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Telegram 81 for SIMIT

SIMIT SP V10.0

<https://support.industry.siemens.com/cs/ww/en/view/109761007>

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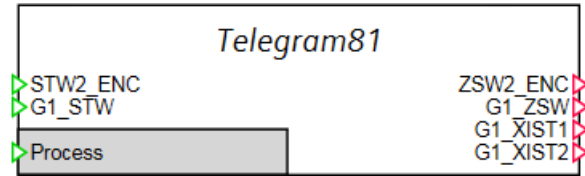
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1 Description of the telegram

1.1 Symbol

Figure 1-1



1.2 Function

The standard telegram 81 is typically used when the encoder is used together with a motion control system with PROFIdrive interface such as SIMOTION or SINUMERIK. The telegram offers a standard PROFIdrive sensor interface, which corresponds to the sensor interface of a standard drive. However, the telegram 81 can also be used with a programmable logic controller if the monitoring of vital signs or error codes via a cyclic interface is required.

Telegram 81 offers the following functionality:

- PROFIdrive encoder channel with 32 bit actual position value

See also Manual

"SIMOTION/SIMATIC, MC-ENCODER, Absolute encoders with PROFINET IO"

<https://support.industry.siemens.com/cs/ww/en/view/109478024>

1.3 Telegram format

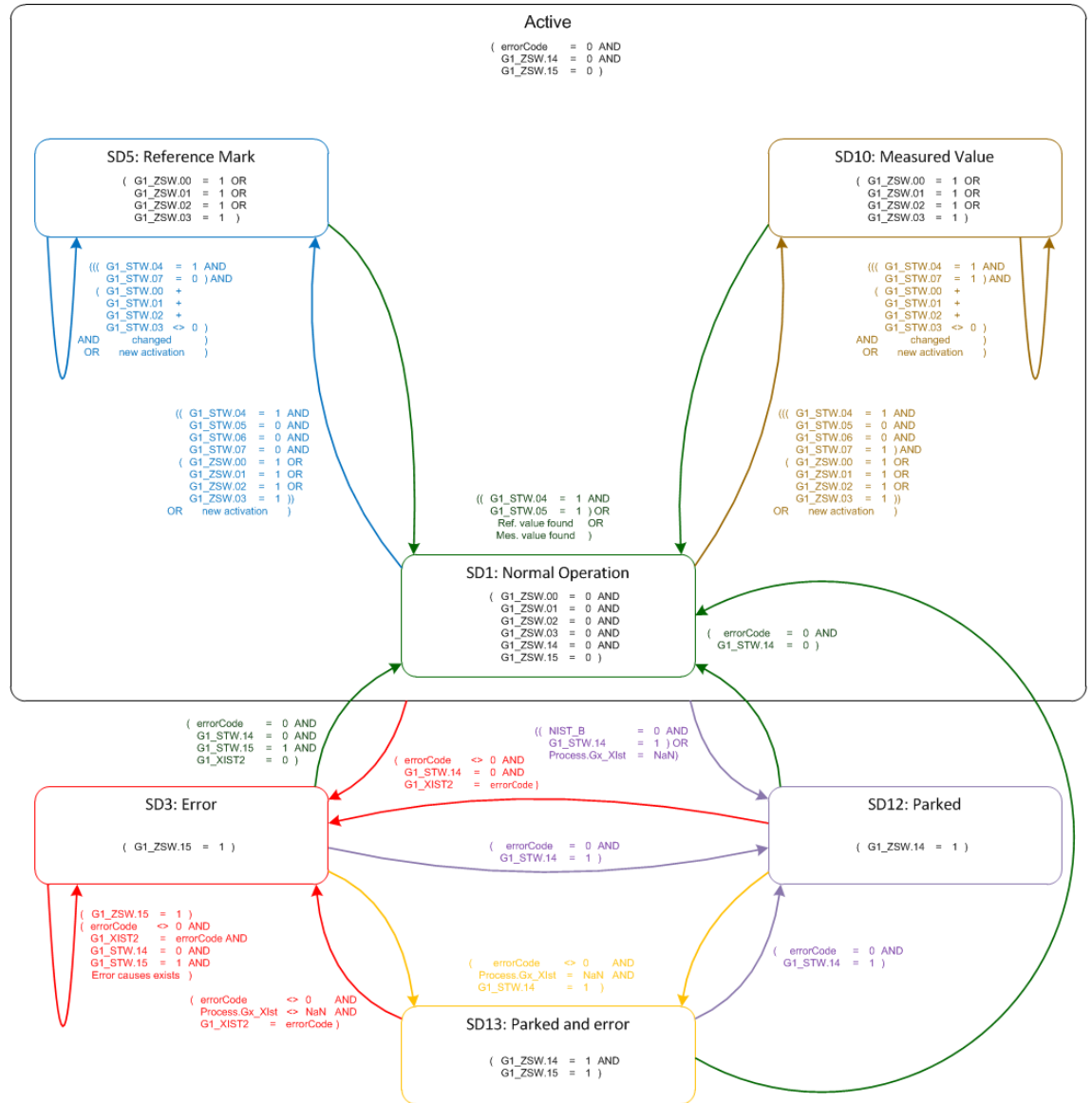
Figure 1-1

	PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
TEL 81 Nominal	STW2_ENC	G1_STW				
TEL 81 Actual	ZSW2_ENC	G1_ZSW	G1_XIST1		G1_XIST2	

1.4 State machine

The state machine is described in detail in the PROFIdrive specification. The state graph implemented in the telegram 81 is shown in the following illustration:

Figure 1-2



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The control bits that are disaggregated in the table are used to control the state machine (state transitions). Depending on the current state, the corresponding state bits are set as shown in the table.

1.4.1 States

Table 1-1

State	Number	Description	G1_ZSW (Bitfolge 15 ... 0)
SD1: Normal Operation	1	Normal operation	a0xx x0mm xxxx 0000
SD3: Error	3	Error	1000 0000 0000 0000
SD5: Reference Mark	5	Reference mark mode	a00x x000 0000 xxxx
SD10: Measured Value	10	Measurement on the fly	a0xx x0mm 0000 xxxx
SD12: Parked	12	Parked	0100 x000 0000 0000
SD13: Parked and error	13	Parked and error	1100 0000 0000 0000

The individual positions in the status word "G1_ZSW" in the table have the following meaning:

Table 1-2

Position	Meaning
x	from state machine
m	depending on the model (here: Process.Gx_Probes)
a	can be set in the operating window

1.4.2 Control word

Table 1-3

Name	G1_STW.Bit	Description	Use
Function requests	G1_STW.0 – 3	Functions: Mode = 0 Bit 0: Function 1 (Reference mark 1) Bit 1: Function 2 (Reference mark 2) Bit 2: Function 3 (Reference mark 3) Bit 3: Function 4 (Reference mark 4) Mode = 1 Bit 0: Function 1 (Probe 1 pos. edge) Bit 1: Function 2 (Probe 1 neg. edge) Bit 2: Function 3 (Probe 2 pos. edge) Bit 3: Function 4 (Probe 2 neg. edge)	Yes
Command requests	G1_STW.4 – 6	Commands: 0: No command 1: Activate functions 2: Read value 3: Cancel functions 4-7: Reserved	Yes
Mode	G1_STW.7	Activation of mode: 0: Reference mark search 1: Measurement on the fly	Yes
Reserved	G1_STW.8 – 10	Reserved, currently not occupied	No
Preset / Shift	G1_STW.11	Preset / Shift: 0 = Preset position 1 = Shift position	Yes

1 Description of the telegram

Name	G1_STW.Bit	Description	Use
Request preset	G1_STW.12	Requests: Set preset position / Request shift position	Yes
Absolute value cyclically	G1_STW.13	Request absolute value cyclically	Yes
Request parking encoder	G1_STW.14	Activate parking encoder	Yes
Acknowledge error	G1_STW.15	Acknowledge sensor error	Yes

1.4.3 State word

Tabelle 1-4

Name	G1_ZSW.Bit	Description	Source
Function active	G1_ZSW.0 – 3	Activation functions (Reference mark search / Measurement on the fly): Bit 0: Function 1 active Bit 1: Function 2 active Bit 2: Function 3 active Bit 3: Function 4 active	State machine
Value available	G1_ZSW.4 – 7	Value available (Reference mark / Probe): Bit 4: Measured value 1 available Bit 5: Measured value 2 available Bit 6: Measured value 3 available Bit 7: Measured value 4 available	State machine
Probe 1 deflected	G1_ZSW.08	Negative or positive edge evaluation for probe 1	Process.Gx_Probes
Probe 2 deflected	G1_ZSW.09	Negative or positive edge evaluation for probe 2	Process.Gx_Probes
Reserved	G1_ZSW.10	Reserved, currently not occupied	-
Encoder fault acknowledged	G1_ZSW.11	Error acknowledgement in process	State machine
Preset executed	G1_ZSW.12	Executed: Set preset position / Request shift position	State machine
Absolute value output	G1_ZSW.13	Transmit absolute value cyclically	State machine
Parking sensor executed	G1_ZSW.14	Executed: Request parking encoder	State machine
Sensor error	G1_ZSW.15	Signals a sensor error	State machine / Operating window

1.5 Sign of Life exchange via "STW2" and "ZSW2"

In the standard PROFIdrive telegrams 81 and higher, the process data "STW2_ENC" and "ZSW2_ENC" are defined. This is used to cyclically exchange a "sign of life" between the controller and the encoder. If the "sign of life" fails in a configurable sequence, an error is generated and the application is deactivated.

1.6 Error codes

The following error codes are generated with "G1_ZSW" bit 15 sensor error:

Table 1-5

Error code	Description
0x0001 (1)	Sensor error: The process value is invalid and "Cancellation of parked encoder" is occurred.
0x0004 (4)	Cancellation reference mark search: <ul style="list-style-type: none"> "Reference mark run" function is active (not all reference marks have arrived yet) with mode bit 1 (except "retrieve measurement value" or "cancel function"). No reference mark is activated / expected (no function bit is set).
0x0005 (5)	Retrieve cancellation reference value: <ul style="list-style-type: none"> "Retrieve measurement value" is attempted, even though "reference mark run" is active or reference values are available. No or more than one value is requested with the functions bits. Requested value is neither available nor activated / expected.
0x0006 (6)	Cancellation flying measurement: <ul style="list-style-type: none"> "Flying measurement" function is active (not all measurements values have arrived yet) with mode bit 0 (except "retrieve reference value" or "cancel function"). No measurement value is activated / expected (no function bit is set).
0x0007 (7)	Retrieve cancellation measurement value: <ul style="list-style-type: none"> "Retrieve measurement value" is attempted, even though „flying measurement“ is active or measurement values are available. No or more than one value is requested with the functions bits. Requested value is neither available nor activated / expected.
0x0E10 (3600)	Error was triggered with control panel switch.
0x0E16 (3606)	"G1_XIST1": Overflow of the calculated output value
0x0E17 (3607)	"G1_XIST1": Underflow of the calculated output value
0x0E18 (3608)	"G1_XIST2": Overflow of the calculated output value
0x0E19 (3609)	"G1_XIST2": Underflow of the calculated output value

With "ZSW2_ENC" bit Fault is generated:

Table 1-6

Error code	Description
0x0F02 (3842)	"Sign of life": Error

A warning with "ZSW2_ENC" bit alarm / warning is generated if the sum of internal "Xlst" and "XOffset" value for "G1_XIST1" is larger than 2^{53} (9007199254740992.0) "G1_XIST1" units, the full "G1_XIST1" resolution is no longer reached or significant rounding errors are to be expected.

2 Connections

Table 2-1

Input	Description
STW2_ENC	Control word 2 encoder from the PROFIdrive telegram
G1_STW	Encoder 1 control word from the PROFIdrive telegram
Process	Sensor data

Table 2-2

Output	Description
ZSW2_ENC	State word 2 Encoder from the PROFIdrive telegram
G1_ZSW	Encoder 1 state word from the PROFIdrive telegram
G1_XIST1	Actual position value 1 from the PROFIdrive telegram / error code for telegram
G1_XIST2	Actual position value 2 from the PROFIdrive telegram / error code for telegram

3 Parameter

Table 3-1

Parameter	Description
G1_FineResolutionXist1	Enter the fine resolution for the actual position value here (used to calculate the output "G1_XIST1")
XIstPeriod2	Enter the value range for "G1_XIST2" here (if = 0, "Process.EncoderRange" is used)
G1_FineResolutionXist2	Enter the fine resolution for the actual position value here (used to calculate the output "G1_XIST2")
XIstSetupValue	Enter the value here (in "G1_XIST1" units) set to "XIst" or shift by "XIst" (adjustable in the operating window)
AllowedLifeSignErrors	Enter here the count of the "sign of life" monitoring until the transfer to a "sign of life" error
LifeSignTolerance	Enter here the length of the tolerance range for the "sign of life" recognition

4 Operating window

Figure 4-1

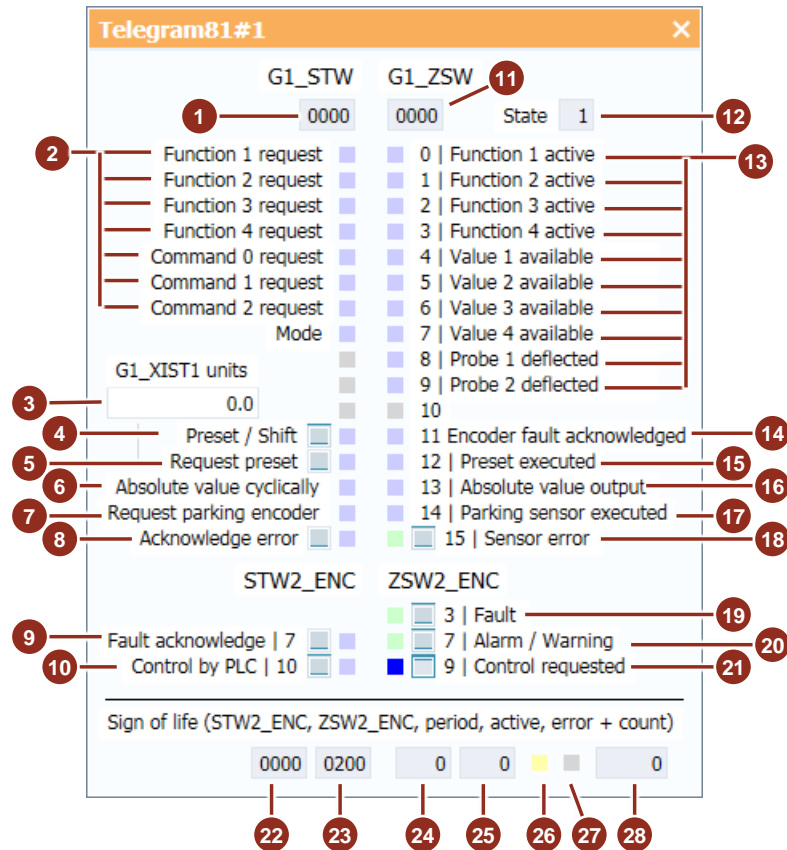


Table 4-1

Number	Description
1	"G1_STW"; the unaffected input value is displayed.
2	Function and control inputs of the basic component PROFIdrive/Sensor
3	Value to be set or shifted in "G1_XIST1" units. The specification of fractions is possible; "G1_XIST1" is then rounded to the nearest integer.
4	Preset / offset, effective on positive edge of the preset request (point 5): <ul style="list-style-type: none"> False: "G1_XIST1" is set to the value specified in point 3. True: "G1_XIST1" is shifted by the value set in point 3. The bit is switchable by the assigned switch; the display takes into account the influence.
5	False → True: Set preset request / request shift: The bit is switchable by the assigned switch.
6	Request absolute value cyclically: The bit is processed by the state machine and affects "G1_XIST2".
7	Request parking encoder: The bit is processed by the state machine and affects "G1_XIST1" and "G1_XIST2".

Number	Description
8	<p>Acknowledge "Sensor error" / "G1_ZSW" error:</p> <ul style="list-style-type: none"> • True: If a sensor error occurs ("G1_ZSW-Bit" 15 "Sensor error" = True), an automatic error acknowledgement is attempted. After eliminating all causes of error, the "Sensor error" bit reset and „Encoder fault acknowledged“ is set ("G1_ZSW-Bit" 11 = True). If an error persists, the error output in "G1_XIST2" is updated. <p>The bit is switchable by the assigned switch.</p>
9	<p>Acknowledge errors and warnings in "ZSW2_ENC": False → True: "ZSW2_ENC"-Bit 3 (Fault) and 7 (alarm / warning) are reset when the error is corrected.</p> <p>The bit is switchable by the assigned switch.</p>
10	<p>Control by PLC:</p> <ul style="list-style-type: none"> • False: Only the "sign of life" bits in "STW_2_ENC" are valid, the remaining bits of "STW2_ENC" and "G1_STW" are not accepted or influenced, the bit displays for "G1_STW" and "STW2_ENC" are deactivated to avoid an incorrect display. The last input values obtained with set bit bits are preserved and are reactivated after switching the control. • True: The component can be controlled, influenced and used. <p>The bit is switchable by the assigned switch.</p>
11	"G1_ZSW"; the output value is displayed after processing.
12	Display of the active state in the state machine.
13	Activity and availability outputs of the basic component PROFIdrive/Sensor "Probe1/2 deflected" are not controlled by the state machine but are taken directly from the inputs "Gx_Probe1 / Gx_Probe2" of the "SensorProcess" component.
14	<p>Acknowledgment of the sensor error is running: After debugging and requesting an error acknowledgment, the bit is set to true. If the error still exists after the acknowledgment attempt, the bit is = False.</p>
15	<p>"Set preset" / "shift reference mark" executed: The bit is processed by the state machine and is set to true for one cycle in case of successful completion.</p>
16, 17	<p>"Absolute value transmitted cyclically" / "parking encoder" activated: The bits are processed by the state machine.</p>
18	"Sensor error" (see error codes)
19	<p>External error or "sign of life" error. The bit can be set with the assigned switch.</p>
20	<p>Alarm / warning:</p> <ul style="list-style-type: none"> • True: There is warning (loss of resolution) that should be removed and then acknowledged (see error codes). <p>The bit can be set with the assigned switch.</p>
21	<p>Control requested (settings valid, component ready):</p> <ul style="list-style-type: none"> • Switch on: The bit is True, the data of the components are valid. • Switch off: The bit is False, the data of the components are invalid. <p>With the initialization of the component the switch is set to on.</p>
22	<p>"STW2_ENC"; the unaffected input value is displayed. Bits 12 to 15 contain the received "sign of life" bits.</p>

4 Operating window

Number	Description
23	"ZSW2_ENC"; the output value is displayed after processing. Bits 12 to 15 contain the output "sign of life" bits.
24	Number of simulation cycles between the last two changes of the received "sign of life" bits or 0, if no reasonable bit sequence was detected or after a restart of the simulation.
25	Maximum number of simulation cycles between two changes to the received "sign of life" bits or 0, if no reasonable bit sequence was detected or after a restart of the simulation. The valid value range is set in the parameter "LifeSignTolerance".
26	Activation of "sign of life" monitoring: <ul style="list-style-type: none"> • Green: The "sign of life" monitoring has detected a valid bit sequence and a change within the tolerance is activated and outputs the "sign of life" bits in "ZSW2_ENC".
27	Error in "sign of life" monitoring: <ul style="list-style-type: none"> • Red: Number of detected errors in received "sign of life" bits ((point 28) / 10) has exceeded the parametrized value "AllowedLifeSignErrors". The reset occurs together with the acknowledgement of Fault.
28	Count of "sign of life" monitoring

5 Appendix

5.1 Service and support

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5.2 Links and literature

Table 5-1

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to this entry page of this application example https://support.industry.siemens.com/cs/ww/en/view/109761007
\3\	SIMATIC SIMIT Simulation Platform – Overview https://support.industry.siemens.com/cs/ww/en/view/109746429
\4\	"SIMOTION/SIMATIC, MC-ENCODER, Absolute encoders with PROFINET IO" https://support.industry.siemens.com/cs/ww/en/view/109478024

5.3 Abbreviations

PZD Process Data

PLC Programmable Logic Controller

5.4 Change documentation

Table 5-2

Version	Date	Modifications
V1.0	10/2018	First version