummerTime	Mandatory ☐ Optional ☒

Description:

Summer ↔ standard time switching function is disabled if parameter EnableSummerTime=false

DPT:	Name	DPT_Enable	DPT ID	1.003	Datatype format	Boolean

Field	Description	Sup.	Range	Unit	Default
bit Enable/Disable	see above	M	{0,1}		enabled

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	117
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒	

Exception Handling: Value after Powerup: Stored Value ☒ Act Value ☐ Default Value ☐

Special Features:

1.5.20 Diagnostic data ClockSyncSignQual

FB: SCLO	Property Name (Server): ClockSyncSignQual	Mandatory ☐ Optional [1] ☒

Description:

For clocks with external sync. signal only (e.g. radio clocks). This property contains the actual relative signal quality (% value) of e.g. DCF77 signal

DPT:	Name	DPT_RelValue_Z	DPT ID	202.001	Datatype format	U_8Z_8

Field	Description	Sup.	Range	Unit	Default
ClockSyncSignQual	actual signal quality of external clock sync signal like DCF77 etc	M	0..100	%	0 %
Status - OutOfService	Standard Status value 'ClockSyncSignQual' is 'Out of Service' until first reception of the ext. sync. signal	M	Z_8 true/false	bool.	true
- all other flags	not supported, fixed to '0'	NA			

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	121
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒	

Exception Handling: Value after Powerup: Stored Value ☐ Act Value ☐ Default Value ☒

Special Features:

[1] See clause 1.4.1 - 1.4.3.

1.5.21 Diagnostic data ClockSyncTimeSinceRecept

FB: SCLO	Property Name (Server): ClockSyncTimeSinceRecept	Mandatory ☐ Optional [1] ☒

Description:

For clocks with external sync. signal only (e.g. radio clocks). This property contains the elapsed relative time since last proper reception of e.g. DCF77 signal

DPT:	Name	DPT_TimePeriodMin_Z	DPT ID	203.016	Datatype format	$U_{16}Z_8$

Field	Description	Sup.	Range	Unit	Default
TimePeriodMin	see above	M	0 to 65 535	min	-- [2]
Status - OutOfService - all other flags	Standard Status value 'ClockSyncTimeSinceRecept' is 'Out of Service' until first reception of the ext. sync. signal not supported, fixed to '0'	Z_8 M NA	Z_8 true/false	bool.	true [2]

Communication:

DP Address: (in the server)	IO Type(ID):	1001 (SCLO)	Property ID:	122
	Start-Index:	1	N° of elements	1
Property access:	Read only ☒		Read/Write ☒	

Exception Handling: Value after Powerup: Stored Value ☐ Act Value ☐ Default Value ☒

Special Features:

[1] see clause 1.4.1 - 1.4.3

[2] Remark:
Considerations concerning the 'right' default value after power up until first proper reception of the ext. sync signal:
– 0: not possible ⇒ implies immediate reception after power up
– 65 535: better solution, means a very long time but still means there was once a proper reception
– OutOfService: best solution, but this means usage of a DPT with standard status field

2 Appendix

2.1 SCLO Property Identifier list

Object Name: **SCLO**
Object Type: **1001**

Property Identifier	Datapoint Name	Datapoint Type Name	Datapoint Type Code
LTE-process data (runtime Interworking, zone addressing and individual addressing)			
51	SystemClock	DPT_DateTime	19.001
52	SystemClockSetting	DPT_DateTime	19.001
53	RelToGMT	DPT_DeltaTimeMin	8.006
Parameters and Diagnostic Data (individual addressing only)			
110	SCLOMode	DPT_SCLOMode	20.001
111	SystemClockHeartbeat	DPT_TimePeriodMin	7.006
112	SystemClockTimeout	DPT_TimePeriodMin	7.006
113	EnableSystemClockSetting	DPT_Enable	1.003
114	LocalTimeOffsetRefClock	DPT_DeltaTimeMin	8.006
115	DateStartSummerTime	DPT_DateTime	19.001
116	DateStartStandardTime	DPT_DateTime	19.001
117	EnableSummerTime	DPT_Enable	1.003
118	GMTimeOffsetRefClock	DPT_DeltaTimeMin	8.006
119			
120	LocalClock	DPT_DateTime	19.001
121	ClockSyncSignQual	DPT_RelValue_Z	202.001
122	ClockSyncTimeSinceRecept	DPT_TimePeriodMin_Z	203.006

