“位置检测模板 **SM 338**”快速入门

V1.0

SLC A&D CS Beijing

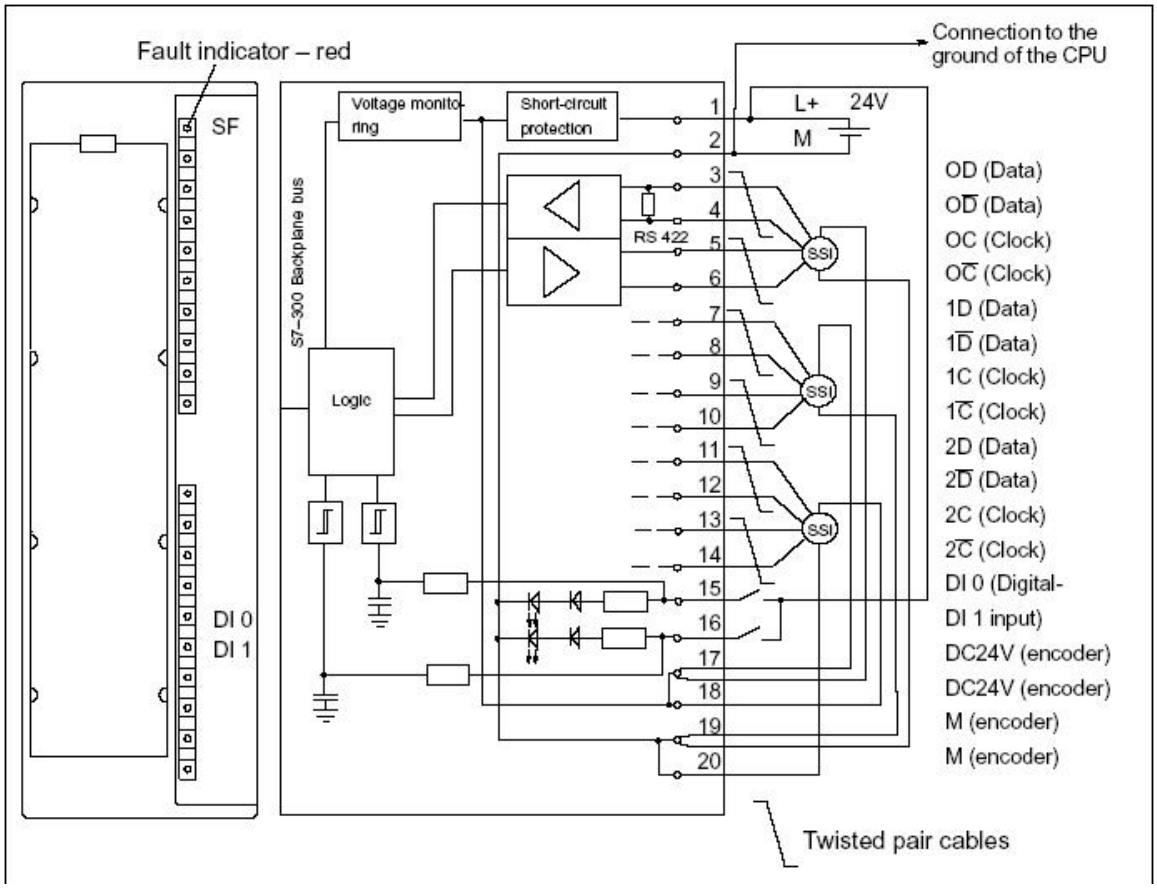
March 4, 2005

1 初学者入门

1.1 必要条件

- ✓ 必须有一个 S7-300 站，带电源模块、CPU314-2 DP 和 SM 338(订货号：6ES7 338-4BC01-0AB0)；
- ✓ STEP 7（> 4.0.2.1）必须被正确安装在编程器上；
- ✓ 编程器已经按照实际硬件设备，正确建立了一个 S7-300 站；
- ✓ 编程器已经通过编程介质（如：CP5511、CP5512、CP55611 或者 PC Adapte，外加通讯电缆“MPI 电缆”、“RS232 电缆”）正确连接到 S7-300 站的 CPU 编程口上。

1.2 端子连接图和框图



布线规则：

在对模板进行接线时，应注意以下事项：

1. 编码器电源的接地与 CPU 的接地不隔离。因此，应将 SM 338（M）的引脚 2 以低阻抗连接到 CPU 的接地；
2. 编码器导线（引脚 3-14）必须屏蔽，最好使用双绞电缆。并将任一端的屏蔽层进行支承；
3. 为了支承 SM 338 的屏蔽层，应使用支承元件（订货号：6ES7 390-5AA00-0AA0）；
4. 如果超出编码器的最大输出电流（900 mA），必须连接一个外部电源。

1.3 SM338 参数配置

你可以使用 STEP 7 对 SM 338 进行参数赋值。但必须在 CPU 处于“STOP“模式下进行。当你设定完所有的参数后，应将参数从编程器下载到 CPU 中。当 CPU 从“STOP“模式转换为“RUN“模式时，CPU 即可将参数传送到 SM 338。不能通过用户程序对参数重新赋值。

SM 338 的参数概述：

SM 338 的可编程参数概述及其缺省值，见下表。（如果你没有使用 STEP 7 进行参数赋值，将使用缺省设置。）

参数	数值范围	缺省值
使能“诊断中断“OB82	有/无	使能参数，所有的 3 个通道均工作
SSI 绝对值编码器类型： ✓ 位报文帧长度 ✓ 代码类型 ✓ 传输速率 ✓ 单稳时间	无/13 位/21 位/25 位 格雷码/二进制码 125kHz / 250kHz / 500kHz / 1MHz	无：编码器输入被关掉； SSI 位置检测的数据传输率。注意电缆长度和波特率之间的关系。 单稳时间是两个 SSI 报文桢之间的时间间隔。

		所编程的单稳时间必须大于绝对值编码器的单稳时间。
标准化： ✓ 位置 ✓ 步进/分辨率	0 – 12 2 - 8192	由于标准化，编码器的数值将在地址区内右移。不相关的地址区将被去除
FREEZE 功能	关闭/ 0 / 1	数字量输入的上升沿信号，触发编码数值的保持

注意：

- ✓ 传输速率和单稳时间会影响非等时模式中绝对值编码器值的精度；
- ✓ 在等时模式中传输速率和单稳时间将影响 FREEZE 功能的精度(参见编码器制造商的技术规范)；
- ✓ 所编程的单稳时间必须大于绝对值编码器的单稳时间；
- ✓ 绝对值编码器的单稳时间将使用以下限制：

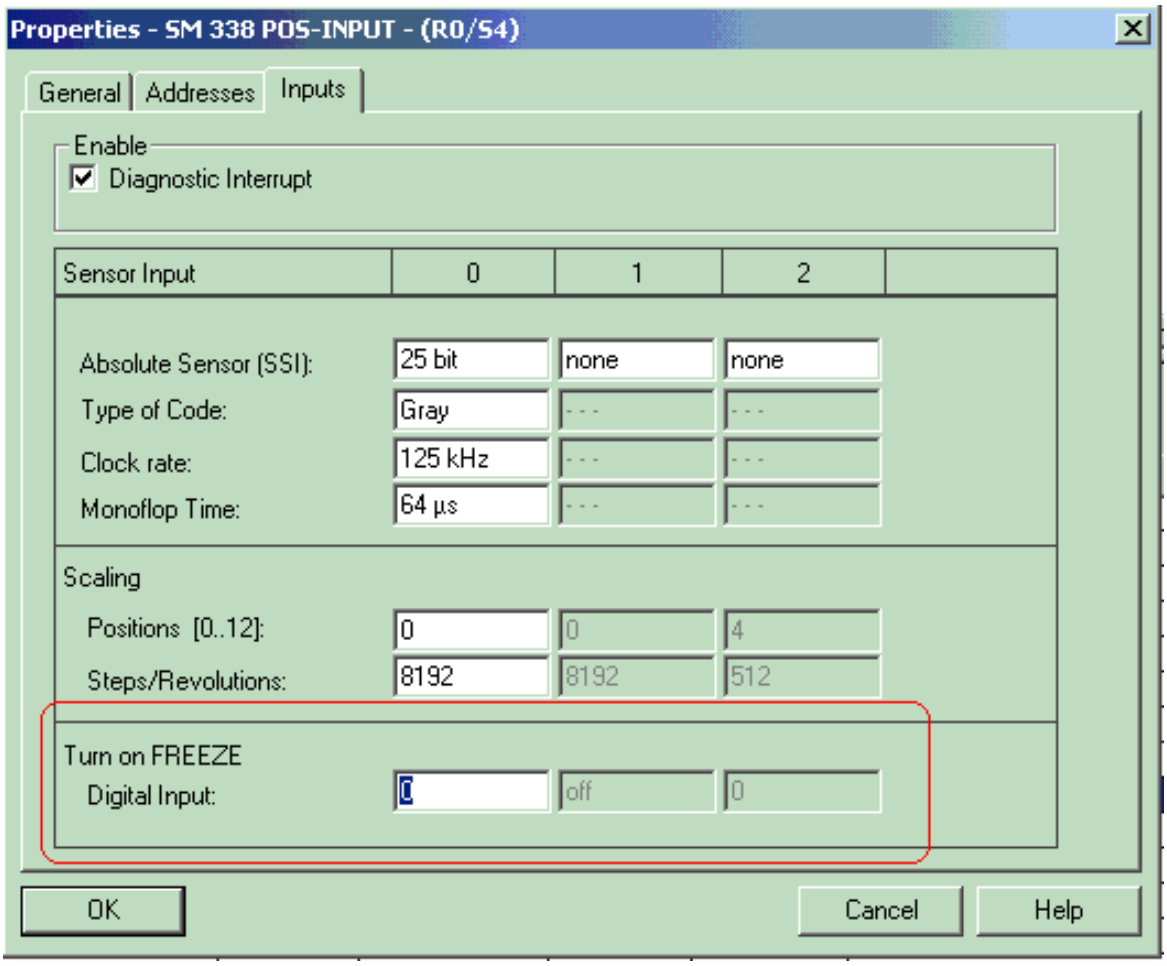
(1/传输速率) < “绝对值编码器的单稳时间” < 64 µ s + 2 x (1/传输速率)

1.4 使能 FREEZE 功能

用 FREEZE 功能可以“保持“SM 338 当前的编码值。FREEZE 功能连接到 SM 338 的数字量输入“DI 0“ 和“DI 1“。

通过“DI 0“ 和“DI 1“的沿变化(上升沿)触发“保持“功能。通过判断位 31(输入地址)的状态（0 和 1），识别被保持的编码值。一个数字量输入可以 “保持”1 个、2 个或 3 个编码器值。

必须使能 FREEZE 功能，也就是说用 STEP 7 进行参数赋值。（如图）



直到 FREEZE 功能结束前，将始终保持编码器值，并可以作为结果的一个功能进行评估。

结束 FREEZE 功能可以对每个编码器输入结束 FREEZE 功能。可以用 STEP 7 运行“T PQBxyz“，在用户程序中对 0、1 和 2 位置位来响应该功能。响应后，相应的编码器值的 31 位被删除，并重新刷新。编码器值又可以再次被保持。一旦模板的输出地址的响应位被“复位”，则编码器值可以再次被保持。

在等时模式中，在 To 时间段进行响应。从该时间段，通过数字量输出可以再次保持编码器数值。

1.5 地址分配

1.5.1 编码值的数据区

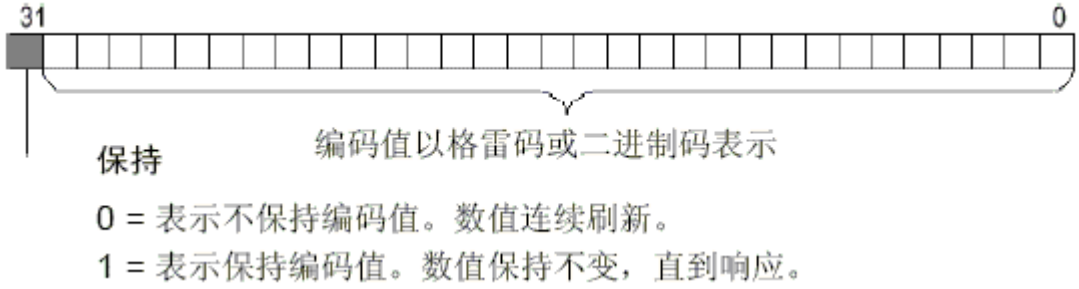
SM 338 的输入和输出都编址为初始模板地址。在使用 STEP 7 进行 SM 338 组态过程中，可以确定输入和输出地址。

1.5.2 输入地址

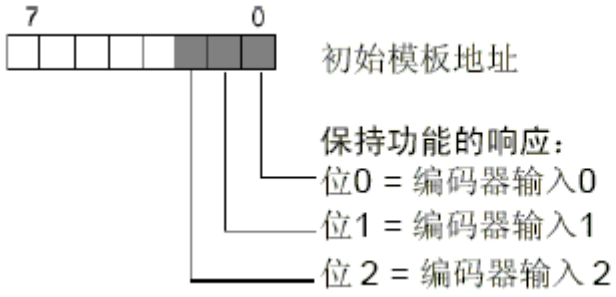
编码器输入	输入地址（组态）+地址偏移量
0	“初始模板地址“
1	“初始模板地址“+ 4 字节地址偏移量
2	“初始模板地址“+ 8 字节地址偏移量

1.5.3 编码器输入的数据双字结构：

每个编码器输入的数据双字具有如下结构：



1.5.4 输出地址



1.5.5 读取数据区

你可以在用户程序中，使用 STEP 7 运行 L PID“xyz“(或者 LAD 的“Move“指令)读取数据区。

1.6 程序编制，编码值的存取和保存功能使用实例

假设你想在编码器输入处读取，并且评估编码值。“初始模板地址“为“256“。OB1 程序如下：

OB1 例子程序

之后，你可以继续从位存储地址区 MD 100、MD 104 和 MD 108 读取编码值。编码值保存在存储双字的位 0 到位 30 中。

1.7 诊断中断程序编制

本节将阐述 SM 338 的诊断中断行为。

SM 338 可以触发诊断中断。有关下述 OB 和 SFC，参见 STEP 7 的在线帮助，其中阐述更为详细。

1.7.1 使能诊断中断

没有预置中断，换言之，即如果没有相应的参数赋值，中断将被禁止。应使用 STEP 7 赋值中断使能的参数。

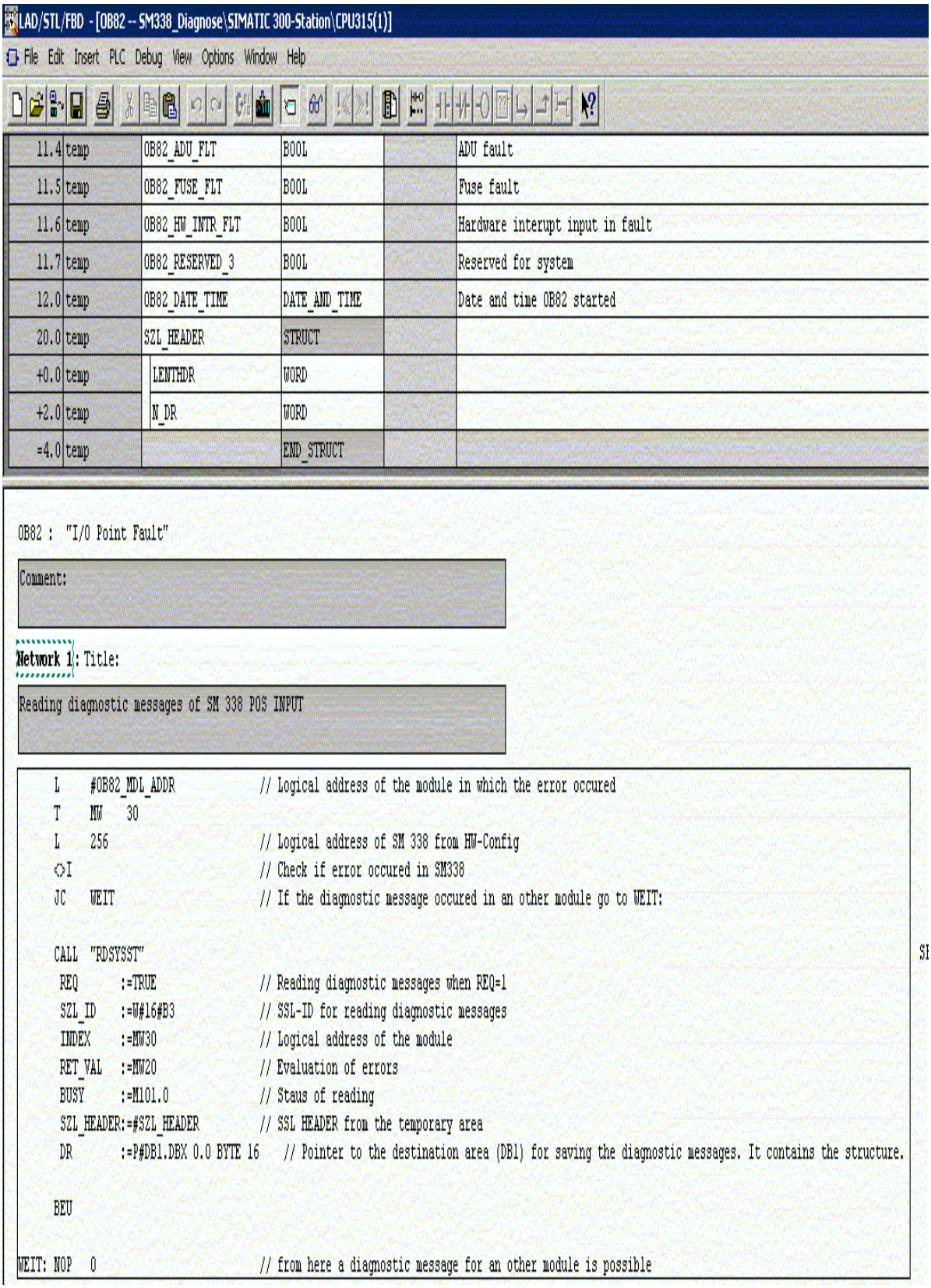
1.7.2 诊断中断 OB82 程序编制

如果你已使能诊断中断，当前的错误事件（故障的初始发生）和排除故障事件（故障排除后的报文）都可通过中断来报告。

CPU 可以中断用户程序的执行，处理诊断中断块（OB 82）。在用户程序中，你可以调用 OB 82 中的 SFC 51 或 SFC 59，以从模板中获得更为详细的诊断信息。

诊断信息在 OB 82 退出之前都是一致的。当 OB 82 退出时，将对模板作出诊断中断响应。

OB82 程序如下：



2 订货号

6ES7 338-4BC01-0AB0

3 特点

位置检测模板 SM 338 具有以下特性：

- ✓ 连接最多 3 个绝对值编码器(SSI)，2 个数字量输入（用于保留编码器数值）；
- ✓ 提供位置编码器数值，用于 STEP 7 软件程序的进一步处理；
- ✓ 可在用户程序中处理 SM 338 采集的编码值；
- ✓ 等时模式；
- ✓ 24 VDC 额定输入电压；
- ✓ 与 CPU 隔离；

4 所支持的编码器类型

位置检测模板 SM 338 支持以下编码器类型：

- ✓ 带 13 位报文帧长度的编码器；
- ✓ 带 21 位报文帧长度的编码器；
- ✓ 带 25 位报文帧长度的编码器；
- ✓ 编码器值的持续时间取决于传输和处理方法；
- ✓ 单稳时间超过 64μs 的编码器不能用于 SM 338。

5 所支持的数据格式

支持格雷码和二进制码数据格式。

6 等时模式

6.1 硬件需求

- ✓ CPU 需要支持时钟功能；
- ✓ DP Master 需要支持“等时模式“；
- ✓ DP 接口模块（IM153-x）需要支持“等时模式“。

6.2 特性

- ✓ 根据系统参数的设置，位置检测模板 SM 338 既可以工作在“非等时模式“，也可以工作在“等时模式“；
- ✓ 在“等时模式“下，“DP Master“和“位置检测模板 SM 338“之间，可以在“PROFIBUS DP”通讯循环中，同步进行数据交换。所有“位置检测模板 SM 338“的 16 个信号输入字节，保持一致、协调；
- ✓ 如果，当前“PROFIBUS DP“通讯循环中，由于“等时模式“失败造成其他的错误。那么，在下一个“PROFIBUS DP“通讯循环中，“位置检测模板 SM 338”可以自动恢复“等时模式“，而没有任何的错误反应；
- ✓ 如果“等时模式“失败，“位置检测模板 SM 338“的 16 个信号输入字节，将无法自动更新。

7 检测编码值

绝对值编码器以报文帧的形式向 SM 338 传送编码值。通过 SM 338 启动报文帧的传送。

- ✓ “非等时模式“的编码值检测可以随时进行；
- ✓ 在“等时模式“的编码值将在 PROFIBUS DP 循环中的 Ti 时间内同步进行检测。

7.1 “非等时模式“编码值检测

- ✓ SM 338 在每个参数化的单元时间间隔内执行报文帧的传送。
- ✓ SM 338 在刷新速率的循环中，与自由运行的报文帧异步地处理检测到的编码值。

7.2 “等时模式“编码值检测

- ✓ 当在 DP 主站系统中的等距离总线循环被激活，以及 DP 从站与 DP 循环同步时，将自动执行同步编码值的检测；
- ✓ SM 338 在每个 PROFIBUS DP 循环的 Ti 时间执行报文帧的传送；
- ✓ SM 338 以 PROFIBUS DP 循环的时钟速率处理所传送的编码值。

8 格雷码与二进制码的转换

当设置为格雷码时，绝对值编码器以格雷码形式提供的编码值转换为二进制码。当设置为二进制码时，所发送的编码值将不进行转换。

9 传送的编码器值和规格化

被传送的编码器值，包括绝对值编码器的编码器位置。根据所使用的编码器，位于编码器位置之前和之后的其它位、连同编码器位置一起传送。

为了让 SM 338 识别编码器位置，应指定：

- ✓ 位置(0 至 12)；
- ✓ 步/分辨率。

编码器值标准化举例：

例如，当使用单圈编码器时，2（的 9 次方幂）步=512 步/分辨率(分辨率/360°)。

在 STEP 7 中进行下列参数设置

- ✓ 编码器绝对值：13 位
- ✓ 标准化：4 个位置
- ✓ 步/分辨率：512

标准化之前：周期性地获得编码值 100

标准化之后：编码值 100

结果：第 0 到第 3 位(4 位用“x”表示)被排除在外。

10 SM 338 的错误诊断

SM 338 可以提供所有诊断报文，而无需其它操作。

10.1 在 STEP 7 中诊断报文后的动作

每个诊断报文都会致使以下动作：

- ✓ 诊断报文被输入到模板的诊断中，并传送到 CPU；
- ✓ 模板中的 SF 指示灯亮；
- ✓ 如果你已使用 STEP 7 对“使能诊断中断“进行了编程，将触发一个诊断中断，并调用 OB 82。

10.2 读出诊断报文

你可以通过用户程序中的 SFC，读出详细的诊断报文（参见附录“信号模板的诊断数据”）。在模板诊断中，你可以查看 STEP 7 中的故障原因（参见 STEP 7 的在线帮助）。

10.3 SF 指示灯指示的诊断报文

- ✓ SM 338 通过 SF 指示灯（组故障指示灯）指示错误。只要 SM 338 一触发诊断报文，SF 指示灯就亮。当所有错误被排除之后，指示灯就熄灭。
- ✓ 如果出现外部故障（传感器电源短路），组故障（SF）指示灯也亮，与 CPU 的运行状态无关（如果通电）。
- ✓ 在启动时以及 SM 338 自测试时，SF 指示灯都亮一下。

10.4 SM 338；POS-INPUT 的诊断报文

下表概述了 SM 338 的诊断报文。

诊断报文	LED	诊断监测
模板有问题	SF	模板
内部故障	SF	模板
外部故障	SF	模板
通道错误	SF	模板
外部辅助电源故障	SF	模板
模板没有参数化	SF	模板

参数错误	SF	模板
通道信息可用	SF	模板
触发监测	SF	模板
通道错误	SF	通道（编码器输入）
组态/参数赋值出错	SF	通道（编码器输入）
外部通道错误（编码器错误）	SF	通道（编码器输入）

10.5 故障原因及排除

诊断报文	LED	诊断监测
模板故障	模板检测到一个错误	
内部故障	模板检测到 PLC 中的错误	
外部故障	模板检测到 PLC 外的错误	
通道错误	某些通道有故障	
外部辅助电源故障	没有模板的电源电压 L+	馈入模板的电源电压 L+
模板没有参数化	模板需要使用系统缺省参数，或者你规定的参数。	通电后报文排队，直到 CPU 参数传送完毕。根据需要参数化模板。
参数错误	一组或者多组参数不合理	重新赋值模板参数
存在通道信息	通道错误；或者模板可以提供其他通道信息	
看门狗断开	临时的高电磁干扰	排除干扰
通道错误	在编码器输入处检测到模板通道的错误	
组态/参数赋值出错	传送给模板的参数非法	重新赋值模板参数
外部通道错误（编码器错误）	编码器电缆断线，没有连接编码器电缆或编码器故障	检查所连接的编码器

11 SM 338 的技术规范

参见“Reference Manual”《Position Decoder Module SM 338; POS-INPUT; (6ES7338-4BC01-0AB0)》1.1.7章节。

Position Decoder Module SM 338; POS-INPUT;(6ES7338-4BC01-0AB0)

12 附录

12.1 OB1 程序实例；

12.2 参考手册《 Position Decoder Module SM 338; POS-INPUT;(6ES7338-4BC01-0AB0)》

12.3 常见问题

1. 已经完成模板 SM338 的参数配置，并且正确下载到 CPU。但是，模板不能正常工作，保持在最后一个编码器计数值，没有读出新的编码器计数值，为什么？
2. 什么原因会造成“POS INPUR, sensor error”SM338 模板错误信息？

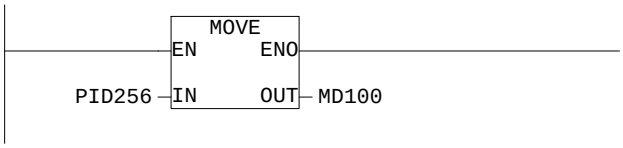
OB1 - <offline>

"CYCL_EXC" Cycle Execution
Name: **Family:**
Author: **Version:** 0.1
Block version: 2
Time stamp Code: 2005-03-04 16:35:19下午
Interface: 1996-02-15 16:51:12下午
Lengths (block/logic/data): 00170 00046 00020

Name	Data Type	Address	Comment
TEMP		0.0	
OB1_EV_CLASS	Byte	0.0	Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
OB1_SCAN_1	Byte	1.0	1 (Cold restart scan 1 of OB 1), 3 (Scan 2-n of OB 1)
OB1_PRIORITY	Byte	2.0	Priority of OB Execution
OB1_OB_NUMBR	Byte	3.0	1 (Organization block 1, OB1)
OB1_RESERVED_1	Byte	4.0	Reserved for system
OB1_RESERVED_2	Byte	5.0	Reserved for system
OB1_PREV_CYCLE	Int	6.0	Cycle time of previous OB1 scan (milliseconds)
OB1_MIN_CYCLE	Int	8.0	Minimum cycle time of OB1 (milliseconds)
OB1_MAX_CYCLE	Int	10.0	Maximum cycle time of OB1 (milliseconds)
OB1_DATE_TIME	Date_And_Time	12.0	Date and time OB1 started

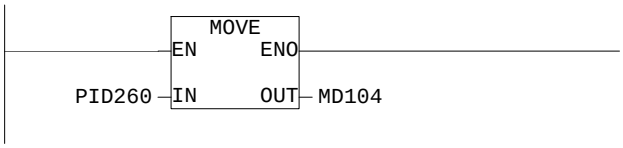
Block: OB1 "Main Program Sweep (Cycle)"

Network: 1



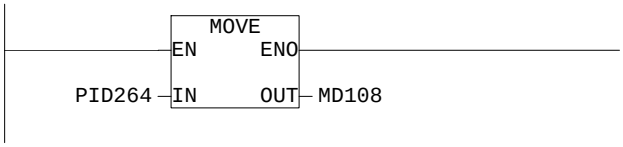
Network: 2

Network: 3



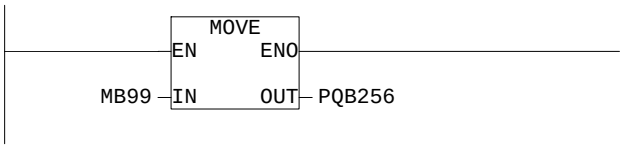
Network: 4

Network: 5



Network: 6

Network: 7



SIEMENS

Product Information on the Reference Manual

Programmable Logic Controllers S7-300 Module Data Release 3

1 Position Decoder Module SM 338; POS-INPUT; (6ES7338-4BC01-0AB0)

Order number

6ES7338-4BC01-0AB0

Characteristics

The position decoder module SM 338; POS-INPUT is distinguished by the following features:

- 3 inputs for the connection of maximum three absolute value encoders (SSI) and 2 digital inputs to freeze the encoder values
- Direct reaction possible to encoder values in moving systems
- Processing of acquired encoder values of the SM 338 in user program
- Supports clocked operation
- Type of encoder value acquisition (see chapter 1.1.2.1) can be selected:
  - Free running
  - Clocked
- 24 VDC rated input voltage
- Non-isolated against the CPU
- Fast mode selectable; with faster encoder recording and compressed checkback interface

  Fast mode is available as of SM 338; POS-INPUT firmware version V2.0.0 and as of STEP 7 V5.3+SP2 selectable.

A5E00409892-01

Supported encoder types

The following encoder types are supported by the SM 338; POS-INPUT:

- Absolute value encoder (SSI) with 13-bit message length
- Absolute value encoder (SSI) with 21-bit message length
- Absolute value encoder (SSI) with 25-bit message length

Supported data formats

The SM 338; POS-INPUT supports the gray code and binary code data formats.

Firmware update[1)]

You can use STEP 7 HW Config firmware update to load POS-INPUT in the operating system memory of the SM 338 in order to extend the functionality and trouble-shooting.

Note

The old firmware is deleted with the start of the firmware update. If the firmware update is interrupted or canceled for any reason, the SM 338; POS-INPUT is no longer functional. Restart the firmware update and wait until it has been successfully completed.

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1) The function is only possible in distributed configuration if the header module (slave interface) supports the necessary system services

1.1 Synchronous Operation

Warning

The basics of synchronous operation are described in a separate manual.

Hardware requirements

For the synchronous operation of the SM 338, you require:

- CPU which supports clocked operation
- DP master which supports the equidistant bus cycle
- Slave interface (IM 153-x) which supports synchronous operation

Characteristics

Depending on the system parameterization, the SM 338 works in either non-synchronous or synchronous mode.

In synchronous operation, the data exchange between DP master and SM 338 is synchronous to the PROFIBUS DP cycle.

In synchronous operation all 16 bytes of the checkback interface are consistent.

If synchronicity is lost due to faults or failure or delay of Global Control (GC), the SM 338 goes back into synchronous operation in the next cycle without error response.

If synchronicity is lost, the checkback interface is not updated.

1.1.1 Terminal Connection Diagram and Block Diagram

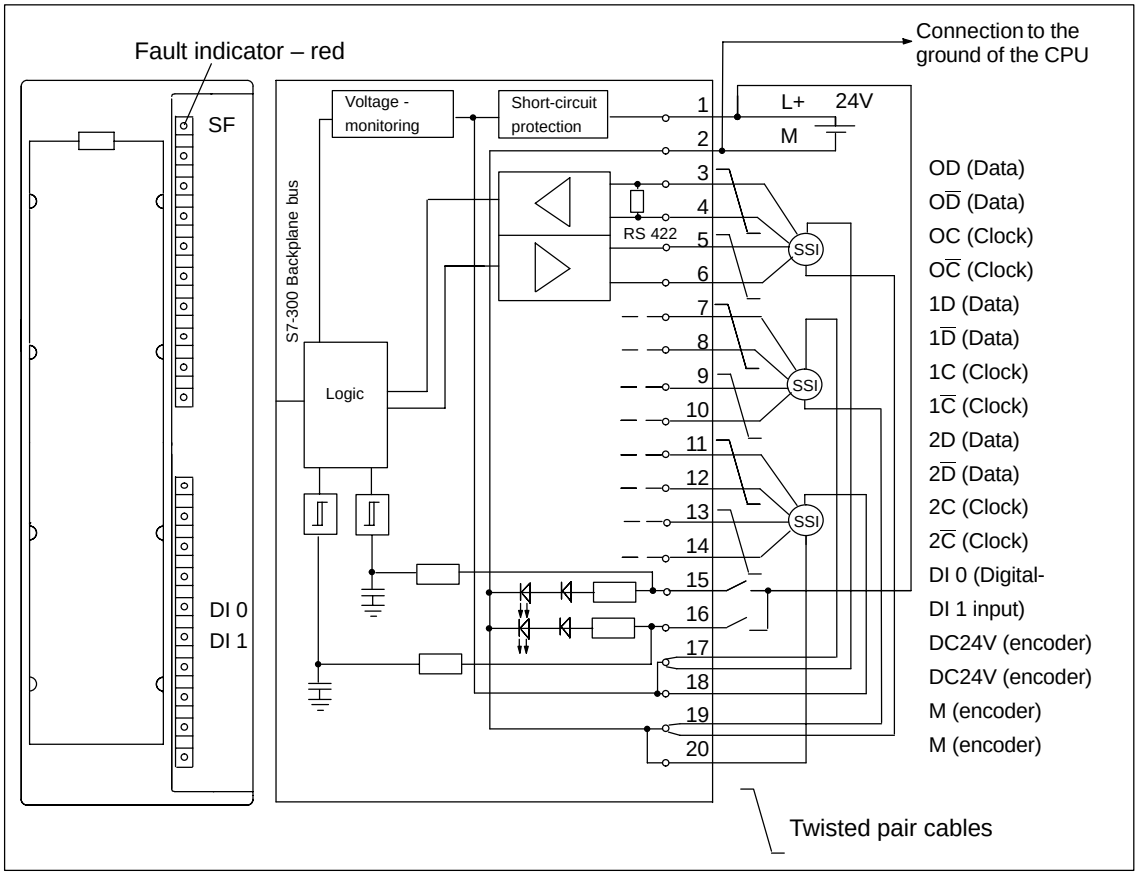


Figure 1-1 Module View and Block Diagram of the SM 338; POS-INPUT

Wiring rules

Please observe the following important rules of the wiring of the module:

- The ground of the encoder supply is connected non-isolated to the ground of the CPU. Thus, connect pin 2 of the SM 338 (M) with low impedance with the ground of the CPU.
- The encoder lines (pins 3 to 14) must be twisted pairs and shielded. Apply the shield to both sides.
  For the shield connection to the SM 338, use the shield connection element (order number 6ES7390-5AA00-0AA0).
- If the output current (900 mA) of the encoder supply is exceeded, then you must connect an external power supply.

1.1.2 Functions of the SM 338; POS INPUT

1.1.2.1 Encoder value acquisition

The absolute value encoder transfers its encoder values in messages to the SM 338. The transfer of the message is initiated by the SM 338.

- In non-synchronous operation, the encoder values are acquired while it is free running.
- In synchronous operation the encoder values are acquired synchronized to the PROFIBUS DP cycle at each T_i.

Free running encoder value acquisition

The SM 338 always initiates the transfer of a message after the end of the parameterized monoflop time.

Asynchronous to these free running messages, the SM 338 processes the acquired encoder values during the cycle of its updating rate (see Technical Data).

Thus, in the case of free running encoder value acquisition, encoder values of different ages result. The difference between the maximum and minimum age is the jitter (see Technical Data).

Synchronous encoder values acquisition

Synchronous encoder values acquisition is automatically set if, in the DP master system, the equidistant bus cycle is activated and the DP Slave is synchronized to the DP cycle.

The SM 338 initiates the transfer of a message in each PROFIBUS DP cycle at the time T_i.

Synchronous to the PROFIBUS DP cycle, the SM 338 processes the transferred encoder values.

1.1.2.2 Gray/Dual Converter

In the Gray setting, the encoder values provided by the absolute value encoder in gray code is converted into Dual code. In the Dual setting, encoder values provided by the absolute value encoder remain unchanged.

Warning

If you have selected the Gray setting, the SM 338 always converts the entire encoder value (13, 21, 25 bits). As a result, preceding special bits affect the encoder values and following bits could be falsified under certain circumstances.

1.1.2.3 Transferred Encoder Value and Normalization

The transferred encoder value contains the encoder position of the absolute value encoder. Depending on the encoder used, additional bits which are located before and after the encoder position are also transferred in addition to the encoder position.

So that the SM 338 can detect the encoder position, make the following settings:

- Normalization, places (0..12), or
- Normalization, units / revolution

Normalization, places

The normalization determines the position of the encoder values in the checkback interface.

- If “Places” = 1, 2....12, this indicates that the following non relevant bits in the encoder values are removed and the encoder value is right justified in the address range (see following example).
- If “Places” = 0, this indicates that the following bits are retained and available for evaluation.
  This can be useful if you use an absolute value encoder which transfers information in the following bits (see manufacturer information) and you want to evaluate these (see also chapter 1.1.2.2).

Parameter units / revolution

A maximum of 13 bits are available for the units/revolution. According to the “Places” data, the resulting number of units/revolution is automatically displayed.

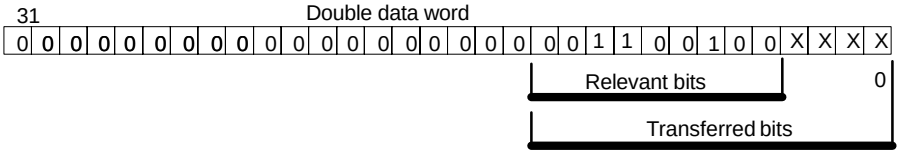
Example of normalization of an encoder value

You are using a single-turn encoder with 2^9 units= 512 units/ revolution (resolution/360°).

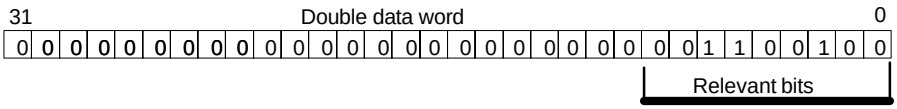
In *STEP 7* you have set the following parameters:

- Absolute encoder: 13 bits
- Normalization: 4 places
- Units / revolution: 512

Before the normalization: cyclically acquired encoder values 100



After the normalization: encoder values 100



Result: Bits 0 to 3 (4 places, marked with “x”) are omitted.

1.1.2.4 Freeze Function

The freeze function “freezes” the current encoder values of the SM 338. The freeze function is coupled to the digital inputs DI 0 and DI 1 of the SM 338.

The freeze is triggered by an edge change (rising edge) on DI 0 or DI 1. A frozen encoder value is identified by the bit 31 (output address) being set. With a digital input you can freeze one, two or three encoder values.

You must switch on the freeze function, i.e. set the corresponding parameters in *STEP 7*. The freeze function is not possible in fast mode.

The encoder values are retained until the freeze function is ended and can thus be evaluated dependent on the event.

Ending the freeze function

The freeze function must be ended at every encoder input. You acknowledge the function in the user program by setting the bit 0, 1 or 2 depending on the channel with the *STEP 7*-Operation T PAB “xyz” (for a program example, see chapter 1.1.4).

After exiting, bit 31 of the corresponding encoder value is again deleted and the encoder values are again updated. A renewed freezing of the encoder values is again possible as soon as you have deleted the acknowledgment bit in the output address of the module.

In synchronous operation the acknowledgment is processed at time T_o. From this point in time a renewed freezing of the encoder values can take place via the digital inputs.

Warning

The freeze function is automatically acknowledged if you newly parameterize the corresponding channel with different parameters (see 1.1.3 chapter).
If the parameters remain identical, the freeze function remains unaffected.

1.1.3 SM 338; POS-INPUT Parameterization

You parameterize the SM 338; POS-INPUT with *STEP 7*. You must perform parameter assignment in STOP mode of the CPU.

As soon as you have set all the parameters, download the parameters from the programming device to the CPU. On a transition from STOP to → RUN mode, the CPU then transfers the parameters to the SM 338.

The parameters cannot be changed by the user program.

Parameters of the SM 338; POS-INPUT

You will find an overview of the parameters that you can set and their default settings for the SM 338 in the table below.

The default settings apply if you have not performed parameter assignment in *STEP 7* (default setting bold).

Table 1-1 Parameters of the SM 338; POS-INPUT

Parameter	values Range	Note
Enable		Release parameter.
• Fast mode	Yes/**no**	Affects all 3 channels.
Enable		Release parameter.
• Diagnosis interrupt	Yes/no	Affects all 3 channels.
Absolute value encoder (SSI) 1)	none; **13 bits**; 21 bits; 25 bits	none: The encoder input is switched off.
Code type 1)	**Gray**; Binary	Code provided by encoder.
Baud rate 1) ,3)	**125 kHz**; 250 kHz; 500 kHz; 1 MHz	Data transfer rate of the SSI position decoder. Observe the relationship between the cable length and baud rate (see Technical Data)
Monoflop time 1),2),3)	16 µs; 32 µs; 48 µs; **64 µs**	The monoflop time is the minimum time interval between 2 SSI message frames. The parameterized monoflop time must always be greater than the monoflop time of the absolute value encoder.
Normalization		Normalizing right justifies the encoder values of the encoder absolute; non-relevant places are discarded.
• Places	**0** to 12	
• Units / revolution 4)	2 to **8192**	
Switching on freeze	**off**; 0; 1	Designation of the digital input whose rising edge causes a freezing of the encoder value.

1) See technical data of the absolute value encoder

2) The monoflop time is the time interval between 2 SSI message frames. The parameterized monoflop time must be greater than the monoflop time of the absolute value encoder (see technical data of the manufacturer). The time 2 × ×(1 / baud rate) is added to the value parameterized in HW config. At a baud rate of 125 kHz with a parameterized monoflop time of 16 µs, an effective monoflop time of 32 µs is actually achieved.

3) The following restriction applies to the monoflop time of the absolute value encoder:
(1 / baud rate) < Monoflop time of the absolute value encoder < 64 µs + 2 × ×(1 / baud rate)

4) to the power of two

Warning

Please note that in non synchronous operation the baud rate and the monoflop time affect the accuracy and actuality of the encoder values.
In synchronous operation the baud rate and the monoflop time affect the accuracy of the freeze function.

1.1.4 SM 338; POS-INPUT Addressing

Data range for the encoder values

The inputs and outputs of the SM 338 are addressed as of the initial module address. The input and output address is determined at the configuration of the SM 338 in *STEP 7*.

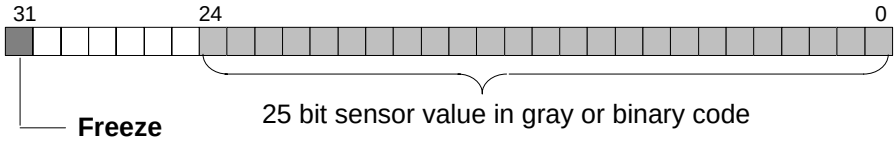
Input Addresses

Table 1-2 SM 338; POS-INPUT: Input Addresses

Encoder input	Input address (from the configuration) + address offset
0	”Initial module address”
1	”Module start address” + 4 bytes address offset
2	”Module start address” + 8 bytes address offset

Structure of the double data word in Standard Mode

For each encoder input the double data word is made up as follows:



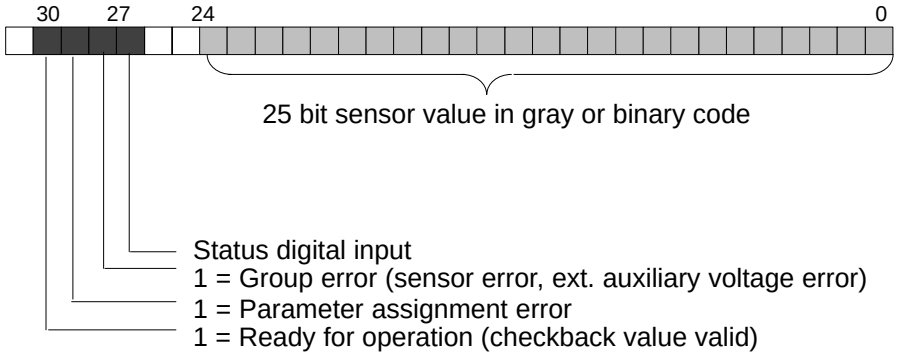
Freeze

0 = encoder value is not frozen. The value is constantly updated.

1 = encoder value is frozen. The value remains constant until acknowledgment.

Structure of the double data word in Fast Mode

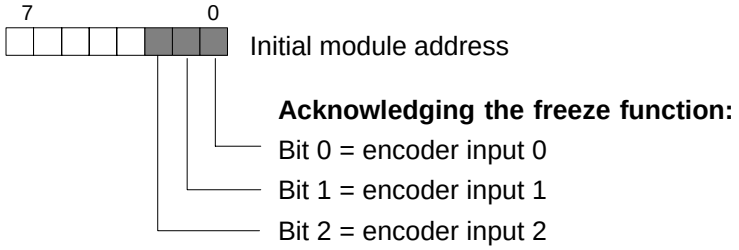
For each encoder input the double data word is made up as follows:



In the double data word of channel 0, the status of the I0 is set in bit 27 (status digital input) and in the double data word of channel 1, the status of the digital input I1 is set.

The bit is always = 0 in the double data word of channel 2.

Output Address im Standard Mode



Reading out data areas

You can read out the data areas in your user program with the *STEP 7*-Operation L PED “xyz”.

Example of access to encoder values and use of the freeze function

You want to read out and evaluate the value of the encoder at the encoder inputs. The module start address is 256.

No output data are supported in fast mode.

```
AWL                              Explanation
L       PED     256     //      Read encoder value in the address range for
                                encoder input 0
T       MD      100     //      Store encoder value in marker double word
U       M       100.7   //      Acquire and store freeze status for later
=       M       99.0    //      acknowledgment

L       PED     260     //      Read encoder value in the address range for
                                encoder input 1
T       MD      104     //      Store encoder value in marker double word
U       M       104.7   //      Acquire and store freeze status for later
=       M       99.1    //      acknowledgment

L       PED     264     //      Read encoder value in the address range for
                                encoder input 2
T       MD      108     //      Store encoder value in marker double word
U       M       108.7   //      Acquire and store freeze status for later
=       M       99.2    //      acknowledgment

L       MB      99      //      Load and acknowledge freeze condition
T       PAB     256     //      (SM 338: output address 256)
```

Afterwards you can further process the encoder values from the marker range MD 100, MD 104 and MD 108. The encoder value is contained in bits 0 to 30 of the marker double word.

1.1.5 Diagnosis of the SM 338; POS-INPUT

The SM 338 makes diagnostic messages available, i.e., all diagnostic messages are always provided by the SM 338 without your assistance.

Actions following diagnostic message in *STEP 7*

Each diagnostic message leads to the following actions:

- The diagnostic message is entered in the diagnosis of the module and forwarded to the CPU.
- The SF LED on the module lights.
- If you have programmed “Enable Diagnostic Interrupt” in *STEP 7*, a diagnostic interrupt is triggered and OB 82 is called.

Reading out diagnostic messages

You can read out detailed diagnostic messages by means of SFCs in the user program (refer to the Appendix “Diagnostic Data of Signal Modules”).

You can view the cause of the error in *STEP 7*, in the module diagnosis (refer to online Help for *STEP 7*).

Diagnostic message via SF LED

The SM 338 indicate errors for you by means of their SF LED (group error LED). The SF LED lights as soon as a diagnostic message is triggered by the SM 338. It goes out when all errors have been rectified.

The group fault (SF) LED also lights up in case of external errors (short circuit of encoder supply), independent of the operating status of the CPU (if power is on).

The SF LED lights up temporarily at startup during the self test of the SM 338.

Diagnostic messages of the SM 338; POS INPUT

The table below gives an overview of the diagnostic messages for the SM 338.

Table 1-3 Diagnostic messages of the SM 338; POS INPUT

Diagnostics Message	LED	Scope of the Diagnostics
Module problem	SF	Module
Internal malfunction	SF	Module
External malfunction	SF	Module
Channel error present	SF	Module
External auxiliary supply missing	SF	Module
Module not parameterized.	SF	Module
Wrong parameters	SF	Module
Channel information available	SF	Module
Time monitoring triggered	SF	Module
Channel error present	SF	Channel (encoder input)
Configuring/parameter assignment error	SF	Channel (encoder input)
External channel error (encoder fault)	SF	Channel (encoder input)

Causes of errors and remedial measures

Table 1-4 Diagnostics Messages of the SM 338, Causes of Errors and Remedial Measures

Diagnostics Message	Possible Error Cause	Remedy
Module fault	An error detected by the module has occurred.	
Internal error	Module has detected an error within the automation system.	
External error	Module has detected an error outside of the automation system.	
Channel error present	Indicates that only specific channels are faulty.	
External auxiliary supply missing	The power supply L+ to the module is missing	Feed supply L+
Module not parameterized	Module requires information whether it should work with parameters preset by the system or with your parameters.	Message present after network active until transfer of the parameters by the CPU complete; parameterize module if necessary.
Wrong parameters	One parameter or the combination of parameters is not plausible	Reassign module parameter
Channel information present	Channel error present; module can provide additional channel information.	
Watchdog tripped	Temporary high electromagnetic interference	Eliminate interference
Channel error present	An error detected by the module has occurred at the encoder input.	
Configuration / parameterization error	Illegal parameter had been transferred to module	Reassign module parameter
External channel error (encoder error)	Broken wire in encoder cable, encoder cable not connected or encoder defective.	Check connected encoder

1.1.6 Interrupts of the SM 338; POS INPUT

Introduction

In this Section, the interrupt behavior of the SM 338; POS-INPUT is described. The SM 338 can trigger diagnostic interrupts.

The OBs and SFCs mentioned below can be found in the online Help for *STEP 7*, where they are described in greater detail.

Enabling interrupts

The interrupts are not preset – in other words, they are inhibited without appropriate parameter assignment. Assign parameters to the Interrupt Enable in *STEP 7* (refer to Section 1.1.3).

Diagnostic interrupt

If you have enabled diagnostic interrupts, then incoming active error events (initial occurrence of the error) and departing error events (message after troubleshooting) are reported by means of interrupts.

The CPU interrupts execution of the user program and processes the diagnostic interrupt block (OB 82).

In the user program, you can call SFC 51 or SFC 59 in OB 82 to obtain more detailed diagnostic information from the module.

The diagnostic information is consistent until such time as OB 82 is exited. When OB 82 is exited, the diagnostic interrupt is acknowledged on the module.

1.1.7 Technical Specifications of the 338; POS-INPUT

Dimensions and Weight	
Dimensions B x H x T (mm)	40 x 125 x 120
Weight	Approx. 235 g
Voltages, Currents, Potentials	
Rated load voltage L+	24 VDC
• Range	20.4 ... 28.8 V
• Reverse polarity protection	No
Isolation	no, only against shield
Permitted potential difference	1 VDC
• between input (M connection) and central grounding point of the CPU	
Encoder supply	
• Output voltage	L+ –0.8 V
• Output current	max. 900 mA, short circuit–proof
Current dissipation	
• From the backplane bus	max. 160 mA
• From the load voltage L+ (no load)	max. 10 mA
Power dissipation of the module	typ. 3 W
Encoder inputs POS INPUT 0 to 2	
Position decoding	absolute
Difference signals for SSI data and SSI clock	according to RS422
Data transfer rate and cable length of absolute value encoders (twisted pair and shielded)	• 125 kHz max. 320 m • 250 kHz max. 160 m • 500 kHz max. 60 m • 1 MHz max. 20 m
Message duration of the SSI transmission	13 bits 21 bits 25 bits
• 125 kHz	112 µs 176 µs 208 µs
• 250 kHz	56 µs 88 µs 104 µs
• 500 kHz	28 µs 44 µs 52 µs
• 1 MHz	14 µs 22 µs 26 µs
Monoflop time[2]	16 µs, 32 µs, 48 µs, 64 µs

Digital inputs DI 0, DI 1	
Isolation	no, only against shield
Input voltage	0-Signal: –3 V ... 5 V 1-Signal: 11 V ... 30.2 V
Input current	0-Signal: ≤2 mA (quiescent current) 1-Signal: 9 mA (typ.)
Input delay	0 > 1: max. 300 µs 1 > 0: max. 300 µs
Maximum repeat frequency	1 kHz
Connection of a two–wire BEROS, type 2	Possible
Shielded line length	600 m
Unshielded line length	32 m
Status, Interrupts, Diagnostics	
Interrupts	
• Diagnostic interrupt	Parameters can be assigned
Status display of digital inputs	LED (green)
Group error/fault	LED (red)
Inaccuracy of the encoder value	
Free running encoder value acquisition (Standard Mode)	
• Maximum age [1)]	(2 × Message duration) + monoflop time + 580 µs
• Minimum age [1)]	Message duration + 130 µs
• Jitter	Message duration + monoflop time + 450 µs
Update rate	Evaluation of the message every 450 µs
Free–wheeling sensor value detection (Fast Mode)	
• Maximum age [1)]	(2 × Message duration) + monoflop time + 400 µs
• Minimum age [1)]	Message duration+ 100 µs
• Jitter	Message duration+ monoflop time + 360 µs
Update rate	Evaluation of the message every 360 µs
Synchronous encoder value acquisition	
• Age	Encoder value at time T_i of the current PROFIBUS DP cycle

Inaccuracy of the frozen encoder value (freeze)	
Free running encoder value acquisition	
• Maximum age 1)	(2 × Message duration) + monoflop time + 580 µs
• Minimum age 1)	Message duration + 130 µs
• Jitter	Message duration + monoflop time + 450 µs
Synchronous encoder value acquisition	
• Jitter	Max (message duration$_n$ + param. Monoflop time $_n$) n = 0, 1, 2, (Channel)

Isochrone time of the module		
In Standard Mode	TWE	850 µs
	TWA	620 µs
	ToiMin	90 µs
	TDPMin	1620 µs
In Fast Mode	TWE	700 µs
	TWA	0 µs
	ToiMin	0 µs
	TDPMin	900 µs

1) Age of the encoder values determined by the transfer process and the processing

2) The following restriction applies to the monoflop time of the absolute value encoder:
(1 / baud rate) < Monoflop time of the absolute value encoder < 64 µs + 2 x (1 / baud rate)

Automation systems > SIMATIC Industrial Automation Systems > PLC > SIMATIC S7 > S7-300/S7-300F > Function modules > FAQ

Block SM338 Position detection Module non operational after download of configuration

QUESTION:
After the loading of the configuration, the position detection module SM338 is parametrized, however, it does no longer work. No new actual position is detected. The last detected actual position remains unmodified. What has to be done?

ANSWER:
If a configured SM338 (6ES7 338-4BC01-0AB0/ E-status E 01) with Firmware version V1.0.0 is loaded with the configuration from the Programming device (PG) with unmodified parameters of the SM338, the parametrized channels of the SM338 still remain parametrized, however they are not operational.

The problem can only be solved by switching the voltage off/on or by a new configuration with different parameters. The behaviour does only happen in the central operation.

Entry ID:16649894 **Date:**08/15/2003

Automation systems > SIMATIC Industrial Automation Systems > PLC > SIMATIC S7 > S7-300/S7-300F > Function modules > FAQ

Possible causes for the "POS INPUT, sensor error" message

QUESTION:
What can cause the "POS INPUT, sensor error" message to be displayed in the SM338 POS INPUT?

ANSWER:
The channel-specific diagnosis "POS INPUT, sensor error" may be attributable to incorrect parameter assignment of the module or to errors in the wiring.
Please check:

- **The parameter assignment**
-
  - Open your project's hardware configuration and go to the Properties mask for the SM338POS INPUT.
  - The sensor-specific parameters are specified in the "Inputs" tab. Check the sensor data against the sensor manufacturer's data sheet. Make any corrections that are required.
  - Once you have input all the data correctly, click on "Save and Compile" to save the parameters in the system data.
  - Transfer the configuration to the CPU.
- **The wiring**
-
  - **The voltage supply to the SSI sensor and requisite chassis ground connections:**
    The voltage supply normally comes from the SM338. Alternatively, the sensor may also be supplied by an external voltage source.
    In either case, a low-resistance connection must be established between the sensor supply ground and the CPU ground. Please check that the supply is present or is not interrupted.
    In order to avoid offset voltages (on the data line, for example), the module ground (pin 2 on the front plug) needs to be connected to the CPU ground (in a centralized configuration) or to the head module ground (in a decentralized configuration).
  - **Plugs:**
    The pairs of signals in the data line (DAT and DAT_N) and the clock line (CLK and CLK_N) have to be correctly wired to the front plug on the SM338. Please check that no signals have been reversed.
    Check the sensor connector for short circuits, cold soldered joints, etc.
  - **Signal lines and shielding**
    It is imperative that sources of interference on the signal lines are suppressed in order to ensure that it operates smoothly. The sensor lines must be shielded and be twisted in pairs. The two signals on the data line and on the clock line must form a core pair. Shield them at both ends.

For further information about this topic, refer to the following manuals:

The voltage supply for the SSI sensor and requisite chassis ground connections:	S7-300 Module Data, sec. 5.4.2; Entry ID 8859629 S7-300 Setup, sec. 5.8.4; ID 13008499
Shielding	S7-300 Module Data, sec. 5.4.2; ID 8859629

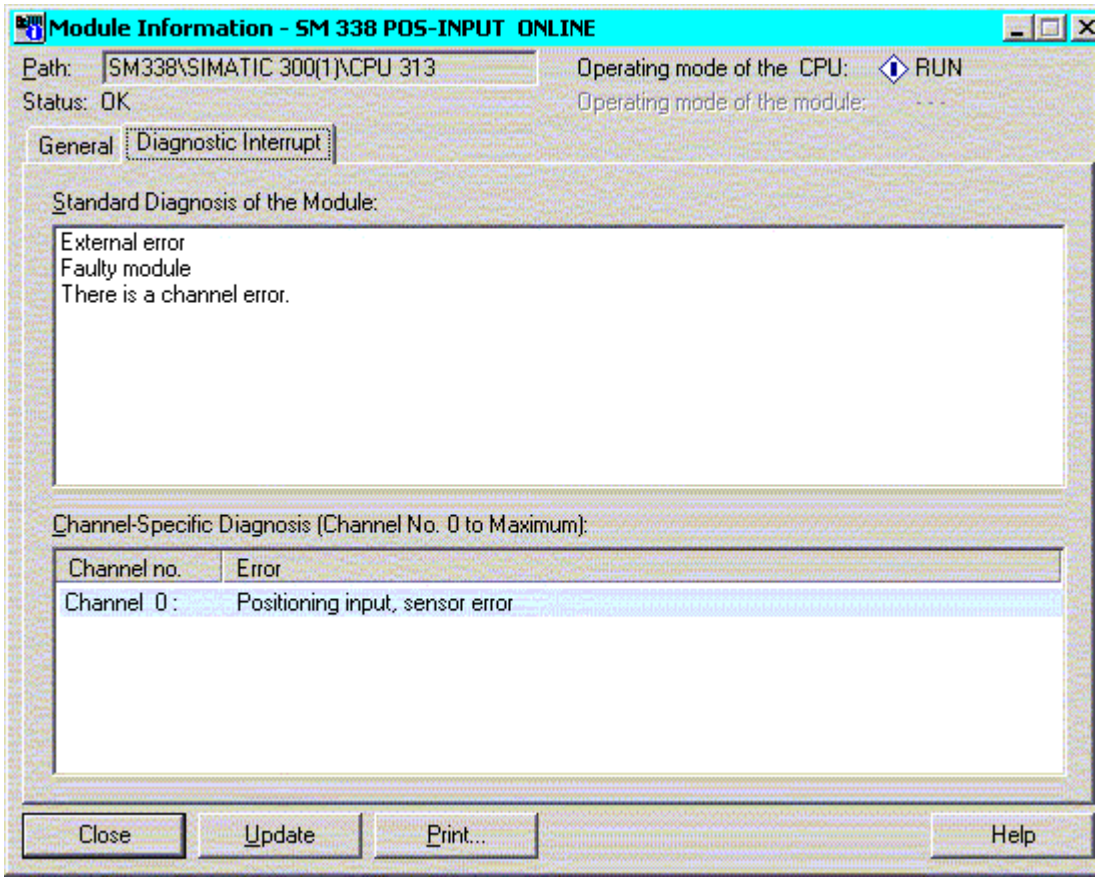


Fig. 1: SM338 "POS INPUT, SENSOR ERROR" diagnosis

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