COPADATA
do it your way

zenon manual

Status processing

v.7.10

Contents

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2. Status processing

With the status administration you get a better overview in the process and in the network. Each variable can have its own statuses. Altogether there are 64 states/attributes. The most common are `spontaneous` (on page 13), `invalid` (on page 14), `manual value (on page 13)` and `replacement value` (on page 16).

Each stored value in zenon consists of three bits of information: value, time stamp and status. That means, that for each archived value also the status is stored.

In the Runtime there are several possibilities to evaluate the status of a variable, as for example: the combined element, the reaction matrices (on page 24) and the Report Generator. The status is also accessible in VBA or VSTA as well as in the recipegroup manager.

License information

Part of the standard license of the Editor and Runtime.

2.1 Status bits

The following status bits are available in zenon:

Bit number	Short term	Long name	zenon Logic label
0 (on page 11)	M1	User status1	_VSB_ST_M1
1 (on page 11)	M2	User status2	_VSB_ST_M2
2 (on page 11)	M3	User status3	_VSB_ST_M3
3 (on page 11)	M4	User status4	_VSB_ST_M4
4 (on page 11)	M5	User status5	_VSB_ST_M5
5 (on page 11)	M6	User status6	_VSB_ST_M6
6 (on page 11)	M7	User status7	_VSB_ST_M7
7 (on page 11)	M8	User status8	_VSB_ST_M8
8 (on page 11)	NET_SEL	Select in the network	_VSB_SELEC
9 (on page 12)	REVISION	Revision	_VSB_REV
10 (on page 12)	PROGRESS	In operation	_VSB_DIREC
11 (on page 13)	TIMEOUT	Runtime exceedance	_VSB_RTE
12 (on page 13)	MAN_VAL	Manual value	_VSB_MVALUE
13 (on page 11)	M14	User status14	_VSB_ST_14
14 (on page 11)	M15	User status15	_VSB_ST_15
15 (on page 11)	M16	User status16	_VSB_ST_16
16 (on page	GI	General query	_VSB_GR

13)			
17 (on page 13)	SPONT	Spontaneous	_VSB_SPONT
18 (on page 14)	INVALID	Invalid	_VSB_I_BIT
19 (on page 14)	T_CHG_A	Daylight saving time/winter time announcement	_VSB_SUWI
20 (on page 14)	OFF	Switched off	_VSB_N_UPD
21 (on page 14)	T_EXTERN	Real time external	_VSB_RT_E
22 (on page 15)	T_INTERN	Realtime internal	_VSB_RT_I
23 (on page 15)	N_SORTAB	Not sortable	_VSB_NSORT
24 (on page 15)	FM_TR	Error message transformer value	_VSB_DM_TR
25 (on page 16)	RM_TR	Working message transformer value	_VSB_RM_TR
26 (on page 16)	INFO	Information for the variable	_VSB_INFO
27 (on page 16)	ALT_VAL	Alternate value If no value was transferred, the defined alternate value is used otherwise the last valid value is used.	_VSB_AVALUE
28	RES28	Reserved for internal use (alarm flashing)	_VSB_RES28
29 (on page 17)	N_UPDATE	Not updated	_VSB_ACTUAL
30 (on page 17)	T_STD	Standard time	_VSB_WINTER
31	RES31	Reserved for internal use (alarm flashing)	_VSB_RES31

32 (on page 18)	COT0	Cause of transmission bit 1	_VSB_TCB0
33 (on page 18)	COT1	Cause of transmission bit 2	_VSB_TCB1
34 (on page 18)	COT2	Cause of transmission bit 3	_VSB_TCB2
35 (on page 18)	COT3	Cause of transmission bit 4	_VSB_TCB3
36 (on page 18)	COT4	Cause of transmission bit 5	_VSB_TCB4
37 (on page 18)	COT5	Cause of transmission bit 6	_VSB_TCB5
38 (on page 19)	N_CONF	Negative acceptance of Select by device (IEC 60870)	_VSB_PN_BIT
39 (on page 19)	TEST	Test bit (IEC870 [T])	_VSB_T_BIT
40 (on page 19)	WR_ACK	Writing acknowledged	_VSB_WR_ACK
41 (on page 20)	WR_SUC	Writing successful	_VSB_WR_SUC
42 (on page 20)	NORM	Normal status	_VSB_NORM
43 (on page 20)	N_NORM	Deviation normal status	_VSB_ABNORM
44 (on page 20)	BL_870	IEC 60870 Status: blocked	_VSB_BL_BIT
45 (on page 21)	SB_870	IEC 60870 Status: substituted	_VSB_SP_BIT
46 (on page 21)	NT_870	IEC 60870 Status: not topical	_VSB_NT_BIT
47 (on page 21)	OV_870	IEC 60870 Status: overflow	_VSB_OV_BIT
48 (on page 22)	SE_870	IEC 60870 Status: select	_VSB_SE_BIT

49 (on page 22)	T_INVAL	Time invalid	not defined
50 (on page 22)	CB_TRIP	Breaker tripping detected	not defined
51 (on page 23)	CB_TR_I	Breaker tripping detection inactive	not defined
52	RES52	reserved	not defined
53	RES53	reserved	not defined
54	RES54	reserved	not defined
55	RES55	reserved	not defined
56	RES56	reserved	not defined
57	RES57	reserved	not defined
58	RES58	reserved	not defined
59	RES59	reserved	not defined
60	RES60	reserved	not defined
61	RES61	reserved	not defined
62	RES62	reserved	not defined
63	RES63	reserved	not defined

Info

In formulas all status bits are available. For other use the availability can be reduced.

The single states are not available for all drivers.

As the statuses of each variable can also be accessed from VBA/VSTA in form of a 64 bit value, the bit position of each status is also listed in the detailed description below. This information is necessary for the individual evaluation with VBA/VSTA.

There are two possibilities for display in Runtime: the short form and the long form. These are separated in the description by a "/".

For each user status, its own text can be defined. This text then is displayed in the different modules (editors such as Runtime). Short text and long text is separated by a semi-colon ";".

To do this, the following entries must be inserted into `project.ini`:

```
[STATUS]

STATUS1=MS_K;my status 00

STATUS2=ET;own text

……

STATUS64=RES;not used
```

Note: The numbering here starts with 1 and not 0 as stated in the table

2.1.1 User status 1 to 8 (M1-M8) and 14 to 16 (M14-M16)

Bit number	Display	Set	Available
0 to 7	M1; user state 1 to M8; user state 8	by the user	with all drivers
13 to 15	M14; user state 14 to M16; user state 16	by the user	with all drivers

The total of 11 user status bits can be used project-specifically. Examples of usage for these user status bits are e.g.: special interlockings for commands or flags for own information.

2.1.2 Select in the network (NET_SEL)

Bit number	Display	Set	Available
8	NET_SEL; Select in the network	automatic	with all drivers

The select identification serves to select an command object in zenon. If this status is active, a new command access (e.g. from another working station) can be locked.

2.1.3 Revision (REVISION)

Bit number	Display	Set	Available
9	REVISION; Revision	by the user	with all drivers

Variables can be set to revision. If this status is active, alarms and setting of commands are suppressed by the process control system. So it is possible to exclude single parts of a process from alarming and operating.

Note: Only the alarms and commands are suppressed. All other limit value properties linked to this such as `Limit color`, `Function`, `Invisible`, `Flashing` etc. are not affected by this and are displayed and/or executed. The current variable values are also shown on the screens as before and also archived.

If linked functions or other properties are suppressed, create a reaction matrix that evaluates the `revision` status.

2.1.4 In operation (PROGRESS)

Bit number	Advertisement	Set	Available
10	PROGRESS; In operation	automatic	only in certain drivers

The status bit `in operation` together with command (only SICAM 230 or zenon Energy Edition) is used to show that a switch is in operation. It is set together with status bit Select in the network (NET_SEL) (on page 11). The bit is set as status of the response variable.
You can activate the automatic setting of the bit in the Runtime in the command by activating property `Display of desired direction`.

If the written command matches the response value, the bit is reset automatically. Only response values ON and OFF can be monitored.

2.1.5 Run time exceeded (TIMEOUT)

Bit number	Display	Set	Available
11	TIMEOUT; Runtime exceeded	automatic	only in certain drivers

The status **`Runtime exceeded`** is set by the command element (only SICAM 230) when it finds out that the time for the confirmation (Runtime) of a switching element is exceeded. The reset is done by a change of the confirmation or another command set.

2.1.6 Manual value (MAN_VAL)

Bit number	Display	Set	Available
12	MAN_VAL; Manual value	automatic	with all drivers

This status is set, as soon as a value in an archive has been changed by hand. This can be done in the Report Generator or in screen Archive revision.

2.1.7 General interrogation (GI)

Bit number	Display	Set	Available
16	GI; General interrogation	automatic	with all drivers

After initializing Runtime, the first image that is read is named “general request”. That means that the value has not changed since Runtime start.

2.1.8 Spontaneous (SPONT)

Bit number	Display	Set	Available
17	SPONT; Spontaneous	automatic	with all drivers

Current value is valid. Everything OK.

2.1.9 Invalid (INVALID)

Bit number	Display	Set	Available
18	INVALID; Invalid	automatic	with all drivers

This bit is set, if there is a problem in the communication with the driver or with a single variable. The evaluation of single variables is only supported by spontaneous drivers. Most of the zenon drivers however are polling drivers, thus only a general problem in the communication can be indicated (and not a separate one for each variable).

2.1.10 Summer/winter time announcement (T_CHG_A)

Bit number	Display	Set	Available
19	T_CHG_A; Daylight saving/winter time announcement (T_CHG_A)	automatic	In certain drivers

This status is set one hour before summer / winter time change (or the other way round). This status can be evaluated by the user. In zenon this status is solely informative.

2.1.11 Switched off (OFF)

Bit number	Display	Set	Available
20	OFF; Switched off	by the user	with all drivers

If a variable is not needed online, it can be switched off. So it is no longer read from the hardware and no longer updated.

This status can e.g. be used to exclude not yet active parts of the process from the alarm handling.

2.1.12 Realtime external (T_EXTERN)

Bit number	Display	Set	Available
21	T-EXTERN	automatic	only in certain drivers

The time stamp is taken from an external device. zenon takes the value as it is. All modules now use this time stamp.

2.1.13 Realtime internal (T_INTERN)

Bit number	Display	Set	Available
22	T-INTERN	automatic	with all drivers

The time stamp is added by the zenon driver. As soon as the value is read correctly, it is stamped. All modules now use this time stamp.

2.1.14 Not sortable (N_SORTAB)

Bit number	Display	Set	Available
23	N_SORTAB	automatic	for IEC standards

Only for SICAM 230.

Concerns real-time data flow at the SSI protocol. SSI is used for SK1703 and concerns the AK driver.

State no longer used.

Originally: If a telegram arrived much too late, it receives the status N_SORTAB if it could not be sorted in. As now there is a secondary sorting, the state has no meaning anymore.

2.1.15 Default message transformer value (FM_TR)

Bit number	Display	Set	Available
24	FM_TR	automatic	for IEC standards

Only for SICAM 230.

Only for SSI protocol: Implausibel transformer value. IN newer protocols this information is transported via INVALID (on page 14) bit.

SSI is used for SK1703 and concerns the AK driver.

2.1.16 Run message transformer value (RM_TR)

Bit number	Display	Set	Available
25	RM_TR	automatic	for IEC standards

Only for SICAM 230.

Concerns SSI protocol and IEC870-101: As long as it is stepped this BIT comes along.

SSI is used for SK1703 and concerns the AK driver.

2.1.17 Info for variable (INFO)

Bit number	Display	Set	Available
26	INFO	automatic	for IEC standards

Only for SICAM 230.

No longer used.

2.1.18 Alternative value (ALT_VAL)

Bit number	Display	Set	Available
27	ALT_VAL; alternative value	by the user	with all drivers

To simulate a value, it can be switched to the alternative value. At this the value is completely uncoupled from the process as with Switched off (OFF) (on page 14). Similar to Switch off the last process value is displayed. There is however the possibility to change the alternate value in the Runtime; e.g. via the set value dialog

- `Modify substitute value`: Changes only the alternate value
- `Switch to and modify alternate value`: Switched to alternate value and changes it to the set value.
- `Modify spontaneous value`: Despite of an alternate value, a set value is sent to the hardware. The variable however retains the alternate value.
- `Switch to spontaneous value`: Switches off the alternate value.

Additional possibilities to influence the alternate value are the Recipegroup Manager or the Programming Interface.

If at the time of the switching to the alternate value the status was invalid (INVALID (on page 14)), the status remains. The value has the state `invalid` and `alternate value set`.

The alternate value is not sent to the connected hardware, but stays in the process image on the computer. This value is sent to all modules of zenon and further processed there. So it is for example archived and alarms are created.

Using this status information these values can especially be marked in the report. So on the one hand the changes are traceable, on the other hand the further processing works with correct values.

Example

If an outside temperature sensor is defective, it may send an unrealistic value, e.g. -280°C. Now the user can enter the correct value instead of the defective value by reading the temperature, e.g. 14°C. Now this value is archived, alarmed and logged.

All modules in zenon now use this alternate value.

2.1.19 Not updated (N_UPDATE)

Bit number	Display	Set	Available
29	N_UPDATE	automatic	with all drivers

The status `Not updated` (N_UPDATE) is set if a value has been requested from the hardware, but no valid value could be read.

2.1.20 Standard time (T_STD)

Bit number	Display	Set	Available
30	T_STD	automatic	with all drivers

This status indicates, whether the time stamp is in winter time (bit high) or in summer time (bit low).

2.1.21 Cause of Transmission (COTx)

Bit number	Advertisement	Set	Available
32 - 37	COT0 to COT5	automatic	for IEC standards

The Cause of Transmission (COT) according to the IEC60870 protocol.

The value of the Cause of Transmission (see **IEC60870-5-101 7.2.3**) is mapped to status bits 32 - 37. With this up to 6 COTx could be set (x represents bit numbers 0 to 5). For example the lowest bit of the COT value is shunted to status bit 32 and called **COT0** in zenon.

The whole COT value can be evaluated in the Runtime via a reaction matrix (multi-numeric or multi-binary). For each COTx bit the value of the cause of transmission is increased as follows:

- COT0 = 2^0 = 1
- COT1 = 2^1 = 2
- COT2 = 2^2 = 4
- COT3 = 2^3 = 8
- COT4 = 2^4 = 16
- COT5 = 2^5 = 32

EXAMPLE

Typical COT values:

Status	Value	Cause of Transmission	Short name
COT0, COT1	1+2 = 3	spontaneous	COT_spont
COT0, COT1, COT2	1+2+4 = 7	activation confirmation	COT_actcon
COT1, COT3	2+8 = 10	activation termination	COT_actterm
COT2, COT4	4+16 = 20	interrogated by station interrogation	COT_inrogen

Info

The module Command uses the cause of transmission for Runtime exceeded of commands.

Attention:

- Not all drivers support COT.
- Some Energy driver support only an area restricted to Runtime exceeded in Command.
- Some drivers support COT although the protocol itself does not contain COT (e.g. DNP3). You can find details in the corresponding driver documentation.

2.1.22 P/N-Bit (N_CONF)

Bit number	Display	Set	Available
38	N_CONF	automatic	for IEC standards

The P/N bit from an IEC870-5-104 telegram is displayed in the N_CONF status bit.

2.1.23 Test bit (TEST)

Bit number	Display	Set	Available
39	TEST	automatic	for IEC standards

The Test bit from an IEC870-5-104 telegram is displayed in the status bit TEST.

2.1.24 Acknowledge writing (WR_ACK)

Bit number	Display	Set	Available
40	WR_ACK	automatic	with all drivers

In zenon it can be defined, for which **`Set value`** or **`Execute recipe`** actions a writing confirmation should be requested.

2.1.25 Writing successful (WR_SUC)

Bit number	Display	Set	Available
41	WR_SUC	automatic	with all drivers

If for a **`Set value`** or **`Execute recipe`** action a writing confirmation should be requested (WR_ACK), this status bit is set accordingly after writing.

2.1.26 Normal status (NORM)

Bit number	Display	Set	Available
42	NORM	automatic	with all drivers

The normal status is defined in the variable properties and evaluated in the status bit NORM.

2.1.27 Deviation normal status (N_NORM)

Bit number	Display	Set	Available
43	N_NORM	automatic	with all drivers

For bit variables the driver compares the process status with the defined normal status and writes the result to the status bit N_NORM.

2.1.28 BL_870

Bit number	Display	Set	Available
44	BL_870	automatic	IEC870 IEC850 (partly)

Signals IEC status `blocked` in accordance with standard 60870-101 or 104. The value is blocked for transferring and remains in the status it had before it was blocked. This status bit can be selected in Multi reaction matrices, in Combined elements and in the Interlocking formula.

In VBA the top 32 bits can be polled with **`StatusExtValue()`**. With **`SetValueWithStatusEx()`** all 64 status bits can be polled.

2.1.29 SB_870

Bit number	Display	Set	Available
45	SB_870	automatic	IEC870 IEC850 (partly)

Signals IEC status `substituted` in accordance with standard 60870-101 or 104. The value was set by an operator or an automatic source. This status bit can be selected in Multi reaction matrices, in Combined elements and in the Interlocking formula.

In VBA the top 32 bits can be polled with **`StatusExtValue()`**. With **`SetValueWithStatusEx()`** all 64 status bits can be polled.

2.1.30 NT_870

Bit number	Display	Set	Available
46	NT_870	automatic	IEC870 IEC850 (partly)

Signals IEC status `not topical` in accordance with standard 60870-101 or 104. The value was not updated or was not available for a certain period of time. This status bit can be selected in Multi reaction matrices, in Combined elements and in the Interlocking formula.

In VBA the top 32 bits can be polled with **`StatusExtValue()`**. With **`SetValueWithStatusEx()`** all 64 status bits can be polled.

2.1.31 OV_870

Bit number	Display	Set	Available
47	OV_870	automatic	IEC870 IEC850 (partly)

Signals `Overflow` in accordance with standard 60870-101 or 104. The value lies outside the predefined bandwidth.

2.1.32 SE_870

Bit number	Display	Set	Available
48	SE_870	automatic	IEC870 IEC850 (partly)

This S/E bit is used in accordance with standard IEC 60870-101 or 104 together with functionality **`Select before operate`** and serves for distinction between Select– and Execute– states of a command.

Values:

- `0` = execute
- `1` = select

2.1.33 T_INVAL

Bit number	Display	Set	Available
49	T_INVAL	automatic	IEC870

T_INVAL is set by driver IEC870 if the received real time stamp is marked as invalid. In this case, the local PC time is stamped. In the IEC870 Slave of the Process Gateways the T_INVAL is forwarded in message direction in the time stamp.

2.1.34 Breaker tripping detected (CB_TRIP)

Bit number	Display	Set	Available
50	Breaker tripping detected	automatic	with all drivers; is used in multi binary reaction matrices, multi numeric reaction matrices, calculating the following archive, combination element, AML/CEL status

The status bit is set to 1 when breaker tripping is detected.

The detection occurs if:

- the value of the response variable changes from <>0 to 0 and
  - the status bit CB_TR_I (on page 23) (51) is not 1
  - the status bit PROGRESS (on page 12) (10) is not 1
  - the value of the response variable is already defined (i.e. it is not the first value of this variable)

A change from value 0 to <>0 resets this bit. Also if status bit PROGRESS (on page 12) (10) is activated. A change of CB_TR_I (on page 23) does not influence an already detected breaker tripping.

This status bit can be modified explicitly by action „Status", „Status on" or „Status off".

NETWORK

In the network the evaluation is carried out on the server which is responsible for the process. The evaluation is carried out on the standby server but the result is not written on the status bits. The current state of CB_TR_I and CB_TRIP is synchronized when the standby server is started or reconnected. If the response variable is a variable on a local computer, the evaluation is also carried out on the client computer.

2.1.35 Breaker tripping detection inactive (CB_TR_I)

Bit number	Advertisement	Set	Available
51	Breaker tripping detection inactive	automatic as result of the formula of property Suppress detection in the command input	with all drivers; is used in multi binary reaction matrices, multi numeric reaction matrices, calculating the following archive, combination element, AML/CEL status

Shows that the breaker tripping detection is inactive.

The new calculation is triggered by a status change or value change of a variable which is defined for the calculations of formulas in the command input. The formula is not evaluated and the result is not written to the status if:

- one of the variables in the formula does not have a defined value and status yet

  or

- one of the variables has bit Disturbed set.

This status bit can be modified explicitly by action „Status", „Status on" or „Status off".

DETECTION AND SUPPRESSION

A change on this status bit is active when it is read back by the driver. That means: The detection of a breaker tripping and the setting breaker tripping detection inactive at the same time does not work.

Example: Formula „RM.Value<1" will still detect a breaker tripping as at the time of the value change CB_TR_I was not yet active but was only set to active at the driver.

NETWORK

In the network the evaluation is carried out on the server which is responsible for the process. The evaluation is carried out on the standby server but the result is not written on the status bits. The current state of CB_TR_I and CB_TRIP is synchronized when the standby server is started or reconnected. If the response variable is a variable on a local computer, the evaluation is also carried out on the client computer.

2.2 Usage

2.2.1 Reaction matrices

The reaction matrices are the most sophisticated way to deal with statuses.

Here single statuses can be evaluated and cause alarms. Basically a status can be treated like a value. As with a value it is also possible with a status to cause certain actions.

As for example:

- Generate alarm
- Generate entry in CEL
- Execute function
- Flashing
- Color change

- Print

Example:

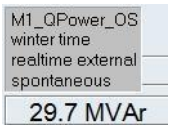
If a value becomes invalid, it gets the state INVALID (on page 14). This happens when the driver loses the connection to the PLC. You can create a reaction matrix, which causes an alarm, as soon as the value becomes invalid (INVALID). There is the possibility to evaluate these alarms afterwards.

2.2.2 Dynamic elements

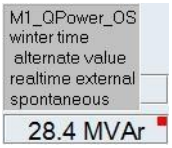
All dynamic elements offer the possibility to display the status of the linked variable. This is done with the property **`Display status of variable`**.

Then it is possible to display the status in the Runtime withe the right mouse button.

In the Runtime the status is displayed by clicking the dynamic element with the right mouse button. As long as the mouse button stays pressed down, the variable name and the current status of the variable is displayed.



If status display is activated, any not normal status is indicated with a red square in the upper right corner of the element.



This indicates, that the value no longer is spontaneous. By clicking the element with the right mouse button it becomes obvious, that somebody changed the status to the alternative value.

2.2.3 Combined element

The Combined Element offers the possibility to evaluate and graphically display the stati. In difference to the Reaction Matrices, this evaluation only effects the graphical display in the screen.

That means:

1	changing the color
2	displaying another symbol
3	displaying another text
4	displaying another bitmap
5	changing the color of a symbol

2.2.4 Report Generator

Also the Report Generator offers the possibility to evaluate the stati.

This is done by using the function **`variabler`** with the status as a parameter.

The syntax is the following:

=variabler(Temperature_outside,status)

In the Runtime the display can look like below.

Temperature_outside	21єC	ALT_VAL (on page 16)

2.2.5 Recipegroup Manager

The Recipegroup Manager offers the possibility to read, display and change all stati, as long as they are not set by the process (driver). To set status bits, go to dialog Editing a recipe and use column Actions.

2.2.6 VBA

In VBA there are all possibilities to access and change all stati, as long as they are not set by the process (driver).