SIEMENS

常问问题 • 7 月/2012 年

# SINAMICS S120 系统中的编码器转换模块介绍

S120，编码器转换模块

http://support.automation.siemens.com/CN/view/109095403

# 目录

## 1 概述

在 SINAMICS S120 驱动系统中，电机模块只能连接带 Drive-Cliq 通讯接口的编码器，如果电机不带 Drive-Cliq 通讯接口则需要将电机编码器连接到 SMC 或 SME 编码器信号转换模块上，将转换后的信号连接到电机模块上。S120 系统连接示例如图 1 所示：

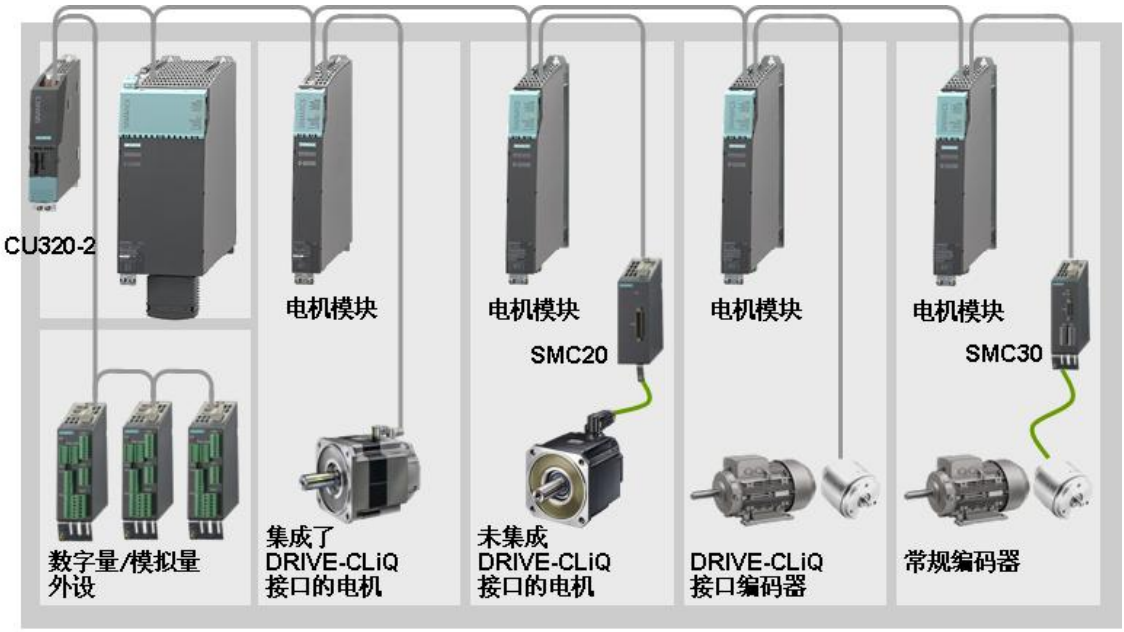



图 1.S120 系统连接示例

编码器模块从安装形式上有用于安装在机柜中及安装在设备上的两种开式，分别为 SMC 及 SME 模块。

可连接的编码器类型：

| | SMC | | | SME | | | |
|---|---|---|---|---|---|---|---|
| Encoder systems | SMC10 | SMC20 | SMC30 | SME20 | SME25 | SME120 | SME125 |
| Resolver | Yes | - | - | - | - | - | - |
| Incremental encoder sin/cos (1 Vpp) with/without reference signal | - | Yes | - | Yes | - | Yes | - |
| Absolute encoder EnDat 2.1 | - | Yes | - | - | Yes | - | Yes |
| Incremental encoder TTL / HTL | - | - | Yes | - | - | - | - |
| Absolute encoder SSI | - | Yes 1) | Yes 2) | - | Yes 1) | - | Yes 1) |
| Temperature evaluation | Yes | Yes | Yes | Yes 3) | - | Yes (electri-cally isolated) | Yes (electri-cally isolated) |

1) 仅可能用于 SSI 编码器 5 V 供电

2) 可用于 SSI 编码器 5 V 或 24V 供电

3) 需定制电缆 6FX8002-2CA88

## 2 安装在机柜中的编码器信号转换模块

机柜式安装的编码器信号转换模块(SMC)可以单独订购和配置。当没有配备带有 DRIVE-

CLiQ 接口的电机或除电机编码器外还需要外部编码器时，可使用这种传感器模块。每个机柜安装式传感器模块(SMC) 只能连接一个传感器系统。

注意：

SMC 为编码器提供电源；必须为 SMC 模块提供单独的 24VDC 电源。

## 2.1 SMC10 模块（6SL3055-0AA00-5AA3）

（1）模块概览

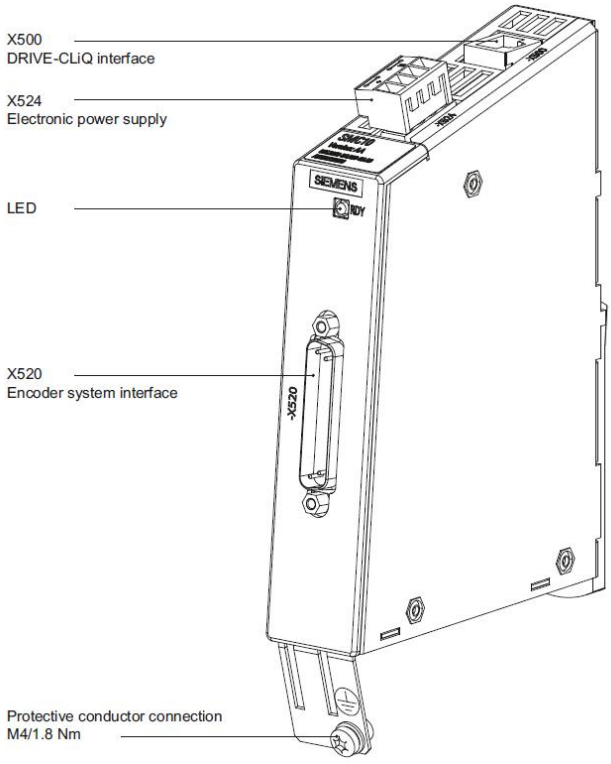



图 2. SMC10 概览

（2）可处理的编码器信号

• 2 极旋转变压器

• 多极旋转变压器

机柜安装式传感器模块 SMC10 通过 DRIVE-CliQ 与控制器 CU320 进行通讯。

（3）设计

机柜安装式编码器模块 SMC10 标准提供有下列接口：

• 1 个 DRIVE-CLiQ 接口

• 1 个编码器接口，包括电机温度检测 (KTY84-130)，通过 Sub-D 连接器连接

• 1 个电子装置电源接口，通过 24 V DC 电源连接器连接

• 1 个 PE ( 保护性接地) 接口

机柜安装式传感器模块 SMC10 的状态通过一个多色 LED 来显示。

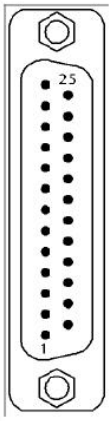
机柜安装式传感器模块 SMC10 可以卡在符合 EN 50 022 标准的 35 x 15 / 7.5 DIN 导轨上。

SMC10 模块和编码器之间的最大编码器电缆长度为：

• 可连接编码器最长电缆长度：130 m

（4）SMC10 X520 接口定义

Table 4- 3 X520 encoder system interface

| | Pin | Signal name | Technical specifications |
|---|---|---|---|
|  | 1 | Reserved, do not use | |
| | 2 | Reserved, do not use | |
| | 3 | S2 | Resolver signal A (sin+) |
| | 4 | S4 | Inverted resolver signal A (sin-) |
| | 5 | Ground | Ground (for internal shield) |
| | 6 | S1 | Resolver signal B (cos+) |
| | 7 | S3 | Inverted resolver signal B (cos-) |
| | 8 | Ground | Ground (for internal shield) |
| | 9 | R1 | Resolver excitation positive |
| | 10 | Reserved, do not use | |
| | 11 | R2 | Resolver excitation negative |
| | 12 | Reserved, do not use | |
| | 13 | + Temp | Motor temperature measurement KTY84-1C130 (KTY+)<br>Temperature sensor KTY84-1C130 / PTC |
| | 14 | Reserved, do not use | |
| | 15 | Reserved, do not use | |
| | 16 | Reserved, do not use | |
| | 17 | Reserved, do not use | |
| | 18 | Reserved, do not use | |
| | 19 | Reserved, do not use | |
| | 20 | Reserved, do not use | |
| | 21 | Reserved, do not use | |
| | 22 | Reserved, do not use | |
| | 23 | Reserved, do not use | |
| | 24 | Ground | Ground (for internal shield) |
| | 25 | - Temp | Motor temperature measurement KTY84-1C130 (KTY-)<br>Temperature sensor KTY84-1C130 / PTC |
| Connector type: SUB-D, 25-pole | | | |

（5）模块连接示例

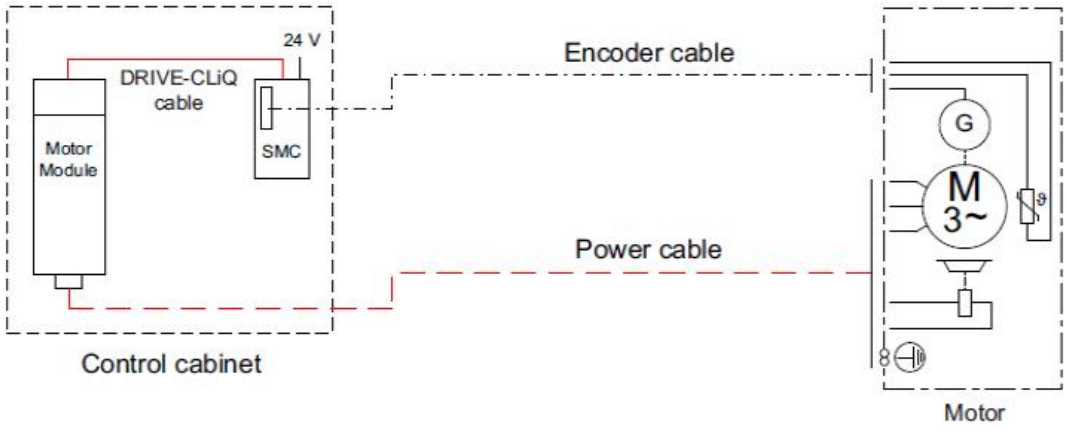



图 3. SMC10 连接示例

（6）可评价的最大频率

| Resolver | | Max. speed resolver / motor | | |
|---|---|---|---|---|
| Number of poles | Number of pole pairs | 8 kHz/125 µsec | 4 kHz/250 µsec | 2 kHz/500 µsec |
| 2-pole | 1 | 120000 rpm | 60000 rpm | 30000 rpm |
| 4-pole | 2 | 60000 rpm | 30000 rpm | 15000 rpm |
| 6-pole | 3 | 40000 rpm | 20000 rpm | 10000 rpm |
| 8-pole | 4 | 30000 rpm | 15000 rpm | 7500 rpm |

## 2.2 SMC20 模块（6SL3055-0AA00-5BA3）

（1）模块概览

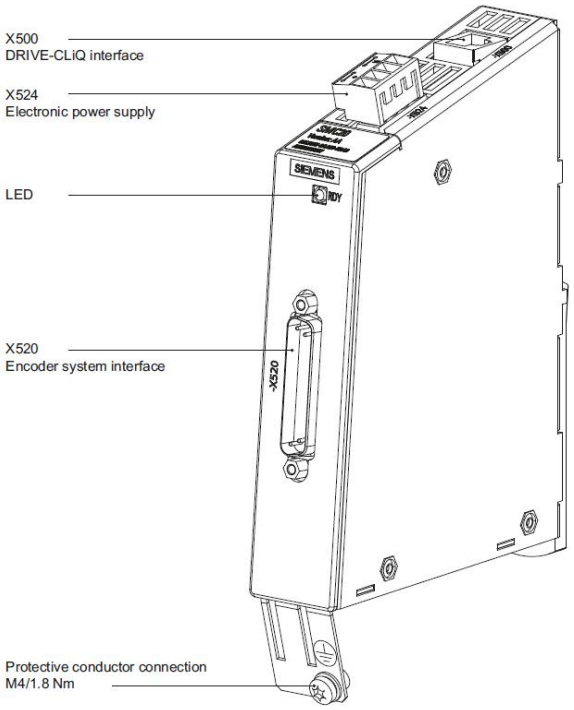


图 4. SMC20 概览

（2）可处理的编码器信号

• 增量编码器 sin/cos 1 Vpp

• 绝对值编码器 EnDat 2.1

• SSI 编码器带增量信号 sin/cos 1 Vpp (版本号 2.4 及之后)

• 编码器供电电源 5 V DC/0.35 A

• 编码器增量信号的最大频率为 500 kHz

• SSI 传输波特率为 100 kBaud

• SMC20 模块和编码器之间的最大编码器电缆长度为 100 m (328 ft)。

此外，还可以借助温度传感器 KTY84-130 来检测电机温度信号。

（3）设计

机柜安装式传感器模块 SMC20 标准提供有下列接口：

• 1 个 DRIVE-CLiQ 接口

• 1 个编码器接口，包括电机温度检测(KTY84-130)，通过 Sub-D 连接器连接

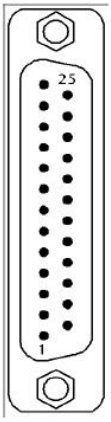
• 1 个电子装置电源接口，通过 24 V DC 电源连接器连接

• 1 个 PE( 保护性接地) 接口

机柜安装式传感器模块 SMC20 的状态通过一个多色 LED 来显示。

机柜安装式传感器模块 SMC20 可以卡在符合 EN 50 022 标准的 35 x 15/7.5 DIN 导轨上。

（4）SMC20 X520 接口定义

| | Pin | Signal name | Technical specifications |
|---|---|---|---|
|  | 1 | P encoder | Encoder power supply |
| | 2 | M encoder | Ground for encoder power supply |
| | 3 | A | Incremental signal A |
| | 4 | A* | Inverse incremental signal A |
| | 5 | Ground | Ground (for internal shield) |
| | 6 | B | Incremental signal B |
| | 7 | B* | Inverse incremental signal B |
| | 8 | Ground | Ground (for internal shield) |
| | 9 | Reserved, do not use | |
| | 10 | Clock | Clock, EnDat interface, SSI clock |
| | 11 | Reserved, do not use | |
| | 12 | Clock* | Inverted clock, EnDat interface,<br>inverted SSI clock |
| | 13 | + Temp | Motor temperature measurement KTY84-1C130 (KTY+)<br>Temperature sensor KTY84-1C130 / PTC |
| | 14 | P sense | Sense input encoder power supply |
| | 15 | Data | Data, EnDat interface,<br>SSI data |
| | 16 | M sense | Ground sense input encoder power supply |
| | 17 | R | Reference signal R |
| | 18 | R* | Inverse reference signal R |
| | 19 | C | Absolute track signal C |
| | 20 | C* | Inverse absolute track signal C |
| | 21 | D | Absolute track signal D |
| | 22 | D* | Inverse absolute track signal D |
| | 23 | Data* | Inverse data, EnDat interface,<br>Inverse SSI data |
| | 24 | Ground | Ground (for internal shield) |
| | 25 | - Temp | Motor temperature measurement KTY84-1C130 (KTY-)<br>Temperature sensor KTY84-1C130 / PTC |

（5）模块连接示例

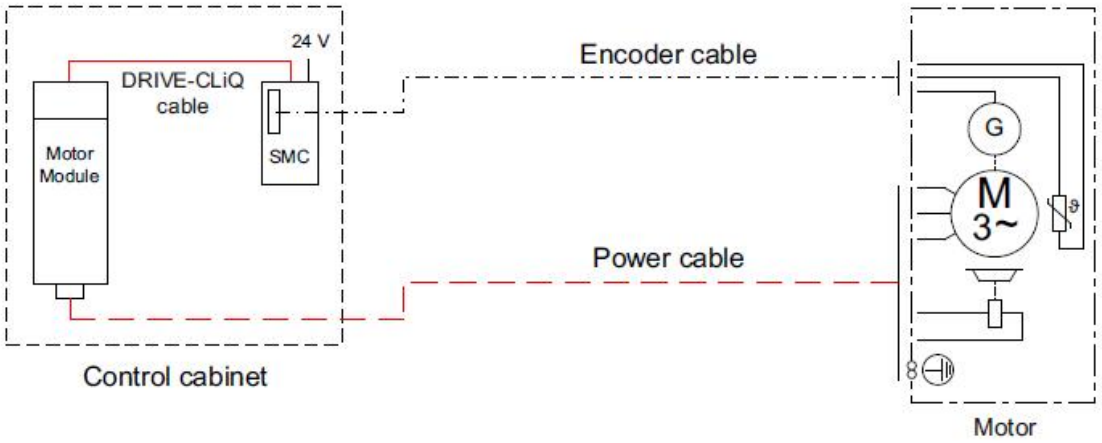



图 5. SMC20 连接示例

注意：

（1）SSI 波特率：100kHz (6SL3055-0AA00-5BA2)

100 - 250 (6SL3055-0AA00-5BA3)

（2）电流控制器时钟

当使用电流控制器时钟为 31.25 μs 时，必须使用订货号为 SL3055-0AA00-5BA3。

### 2.3 SMC30 模块（6SL3055-0AA00-5CA2）

（1）模块概览

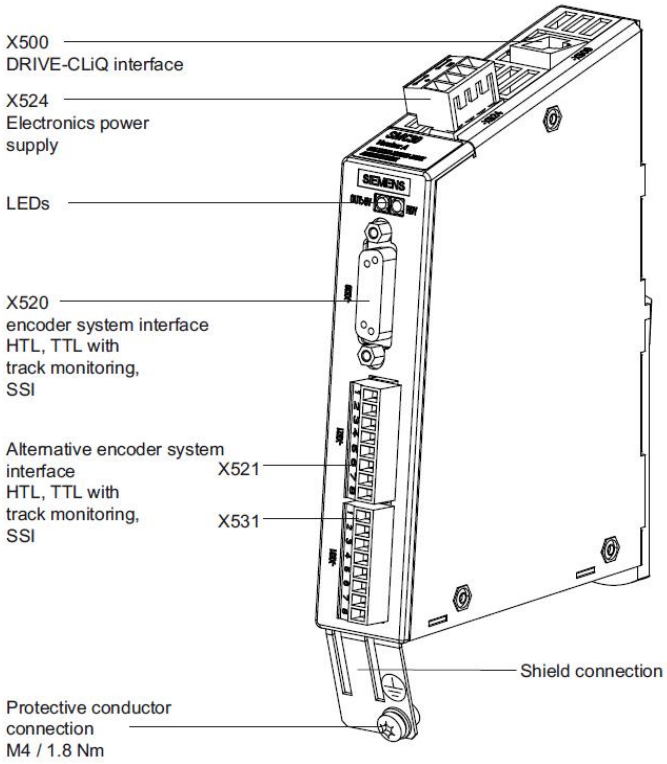



图 6. SMC30 概览

（2）可处理的编码器信号

• 增量编码器 TTL/HTL

• SSI 编码器带有 TTL/HTL 增量信号

• SSI 编码器不带增量信号

• 输入阻抗

- TTL 570 Ω

- HTL, 最大 16 mA

• 编码器供电 24 V DC/0.35 A 或 5 V DC/0.35 A

• 编码器频率，最大 300 kHz

• SSI 波特率 100 … 250 kBaud

• 限制频率 300 kHz

• 绝对位置分辨率 SSI 30 bit

• 最长电缆长度

- TTL 编码器：100 m (328 ft) (仅双极性允许，需用屏蔽双绞线)

- HTL 编码器：单极性 100 m (328 ft) ，双极性 300 m (984 ft) 需用屏蔽双绞线

- SSI 编码器：100 m (328 ft)

（3）设计

机柜安装式传感器模块 SMC30 标准提供有下列接口：

• 1 个 DRIVE-CLiQ 接口

• 1 个编码器接口，包括电机温度检测 (KTY84-130)，通过 Sub-D

连接器或端子连接

• 1 个电子装置电源接口，通过 24 V DC 电源连接器连接

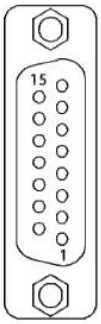
• 1 个 PE ( 保护性接地) 接口

机柜安装式传感器模块 SMC30 的状态通过一个多色 LED 来显示。

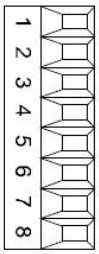
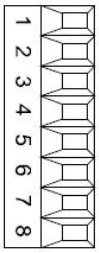
机柜安装式传感器模块 SMC30 可以卡在符合 EN 50 022 要求的 35 x 15/7.5 DIN 导轨上。

（4）SMC30 接口定义

X520 接口定义

| | Pin | Signal name | Technical specifications |
|---|---|---|---|
|  | 1 | Reserved, do not use<br>+ Temp | Motor temperature sensing KTY84-1C130 (KTY+)<br>Temperature sensor KTY84-1C130/PTC/bimetallic switch with NC contact |
| | 2 | Clock | SSI clock |
| | 3 | Clock* | Inverse SSI clock |
| | 4 | P encoder 5 V / 24 V | Encoder power supply |
| | 5 | P encoder 5 V / 24 V | |
| | 6 | P sense | Sense input encoder power supply |
| | 7 | M encoder (M) | Ground for encoder power supply |
| | 8 | Reserved, do not use<br>- Temp | Motor temperature sensing KTY84-1C130 (KTY-)<br>Temperature sensor KTY84-1C130/PTC/bimetallic switch with NC contact |
| | 9 | M sense | Ground sense input |
| | 10 | R | Reference signal R |
| | 11 | R* | Inverse reference signal R |
| | 12 | B* | Inverse incremental signal B |
| | 13 | B | Incremental signal B |
| | 14 | A* / data* | Inverse incremental signal A/inverse SSI data |
| | 15 | A / data | Incremental signal A/SSI data |
| Connector type: SUB-D female, 15-pin | | | |

X521/531 接口定义

| | Pin | Designation | Technical specifications |
|---|---|---|---|
| X521  | 1 | A | Incremental signal A |
| | 2 | A* | Inverse incremental signal A |
| | 3 | B | Incremental signal B |
| | 4 | B* | Inverse incremental signal B |
| | 5 | R | Reference signal R |
| | 6 | R* | Inverse reference signal R |
| | 7 | CTRL | Control signal |
| | 8 | M | Ground |
| | | | |
| | 1 | P_Encoder 5 V / 24 V | Encoder power supply |
| | 2 | M_Encoder | Ground for encoder power supply |
| X531  | 3 | - Temp | Motor temperature sensing KTY84-1C130 (KTY-)<br>Temperature sensor KTY84-1C130/PTC/bimetallic switch with NC contact |
| | 4 | + Temp | Motor temperature sensing KTY84-1C130 (KTY+)<br>Temperature sensor KTY84-1C130/PTC/bimetallic switch with NC contact |
| | 5 | Clock | SSI clock |
| | 6 | Clock* | Inverse SSI clock |
| | 7 | Data | SSI data |
| | 8 | Data* | Inverse SSI data |
| Max. connectable cross-section: 1.5 mm²<br>When using unipolar HTL encoders, at the terminal block A*, B*, R* must be connected to (jumper) M_Encoder (X531)[1]. | | | |

（5）模块连接示例

连接示例 1：带有参考信号的双极性 HTL 编码器

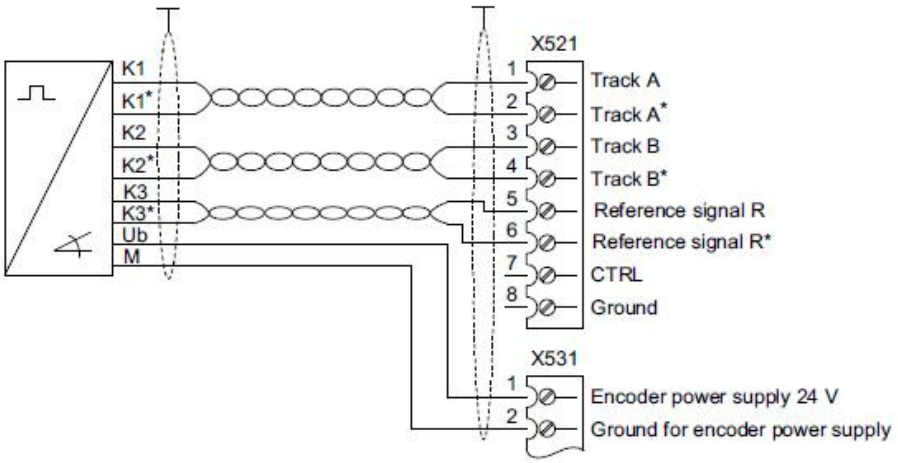



图 7. 连接示例

编码器连线必须使用屏蔽双绞电缆，以抑制电磁干扰。

连接示例 2：带有参考信号的单极性 HTL 编码器

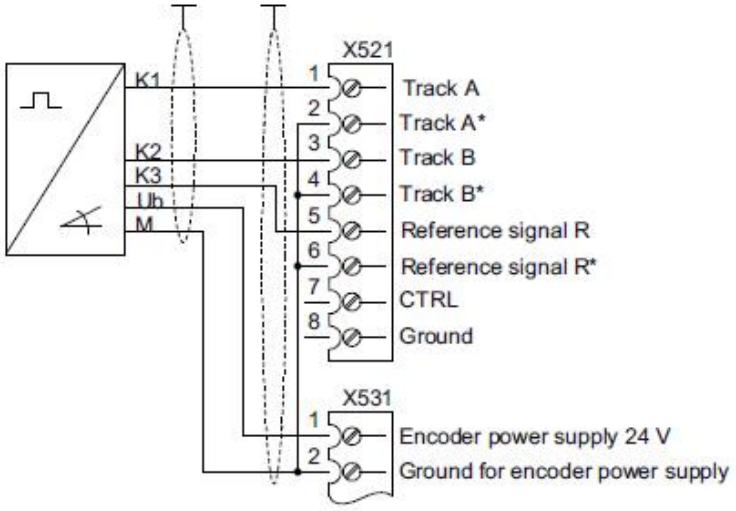



图 8. 连接示例

注意：单极性 HTL 编码器的 A*,B*应连接到 X531 上的 M_Encoder 端子上。

## 3 安装在设备上的的编码器信号转换模块

安装在设备上的电柜外的测量系统可直接连接到外置传感器模块(SME20, SME25, SME120 及 SME125)，在北美遵循 NFPA 79 "工厂机械的电气标准。SME 检测这些测量系统并将所计算的数值转送到 DRIVE-CLiQ，在 SME 中不保存电机和编码器数据。

SME 模块提供编码器的供电，具有较高的防护等级（IP67），适于安装在柜外。

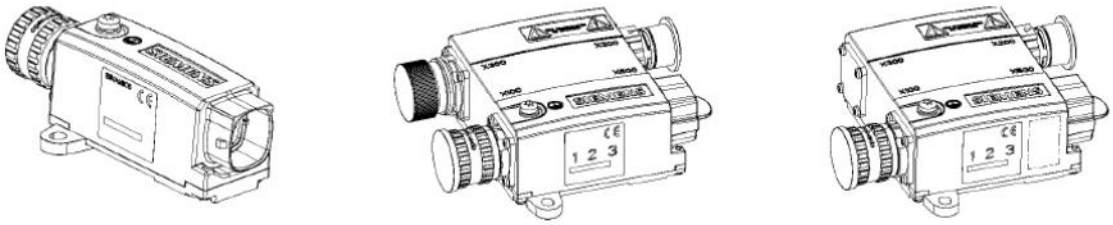



图 9. 模块概览

### 3.1 SME20 模块（6SL3055-0AA00-5EA3）

（1）可处理的编码器信号

可连接增量直接编码器系统带有 SIN/COS (1 Vpp) 及参考信号。

使用适配电缆 6FX 8002-2CA88-xxxx 连接电机编码器至 SME20。

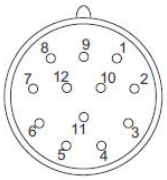
- KTY/PTC 温度传感器用于测量电机温度。
- 编码器模块仅适用于不带绝对轨迹信号的电机:

– 感应电机(如：1PH)

– 带有磁极位置辨识的同步电机 Synchronous (如：1FN, 1FW, 1FE)

SME20 中不保存电机及编码器数据。

（2）编码器系统接口

| | Pin | Signal name | Technical specifications |
|---|---|---|---|
|  | 1 | B* | Inverted incremental signal B |
| | 2 | P5 | Encoder power supply |
| | 3 | R | Reference signal R |
| | 4 | R* | Inverted reference signal R |
| | 5 | A | Incremental signal A |
| | 6 | A* | Inverted incremental signal A |
| | 7 | -Temp | Temperature sensor connection 1) KTY841-C130 or PTC |
| | 8 | B | Incremental signal B |
| | 9 | +Temp | Temperature sensor connection 1) KTY841-C130 or PTC |
| | 10 | M | Ground for encoder power supply |
| | 11 | M | Ground for encoder power supply |
| | 12 | P5 | Encoder power supply |
| Blanking plate for encoder system interface: Pöppelmann GmbH & Co. KG, Lohne, Order No.: GPN 300 F211<br>connector kits, 12-pole, Order No.: 6FX2003-0SA12 | | | |

（3）模块连接示例

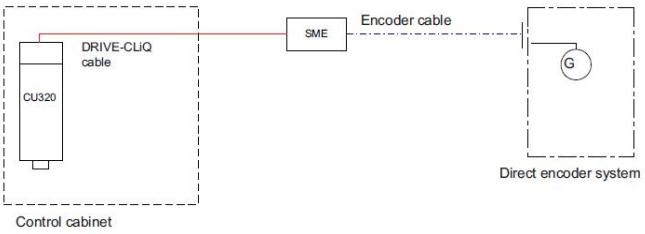



图 10. 连接示例

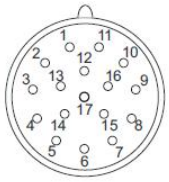
### 3.2 SME25 模块（6SL3055-0AA00-5HA3）

（1）可处理的编码器信号

可连接编码器 EnDat 2.1 或 SSI 带有 SIN/COS (1 Vpp) 增量信号，但不带参考信号。

SME25 中不保存电机及编码器数据。

（2）编码器系统接口

| | Pin | Signal name | Technical specifications |
|---|---|---|---|
|  | 1 | P5 | Encoder power supply |
| | 2 | Reserved, do not use | |
| | 3 | Reserved, do not use | |
| | 4 | M | Ground for encoder power supply |
| | 5 | Reserved, do not use | |
| | 6 | Reserved, do not use | |
| | 7 | P5 | Encoder power supply |
| | 8 | Clock | Clock, EnDat interface, SSI clock |
| | 9 | Clock* | Inverted clock, EnDat interface, inverted SSI clock |
| | 10 | M | Ground for encoder power supply |
| | 11 | Housing potential | |
| | 12 | B | Incremental signal B |
| | 13 | B* | Inverted incremental signal B |
| | 14 | Data | Data, EnDat interface, SSI data |
| | 15 | A | Incremental signal A |
| | 16 | A* | Inverted incremental signal A |
| | 17 | Data* | Inverted data, EnDat interface, Inverted SSI data |
| Blanking plate for encoder system interface: Pöppelmann GmbH & Co. KG, Lohne, Order No.: GPN 300 F211<br>connector kits, 17-pin, Order No.: 6FX2003-0SA17 | | | |

（3）模块连接示例

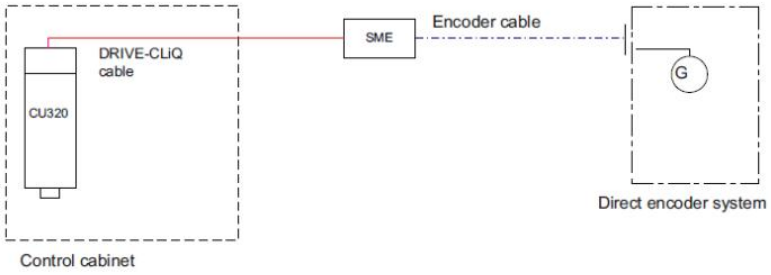



图 11. 连接示例

## 3.3 SME120 模块（6SL3055-0AA00-5HA3）

（1）模块概览

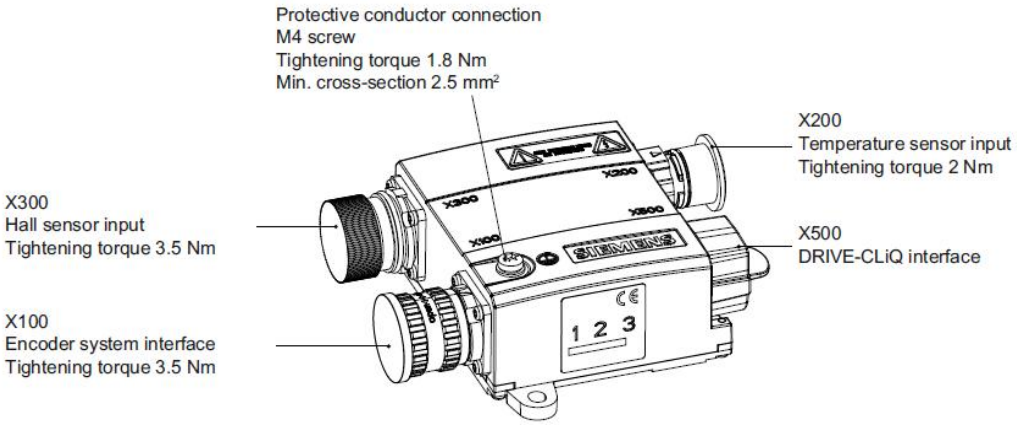


图 12. 模块概览

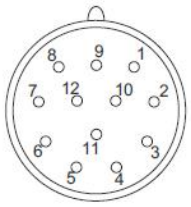
（2）可处理的编码器信号

SME120 主要用于直线电机应用。可连接霍尔传感器盒确定直线电机的换向角位置。

SME120 可连接 SIN/COS (1 Vpp) 及参考信号的增量直接编码器，SME120 中不保存电机及编码器数据。

（3）编码器系统接口

X100 接口：

| | Pin | Signal name | Technical specifications |
|---|---|---|---|
|  | 1 | B* | Inverse incremental signal B |
| | 2 | P5 | Encoder power supply |
| | 3 | R | Reference signal R |
| | 4 | R* | Inverse reference signal R |
| | 5 | A | Incremental signal A |
| | 6 | A* | Inverse incremental signal A |
| | 7 | Reserved, do not use | |
| | 8 | B | Incremental signal B |
| | 9 | Reserved, do not use | |
| | 10 | M | Ground for encoder power supply |
| | 11 | M | Ground for encoder power supply |
| | 12 | P5 | Encoder power supply |
| Blanking plate for encoder system interface: Pöppelmann GmbH & Co. KG, Lohne,<br>Order No.: GPN 300 F211<br>connector kit, 12-pin, Order No.: 6FX2003-0SA12 | | | |

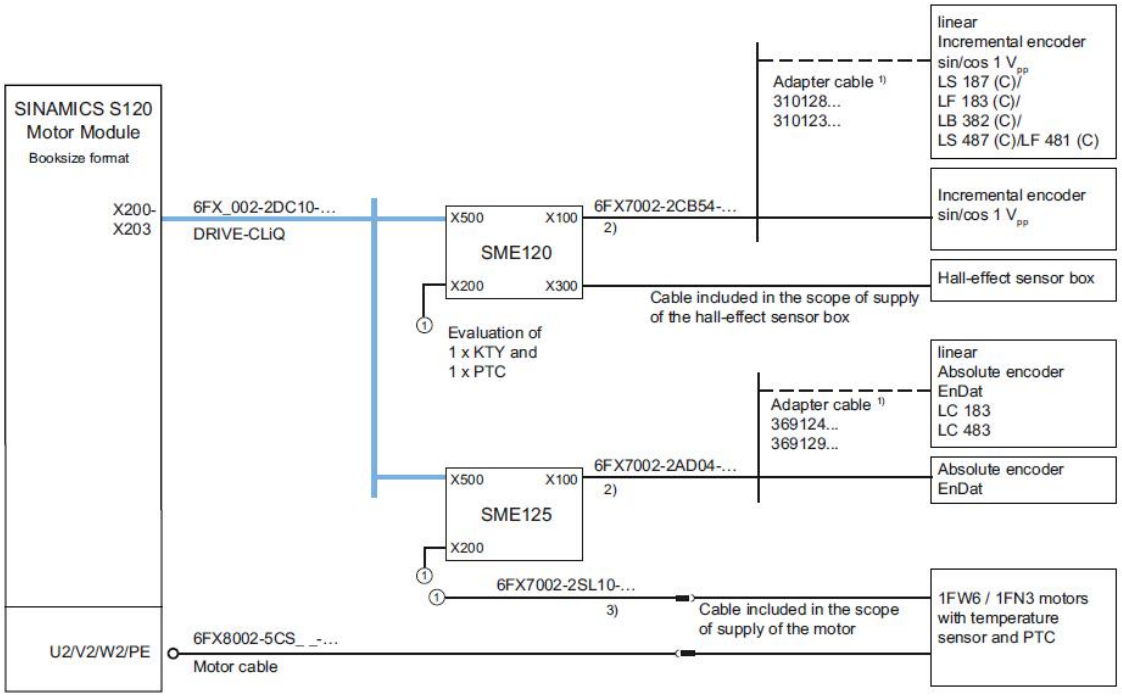
X200 接口：

| Pin | Function | Technical specifications |
|---|---|---|
| 1 | -Temp | Temperature sensor connection KTY84-1C130/PTC/bimetallic switch with NC contact<br>In linear and torque motor applications, connect the KTY84-1C130 motor temperature sensor here |
| 2 | +Temp | |
| 3 | +Temp | Temperature sensor connection KTY84-1C130/PTC/bimetallic switch with NC contact<br>In linear and torque motor applications, connect the PTC triple element 1 or bimetallic switch here |
| 4 | -Temp | |
| 5 | +Temp | Temperature sensor connection KTY84-1C130/PTC/bimetallic switch with NC contact<br>In torque motor applications, connect the PTC triple element 2 here |
| 6 | -Temp | |
| Connector kit, 6+1-pin, order number: 6FX2003-0SU07 | | |

X300 霍尔传感器输入：

| Pin | Signal name | Technical specifications |
|---|---|---|
| 1 | C | Absolute track signal C |
| 2 | C* | Inverse absolute track signal C |
| 3 | P5 | Encoder power supply |
| 4 | M | Ground for encoder power supply |
| 5 | D | Absolute track signal D |
| 6 | D* | Inverse absolute track signal D |
| 7 | Not assigned | |
| 8 | Not assigned | |
| 9 | Ground | Ground (for internal shield) |

（4）模块连接示例




1) Cable can be ordered from supplier of linear scale.
2) max. length of encoder cable, see diagram in Chapter "Technical Data"
3) max. cable length between SME and motor connection: 10 m

图 13. 连接示例

### 3.4 SME125 模块（6SL3055-0AA00-5KA3）

（1）模块概览

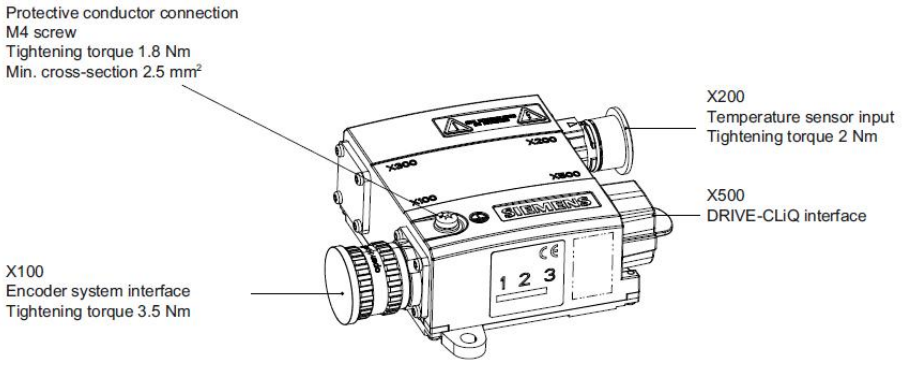



图 14. 模块概览

（2）可处理的编码器信号

SME125 主要用于直线电机应用。可连接霍尔传感器盒确定直线电机的换向角位置。

SME125 可连接 EnDat 2.1 或 SSI 带 SIN/COS (1 Vpp) 增量信号但不带参考信号的绝对值编码器，SME125 中不保存电机及编码器数据。

（3）编码器系统接口

X100 接口：

| | Pin | Signal name | Technical specifications |
|---|---|---|---|
|  | 1 | P5 | Encoder power supply |
| | 2 | Reserved, do not use | |
| | 3 | Reserved, do not use | |
| | 4 | M | Ground for encoder power supply |
| | 5 | Reserved, do not use | |
| | 6 | Reserved, do not use | |
| | 7 | P5 | Encoder power supply |
| | 8 | Clock | Clock, EnDat interface,<br>SSI clock |
| | 9 | Clock* | Inverse clock EnDat interface<br>Inverse SSI clock |
| | 10 | M | Ground for encoder power supply |
| | 11 | Housing potential | |
| | 12 | B | Incremental signal B |
| | 13 | B* | Inverse incremental signal B |
| | 14 | Data | Data, EnDat interface,<br>SSI data |
| | 15 | A | Incremental signal A |
| | 16 | A* | Inverse incremental signal A |
| | 17 | Data* | Inverse data, EnDat interface,<br>Inverse SSI data |
| Blanking plate for encoder system interface: Pöppelmann GmbH & Co. KG, Lohne,<br>Order No.: GPN 300 F211<br>connector kit, 17-pin, Order No.: 6FX2003-0SA17 | | | |

X200 温度传感器输入：

| Pin | Function | Technical specifications |
|---|---|---|
| 1 | -Temp | Temperature sensor connection KTY84-1C130/PTC/bimetallic switch with NC contact<br>In linear and torque motor applications, connect the KTY84-1C130 motor temperature sensor here |
| 2 | +Temp | |
| 3 | +Temp | Temperature sensor connection KTY84-1C130/PTC/bimetallic switch with NC contact<br>In linear and torque motor applications, connect the PTC triple element 1 or bimetallic switch here |
| 4 | -Temp | |
| 5 | +Temp | Temperature sensor connection KTY84-1C130/PTC/bimetallic switch with NC contact<br>In torque motor applications, connect the PTC triple element 2 here |
| 6 | -Temp | |
| Connector kit, 6+1-pin, order number: 6FX2003-0SU07 | | |

（4）模块连接示例

见 SME120。