SIEMENS

SIMATIC

S7-1500

Módulo de salidas analógicas AQ 4xU/I ST (6ES7532-5HD00-0AB0)

Manual de producto

Edición 07/2014

Answers for industry.

SIEMENS

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A5E03484698-AC

Notas jurídicas

Filosofía en la señalización de advertencias y peligros

Este manual contiene las informaciones necesarias para la seguridad personal así como para la prevención de daños materiales. Las informaciones para su seguridad personal están resaltadas con un triángulo de advertencia; las informaciones para evitar únicamente daños materiales no llevan dicho triángulo. De acuerdo al grado de peligro las consignas se representan, de mayor a menor peligro, como sigue.

⚠PELIGRO
Significa que, si no se adoptan las medidas preventivas adecuadas **se producirá** la muerte, o bien lesiones corporales graves.

⚠ADVERTENCIA
Significa que, si no se adoptan las medidas preventivas adecuadas **puede producirse** la muerte o bien lesiones corporales graves.

⚠PRECAUCIÓN
Significa que si no se adoptan las medidas preventivas adecuadas, pueden producirse lesiones corporales.

ATENCIÓN
Significa que si no se adoptan las medidas preventivas adecuadas, pueden producirse daños materiales.

Si se dan varios niveles de peligro se usa siempre la consigna de seguridad más estricta en cada caso. Si en una consigna de seguridad con triángulo de advertencia se alarma de posibles daños personales, la misma consigna puede contener también una advertencia sobre posibles daños materiales.

Personal cualificado

El producto/sistema tratado en esta documentación sólo deberá ser manejado o manipulado por **personal cualificado** para la tarea encomendada y observando lo indicado en la documentación correspondiente a la misma, particularmente las consignas de seguridad y advertencias en ella incluidas. Debido a su formación y experiencia, el personal cualificado está en condiciones de reconocer riesgos resultantes del manejo o manipulación de dichos productos/sistemas y de evitar posibles peligros.

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Los productos de Siemens sólo deberán usarse para los casos de aplicación previstos en el catálogo y la documentación técnica asociada. De usarse productos y componentes de terceros, éstos deberán haber sido recomendados u homologados por Siemens. El funcionamiento correcto y seguro de los productos exige que su transporte, almacenamiento, instalación, montaje, manejo y mantenimiento hayan sido realizados de forma correcta. Es preciso respetar las condiciones ambientales permitidas. También deberán seguirse las indicaciones y advertencias que figuran en la documentación asociada.

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Hemos comprobado la concordancia del contenido de esta publicación con el hardware y el software descritos. Sin embargo, como es imposible excluir desviaciones, no podemos hacernos responsable de la plena concordancia. El contenido de esta publicación se revisa periódicamente; si es necesario, las posibles las correcciones se incluyen en la siguiente edición.

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Prólogo

Finalidad de la documentación

El presente manual de producto complementa los siguientes manuales de sistema:

- Sistema de automatización S7-1500
- Sistema de periferia descentralizada ET 200MP

En estos manuales de sistema se describen las funciones que afectan de forma generalizada a los sistemas.

La información contenida en el presente manual de producto y en los manuales de sistema y de funciones permite poner en marcha los sistemas.

Cambios con respecto a la versión anterior

Con respecto a la versión anterior del manual de producto, se han realizado los siguientes cambios:

- Módulo integrado en el catálogo de hardware STEP 7 (TIA Portal) a partir de V13, Update 3 con las funciones:
  - Shared Output interna del módulo (MSO) para Shared Device
  - Submódulos configurables, p. ej., para Shared Device
- Anexo Open Source Software ampliado

Convenciones

El término "CPU" se refiere en lo sucesivo tanto a los módulos centrales del sistema de automatización S7-1500 como a los módulos de interfaz del sistema de periferia descentralizada ET 200MP.

Preste atención también a las notas marcadas del modo siguiente:

Nota

Una nota contiene información importante relativa al producto descrito en la documentación, al manejo de dicho producto o a aquella parte de la documentación a la que debe prestarse especial atención.

Información de seguridad

Siemens suministra productos y soluciones con funciones de seguridad industrial que contribuyen al funcionamiento seguro de instalaciones, soluciones, máquinas, equipos y redes. Dichas funciones son un componente importante de un sistema global de seguridad industrial. En consideración de lo anterior, los productos y soluciones de Siemens son objeto de mejoras continuas. Por ello, le recomendamos que se informe periódicamente sobre las actualizaciones de nuestros productos

Para el funcionamiento seguro de los productos y soluciones de Siemens, es preciso tomar medidas de protección adecuadas (como el concepto de protección de células) e integrar cada componente en un sistema de seguridad industrial integral que incorpore los últimos avances tecnológicos. También deben tenerse en cuenta los productos de otros fabricantes que se estén utilizando. Encontrará más información sobre seguridad industrial en (http://www.siemens.com/industrialsecurity).

Si desea mantenerse al día de las actualizaciones de nuestros productos, regístrese para recibir un boletín de noticias específico del producto que desee. Encontrará más información en (http://support.automation.siemens.com).

Software de código abierto

En el firmware del producto descrito se utiliza software de código abierto. El software de código abierto se entrega de forma gratuita. Nos hacemos responsables del Producto descrito, incluido el software de código abierto que contiene, de acuerdo con las condiciones vigentes para el Producto. Declinamos cualquier responsabilidad derivada del uso del software de código abierto más allá del flujo del programa previsto para nuestro producto, así como cualquier responsabilidad derivada de los daños causados por modificaciones del software.

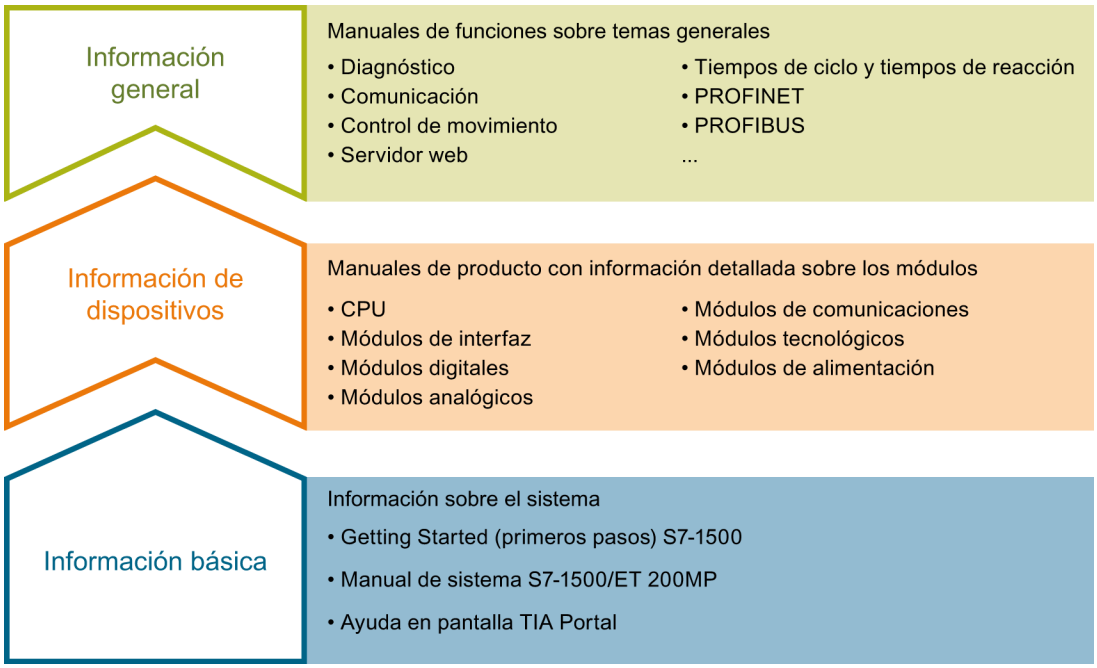
Por motivos legales estamos obligados a publicar las condiciones de licencia y las notas copyright en el texto original. Lea al respecto la información del anexo.

Índice

Guía de la documentación

1

La documentación del sistema de automatización SIMATIC S7-1500 y del sistema de periferia descentralizada SIMATIC ET 200MP se divide en tres partes.
Esta división le permite acceder específicamente al contenido que desee.



Información básica

En el manual de sistema y en Getting Started (primeros pasos) se describen detalladamente la configuración, el montaje, el cableado y la puesta en marcha de los sistemas SIMATIC S7-1500 y ET 200MP. La ayuda en pantalla de STEP 7 le presta asistencia a la hora de configurar y programar.

Información de dispositivos

Los manuales de producto contienen una descripción sintética de la información específica de los módulos, como características, esquemas de conexiones, curvas características o datos técnicos.

Información general

En los manuales de funciones encontrará descripciones exhaustivas sobre temas generales relacionados con los sistemas SIMATIC S7-1500 y ET 200MP, p. ej. diagnóstico, comunicación, control de movimiento, servidor web.

La documentación se puede descargar gratuitamente de Internet (http://www.automation.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/tech-doc-controllers/Pages/Default.aspx).

En la información del producto se documentan los cambios y ampliaciones de los manuales.

Manual Collection S7-1500/ET 200MP

La Manual Collection contiene la documentación completa del sistema de automatización SIMATIC S7-1500 y del sistema de periferia descentralizada ET 200MP recogida en un archivo.

Encontrará la Manual Collection en Internet (http://support.automation.siemens.com/WW/view/es/86140384).

My Documentation Manager

Con My Documentation Manager se combinan manuales enteros o partes de ellos para elaborar un manual propio.
Este manual se puede exportar como archivo PDF o en un formato editable.

Encontrará My Documentation Manager en Internet (http://support.automation.siemens.com/WW/view/es/38715968).

Aplicaciones & Tools

Aplicaciones & Tools le proporciona herramientas y ejemplos para resolver tareas de automatización. Las soluciones se representan como combinación de varios componentes del sistema; se evita centrarse en productos concretos.

Encontrará Aplicaciones & Tools en Internet (http://support.automation.siemens.com/WW/view/es/20208582).

Cesta de Compra CAx

La Cesta de Compra CAx permite acceder a datos de producto actuales para el sistema CAx o CAe.

Con solo unos clics configurará su propio paquete para descargar.

Puede elegir lo siguiente:

- Imágenes de producto, croquis acotados 2D, modelos 3D, esquemas de conexiones, archivos de macros EPLAN
- Manuales, curvas características, instrucciones de uso, certificados
- Datos característicos de productos

Encontrará la Cesta de Compra CAx en Internet (http://support.automation.siemens.com/WW/view/es/42455541).

Descripción del producto

2

2.1 Características

Referencia

6ES7532-5HD00-0AB0

Vista del módulo

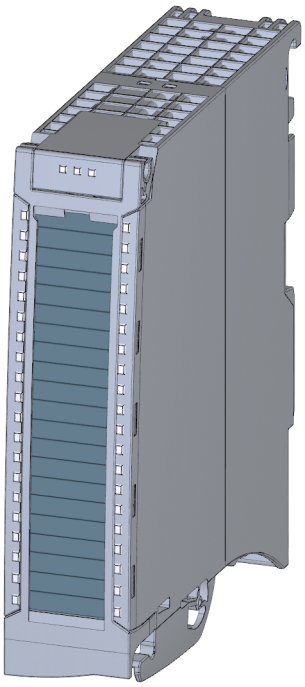


Figura 2-1 Vista del módulo AQ 4xU/I ST

Características

El módulo tiene las siguientes características técnicas:

- 4 salidas analógicas
- Selección de salida de tensión canal por canal
- Selección de salida de intensidad canal por canal
- Resolución: 16 bits incl. signo
- Diagnóstico parametrizable (por canal)

El módulo soporta las siguientes funciones:

Tabla 2- 1 Dependencias de la versión de las funciones del módulo

Función	Versión de firmware del módulo	Software de configuración	
		STEP 7 (TIA Portal)	Archivo GSD en STEP 7 (TIA Portal) a partir de V12 o STEP 7 a partir de V5.5 SP3
Actualización del firmware	a partir de V1.0.0	a partir de V12	X
Datos identificativos I&M0 a I&M3	a partir de V1.0.0	a partir de V12	X
Reparametrización en RUN	a partir de V1.0.0	a partir de V12	X
Calibración en runtime	a partir de V1.0.0	a partir de V12	X
Shared Output interna del módulo (MSO)	a partir de V2.0.0	a partir de V13, Update 3 (solo PROFINET IO)	X (solo PROFINET IO)
Submódulos configurables/submódulos para Shared Device	a partir de V2.0.0	a partir de V13, Update 3 (solo PROFINET IO)	X (solo PROFINET IO)
Configurable detrás del módulo de interfaz IM 155-5 DP ST	a partir de V2.0.0	a partir de V13	X

El módulo puede configurarse con STEP 7 (TIA Portal) y con un archivo GSD.

Accesorios

Los siguientes accesorios se suministran con el módulo y también pueden pedirse como repuesto:

- Abrazadera de pantalla
- Clip de pantalla
- Módulo de alimentación
- Tiras rotulables
- Conector U
- Puerta frontal universal

Otros componentes

Los siguientes componentes deben pedirse por separado:

Conector frontal incl. puentes y bridas para cables

Encontrará más información acerca de los accesorios en los manuales de sistema Sistema de automatización S7-1500 (http://support.automation.siemens.com/WW/view/es/59191792) y Sistema de periferia descentralizada ET 200MP (http://support.automation.siemens.com/WW/view/es/59193214).

Conexión

3

En el presente capítulo encontrará el diagrama de principio del módulo y diferentes opciones de conexión.

Encontrará información sobre cómo cablear el conector frontal, apantallar el cable, etc. en el manual de sistema Sistema de automatización S7-1500 (http://support.automation.siemens.com/WW/view/es/59191792) y en el manual de sistema Sistema de periferia descentralizada ET 200MP (http://support.automation.siemens.com/WW/view/es/59193214), capítulo Conexión.

Nota

Las diferentes posibilidades de conexión pueden utilizarse opcionalmente para todos los canales y combinarse libremente.

Nota

¡Los puentes suministrados con el conector frontal no deben montarse!

Abreviaturas utilizadas

QV_n	Salida de tensión, canal
QI_n	Salida de intensidad, canal
S_n+/S_n-	Línea de sensor, canal
L+	Conexión para la tensión de alimentación
M	Conexión de masa
M_{ANA}	Potencial de referencia del circuito analógico
CHx	Canal o indicador para estado de canal
PWR	Indicador para tensión de alimentación

Asignación de terminales para el módulo de alimentación

El módulo de alimentación se enchufa en el conector frontal y sirve para alimentar el módulo analógico. Para ello debe conectar la tensión de alimentación a los bornes 41 (L+) y 44 (M). Utilice los bornes 42 (L+) y 43 (M) para conectar en bucle el potencial con el siguiente módulo.

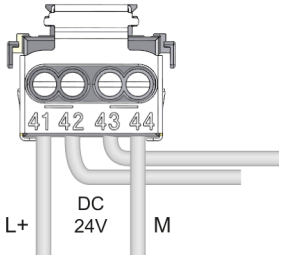
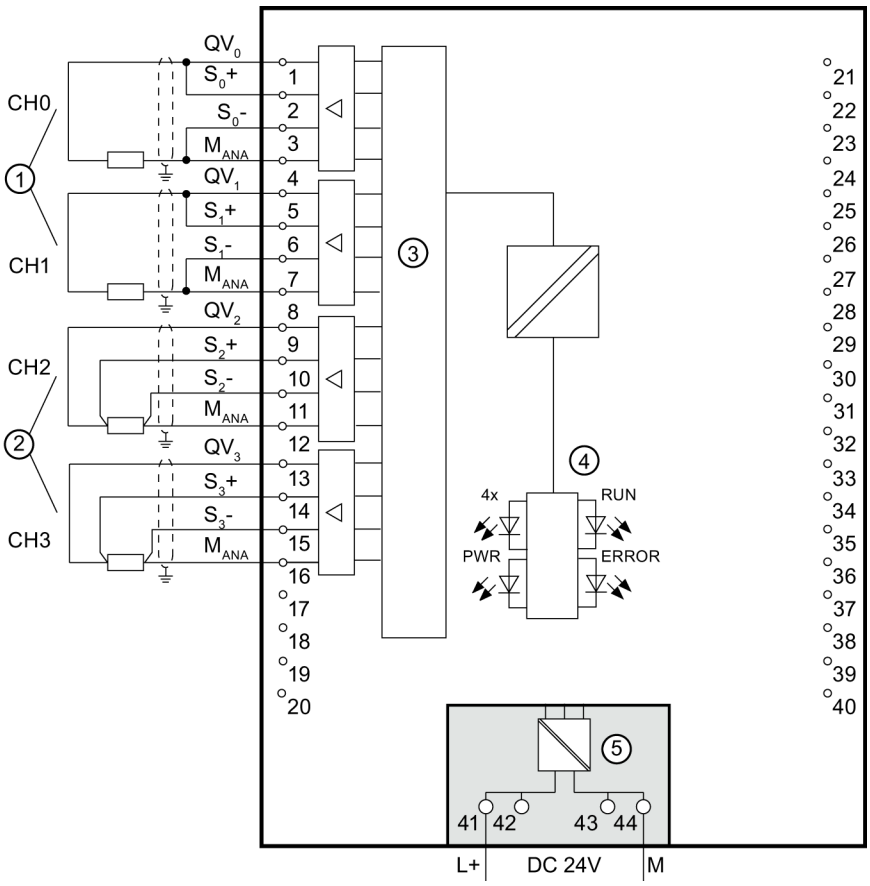


Figura 3-1 Conexión del módulo de alimentación

Diagrama de principio y asignación de terminales para salida de tensión

La siguiente figura muestra como ejemplo las siguientes posibilidades de conexión:

- Conexión a 2 hilos, sin compensación de las resistencias del cable.
- Conexión a 4 hilos, con compensación de las resistencias del cable.

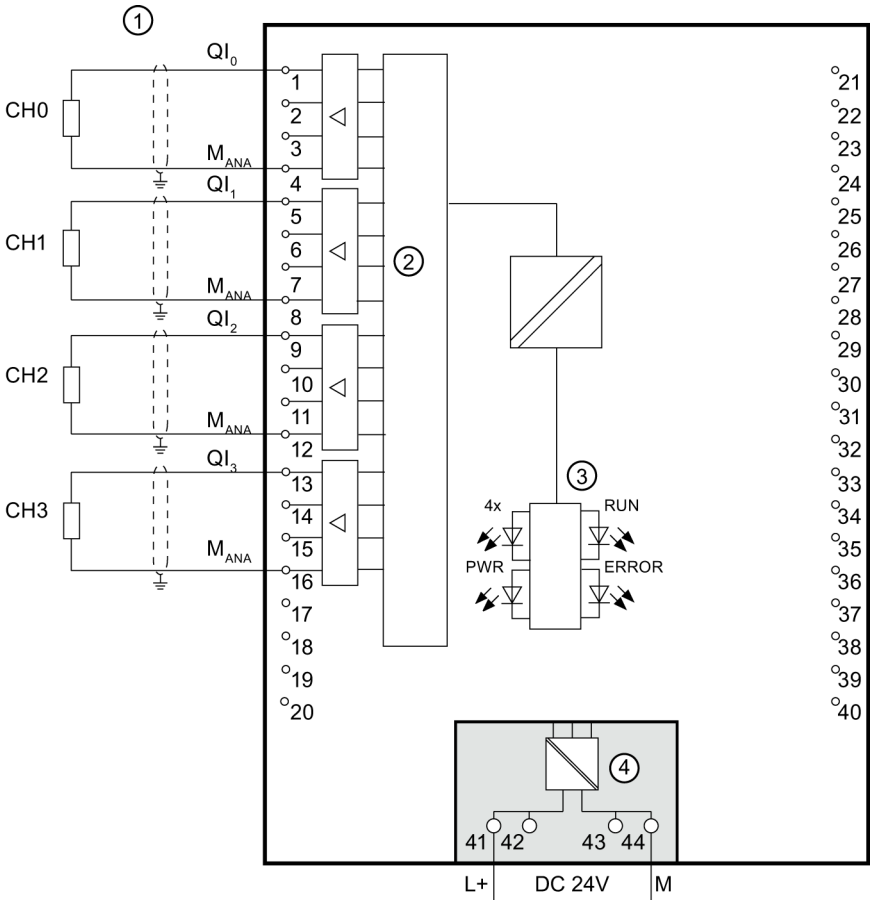


① Conexión a 2 hilos (puente en el conector frontal)
② Conexión a 4 hilos
③ Convertidor digital/analógico (CDA)
④ Interfaz con el bus de fondo
⑤ Tensión de alimentación mediante módulo de alimentación

Figura 3-2 Diagrama de principio y asignación de terminales para salida de tensión

Diagrama de principio y asignación de terminales para salida de intensidad

La siguiente figura muestra como ejemplo la asignación de terminales para el cableado de las salidas de intensidad.



① Carga en salidas de intensidad
② Convertidor digital/analógico (CDA)
③ Interfaz con el bus de fondo
④ Tensión de alimentación mediante módulo de alimentación

Figura 3-3 Diagrama de principio y asignación de terminales para salida de intensidad

Parametrización y direccionamiento

4

4.1 Rangos de salida

El módulo tiene preajustados el tipo de salida Tensión y el rango de salida ±10 V. Si desea utilizar otro rango de salida u otro tipo de salida, deberá cambiar la parametrización del módulo con STEP 7.

Tipos y rangos de salida

La siguiente tabla muestra los tipos y rangos de salida correspondientes.

Tabla 4- 1 Tipos y rangos de salida

Tipo de salida	Rango de salida
Tensión	de 1 a 5 V de 0 a 10 V ±10 V
Intensidad	0 a 20 mA 4 a 20 mA ±20 mA
Desactivado	-

Las tablas de rangos de salida, rebase por exceso, rango de saturación por exceso, etc. se encuentran en el anexo Representación de valores analógicos (Página 40).

4.2 Parámetros

Parámetros del AQ 4xU/I ST

Al efectuar la parametrización del módulo con STEP 7, se especifican las características del módulo mediante diferentes parámetros. Los parámetros ajustables figuran en la siguiente tabla. El rango efectivo de los parámetros ajustables depende del tipo de configuración. Son posibles las siguientes configuraciones:

- Operación centralizada con una CPU S7-1500
- Operación descentralizada con PROFINET IO en un sistema ET 200MP
- Operación descentralizada con PROFIBUS DP en un sistema ET 200MP

Al efectuar la parametrización en el programa de usuario, los parámetros se transfieren al módulo mediante registros con la instrucción WRREC ; ver capítulo Parametrización y estructura de un registro de parámetros (Página 35).

Tabla 4- 2 Parámetros ajustables y su preajuste

Parámetro	Rango de valores	Ajuste estándar	Reparametrización en RUN	Rango efectivo con software de configuración, p. ej., STEP 7 (TIA Portal)	
				Archivo GSD PROFINET IO	Archivo GSD PROFIBUS DP
Diagnóstico					
• Falta tensión de alimentación L+	Sí/No	No	Sí	Canal*	Módulo**
• Rotura de hilo	Sí/No	No	Sí	Canal	Módulo**
• Cortocircuito a M	Sí/No	No	Sí	Canal	Módulo**
• Rebase por defecto	Sí/No	No	Sí	Canal	Módulo**
• Rebase por exceso	Sí/No	No	Sí	Canal	Módulo**
Salida					
• Tipo de salida	Intensidad/tensión	Tensión	Sí	Canal	Canal
• Rango de salida	Consulte el capítulo Rangos de salida (Página 16)	±10 V	Sí	Canal	Canal
• Reacción a STOP de la CPU	• Desconectar • Mantener último valor • Aplicar valor sustitutivo	Desconectar	Sí	Canal	Canal

Parámetro	Rango de valores	Ajuste estándar	Reparametrización en RUN	Rango efectivo con software de configuración, p. ej., STEP 7 (TIA Portal)	
				Archivo GSD PROFINET IO	Archivo GSD PROFIBUS DP
• Valor sustitutivo	Ver Tabla B-4 Valor sustitutivo admisible para el rango de salida (Página 39)	0	Sí	Canal	Canal

* Si habilita el diagnóstico para varios canales, en caso de fallo de la tensión de alimentación recibirá una avalancha de avisos, puesto que cada canal habilitado detectará este fallo. Puede evitar la avalancha de avisos habilitando el diagnóstico solo para un canal.

** Para cada canal puede ajustar el rango efectivo de los diagnósticos en el programa de usuario mediante los registros 64 a 67.

Detección de cortocircuito

Para el tipo de salida Tensión puede parametrizarse el diagnóstico de cortocircuito a M. La detección de cortocircuito no es posible con valores de salida pequeños, de modo que las tensiones emitidas deben ser inferiores a -0,1 V o superiores a +0,1 V.

Detección de rotura de hilo

Para el tipo de salida Intensidad puede parametrizarse el diagnóstico de rotura de hilo. La detección de rotura de hilo no es posible con valores de salida pequeños, de modo que las intensidades emitidas deben ser inferiores a -0,2 mA o superiores a +0,2 mA.

4.3 Explicación de los parámetros

Falta tensión de alimentación L+

Habilitación del diagnóstico si no hay tensión de alimentación L+ o es demasiado baja.

Rotura de hilo

Habilitación del diagnóstico si el cable que va al actuador está interrumpido.

Cortocircuito a masa

Habilitación del diagnóstico si aparece un cortocircuito a M_{ANA} de la salida.

Rebase por exceso

Habilitación del diagnóstico si el valor de salida sobrepasa el margen de saturación por exceso.

Rebase por defecto

Habilitación del diagnóstico si el valor de salida está por debajo del margen de saturación por defecto.

Reacción a STOP de la CPU

Determina el comportamiento de la salida cuando la CPU pasa al estado operativo STOP.

Valor sustitutivo

El valor sustitutivo es el valor que indica el módulo en caso de STOP de la CPU.

4.4 Área de direcciones

En STEP 7, el módulo puede configurarse de diferentes maneras (ver la tabla siguiente). En función de la configuración se asignan direcciones adicionales o distintas en la memoria imagen de proceso de las salidas/entradas.

Opciones de configuración de AQ 4xU/I ST

El módulo puede configurarse con STEP 7 (TIA Portal) o con un archivo GSD.

Si se configura el módulo a través de un archivo GSD, encontrará las configuraciones bajo diversos nombres abreviados/nombres de módulo.

Son posibles las configuraciones siguientes:

Tabla 4- 3 Opciones de configuración

Configuración	Nombre abreviado/nombre del módulo en el archivo GSD	Software de configuración, p. ej., con STEP 7 (TIA Portal)	
		Integrado en el catálogo de hardware STEP 7 (TIA Portal)	Archivo GSD en STEP 7 (TIA Portal) a partir de V12 o STEP 7 a partir de V5.5 SP3
1 x 4 canales sin información de calidad	AQ 4xU/I ST	a partir de V12	X
1 x 4 canales con información de calidad	AQ 4xU/I ST QI	a partir de V12	X
4 x 1 canales sin información de calidad	AQ 4xU/I ST S	a partir de V13, Update 3 (solo PROFINET IO)	X (solo PROFINET IO)
4 x 1 canales con información de calidad	AQ 4xU/I ST S QI	a partir de V13, Update 3 (solo PROFINET IO)	X (solo PROFINET IO)
1 x 4 canales con información de calidad para Shared Output interna del módulo con hasta 4 submódulos	AQ 4xU/I ST MSO	a partir de V13, Update 3 (solo PROFINET IO)	X (solo PROFINET IO)

Información de calidad (Quality Information, QI)

Las opciones siguientes siempre tienen activada la información de calidad:

- AQ 4xU/I ST QI
- AQ 4xU/I ST S QI
- AQ 4xU/I ST MSO

Cada canal tiene asignado un bit adicional de información de calidad. El bit de información de calidad indica si el valor de salida especificado por el programa de usuario está realmente presente en el borne del módulo (0 = el valor es erróneo).

Área de direcciones del AQ 4xU/I ST

La siguiente figura muestra la asignación del área de direcciones en la configuración como módulo de 4 canales. La dirección inicial del módulo puede asignarse libremente. Las direcciones de los canales se derivan de dicha dirección inicial.

"QB x indica p. ej., el byte de salida "x" de la dirección inicial del módulo.

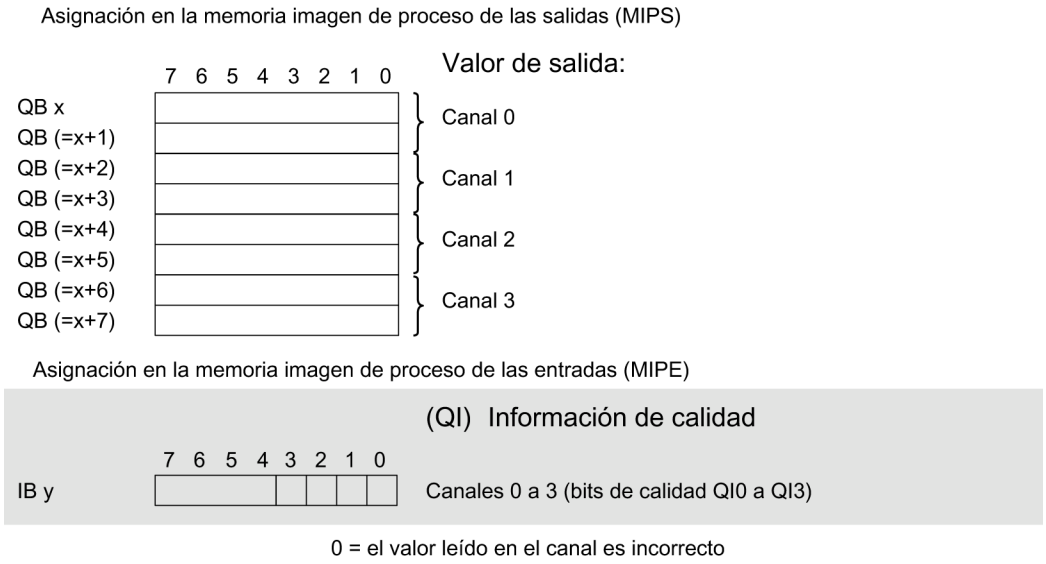


Figura 4-1 Área de direcciones en la configuración como AQ 4xU/I ST de 1 x 4 canales con información de calidad

Área de direcciones en la configuración como AQ 4xU/I ST S QI de 4 x 1 canales

En la configuración como módulo de 4 x 1 canales, los canales del módulo se reparten entre varios submódulos. Estos submódulos pueden asignarse a diferentes controladores IO si el módulo se utiliza en un Shared Device.

El número de submódulos disponibles depende del módulo de interfaz utilizado. Lea las indicaciones del manual de producto que corresponda al módulo de interfaz.

A diferencia de la configuración como módulo de 1 x 4 canales, cada uno de los cuatro submódulos posee una dirección inicial que se puede asignar libremente.

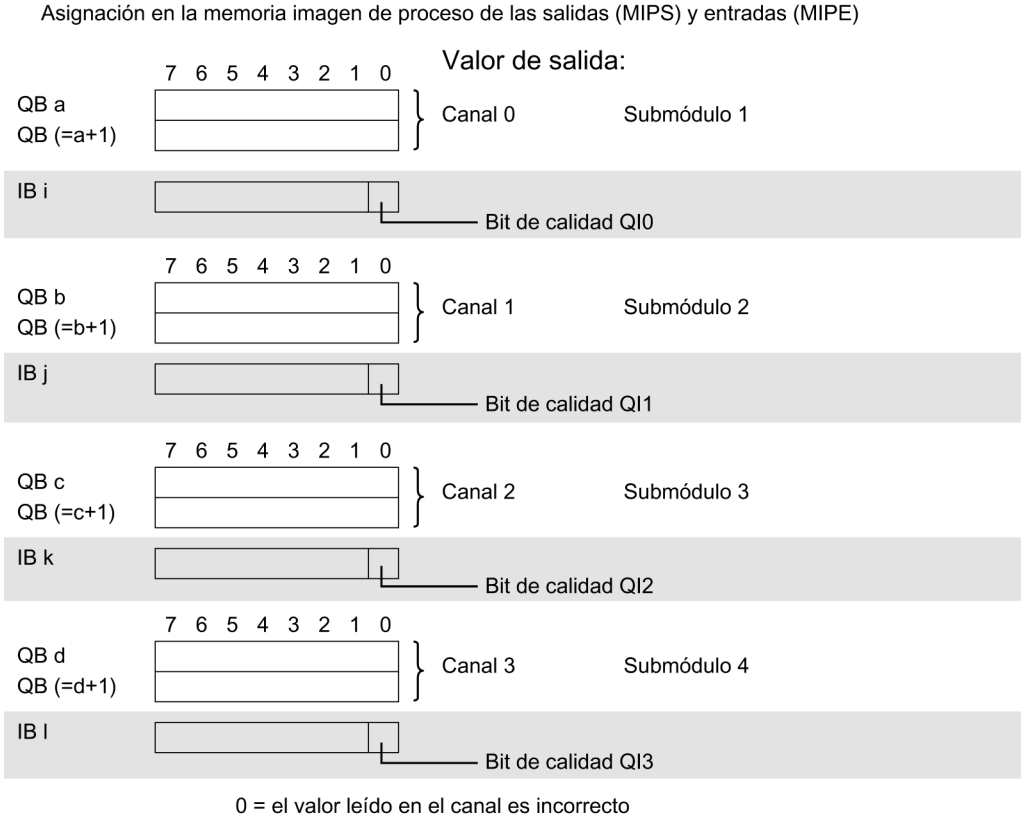


Figura 4-2 Área de direcciones en la configuración como AQ 4xU/I ST S QI de 4 x 1 canales con información de calidad

Área de direcciones en la configuración como AQ 4xU/I ST MSO de 1 x 4 canales

En la configuración como módulo de 1 x 4 canales (Shared Output, MSO interna del módulo), los canales 0 a 3 del módulo se copian a varios submódulos. Así, los canales 0 a 3 están presentes con valores idénticos en distintos submódulos. Estos submódulos pueden asignarse a hasta cuatro controladores IO si el módulo se utiliza en un Shared Device.

- El controlador IO al que está asignado el submódulo 1 tiene acceso de escritura a las salidas 0 a 3.
- Los controladores IO a los que están asignados los submódulos 2, 3 ó 4 tienen acceso de lectura a las salidas 0 a 3.

El número de submódulos disponibles depende del módulo de interfaz utilizado. Lea las indicaciones del manual de producto que corresponda al módulo de interfaz.

Información de calidad (Quality Information, QI)

El significado de la información de calidad depende del submódulo en cuestión.

En el caso del submódulo 1 (= submódulo base), la información de calidad 0 indica que el valor es erróneo o que el controlador IO del submódulo base se encuentra en estado STOP.

En los submódulos 2 a 4 (= submódulos MSO), la información de calidad 0 indica que el valor es erróneo o que se ha producido uno de los siguientes errores:

- El submódulo base todavía no está parametrizado (no está listo para el funcionamiento).
- Se ha interrumpido la conexión entre el controlador IO y el submódulo base.
- El controlador IO del submódulo base se encuentra en el estado STOP o DESCONEXIÓN.

La siguiente figura muestra la asignación del área de direcciones con los submódulos 1 y 2.

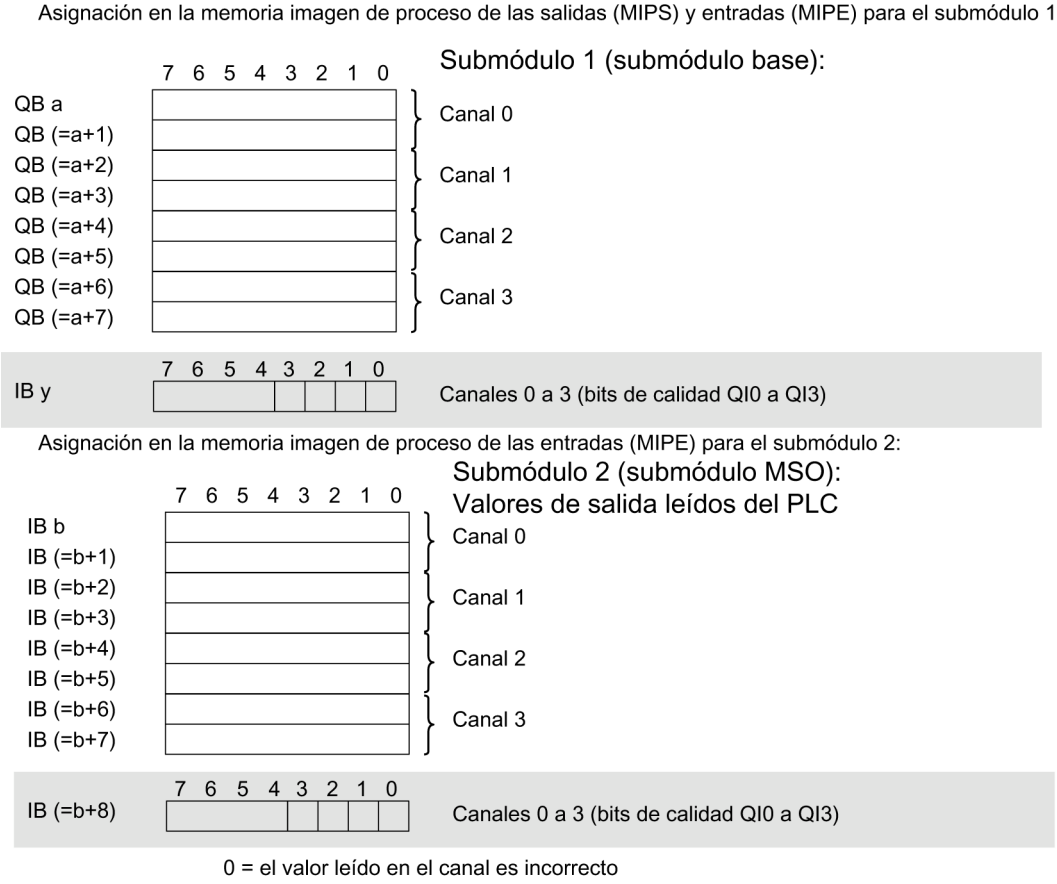


Figura 4-3 Área de direcciones en la configuración como AQ 4xU/I ST MSO de 1 x 4 canales con información de calidad

La siguiente figura muestra la asignación del área de direcciones con los submódulos 3 y 4.

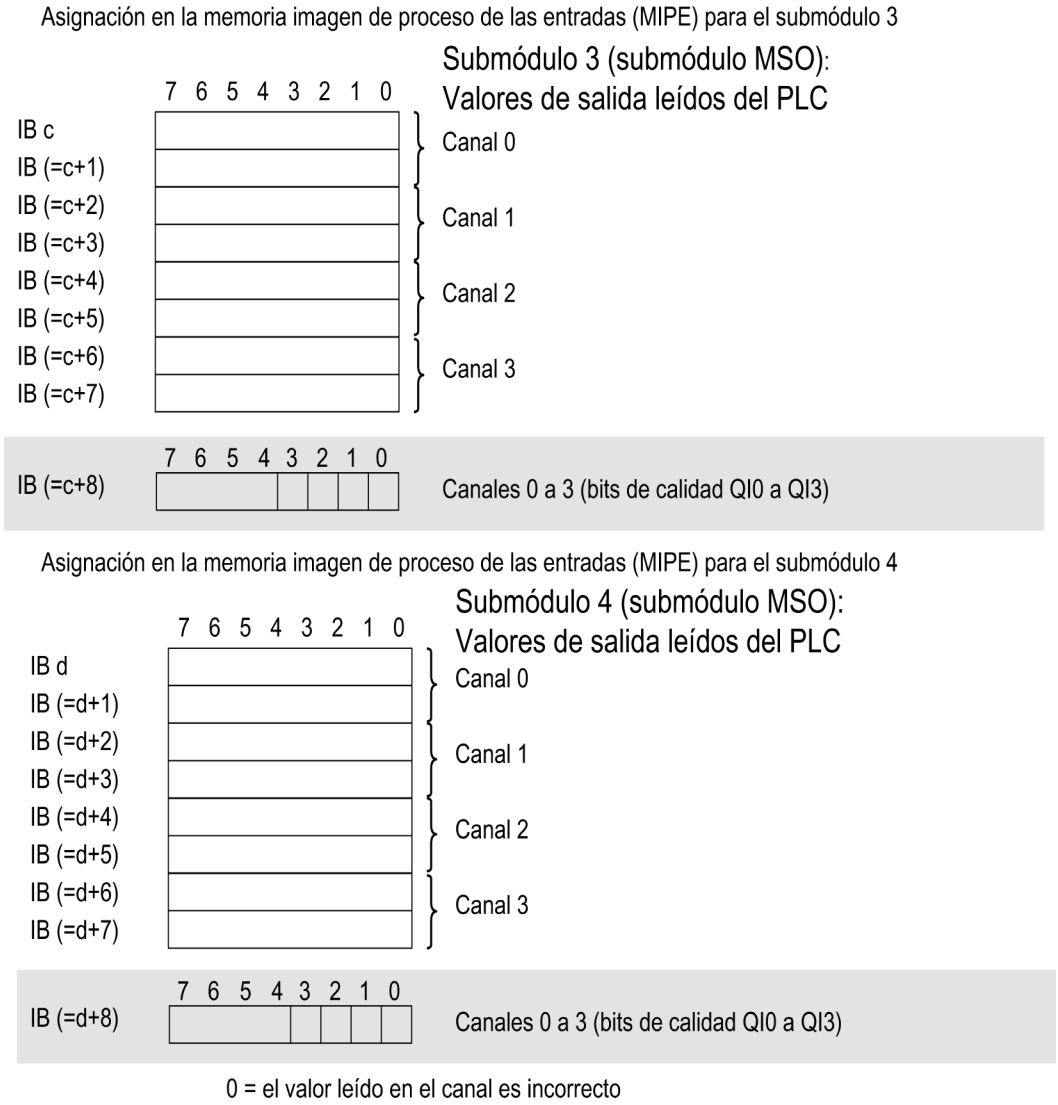


Figura 4-4 Área de direcciones en la configuración como AQ 4xU/I ST MSO de 1 x 4 canales con información de calidad

Alarmas y avisos de diagnóstico

5

5.1 Indicadores de estado y error

Indicadores LED

La siguiente figura muestra los indicadores LED (indicadores de estado y error) de AQ 4xU/I ST.

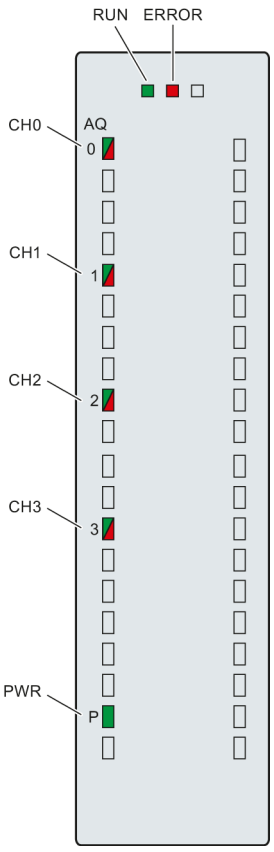


Figura 5-1 LED del módulo AQ 4xU/I ST

Significado de los indicadores LED

En las tablas siguientes se explica el significado de los indicadores de estado y error. Las soluciones para los avisos de diagnóstico se indican en el capítulo Avisos de diagnóstico (Página 29).

LED RUN y ERROR

Tabla 5- 1 Indicadores de estado y errorRUNyERROR

LED		Significado	Solución
RUN	ERROR		
☐ apagado	☐ apagado	Tensión muy baja o nula en el bus de fondo	• Conecte la CPU y/o los módulos de alimentación del sistema. • Compruebe si están enchufados los conectores U. • Compruebe si hay demasiados módulos enchufados.
☼ parpadea	☐ apagado	El módulo arranca y parpadea hasta que se parametrice correctamente.	---
■ encendido	☐ apagado	El módulo está parametrizado.	
■ encendido	☼ parpadea	Indica un error de módulo (al menos hay un error en un canal, p. ej. rotura de hilo).	Evalúe el diagnóstico y corrija el error (p. ej. rotura de hilo).
☼ parpadea	☼ parpadea	Hardware defectuoso	Sustituya el módulo.

LED PWR

Tabla 5- 2 Indicador de estado PWR

LED PWR	Significado	Solución
☐ apagado	Tensión de alimentación L+ demasiado baja o nula	Comprobar la tensión de alimentación.
■ encendido	Hay tensión de alimentación L+ y es correcta.	---

LED CHx

Tabla 5- 3 Indicador de estado CHx

LED CHx	Significado	Solución
□ apagado	Canal desactivado	---
■ encendido	Canal parametrizado y correcto	---
■ encendido	Aviso de diagnóstico: p. ej. rotura de hilo, rebase por exceso, rebase por defecto	Comprobar el cableado. Desactivar el diagnóstico.

5.2 Alarmas

El módulo de salidas analógicas AQ 4xU/I ST admite la alarma de diagnóstico.

Alarma de diagnóstico

El módulo genera una alarma de diagnóstico con estos eventos:

- Falta tensión de alimentación L+
- Cortocircuito a masa
- Rotura de hilo
- Rebase por exceso
- Rebase por defecto

Encontrará información detallada sobre el evento de error en el OB de error, con la instrucción "RALRM" (leer información adicional de alarma), y en la ayuda en pantalla de STEP 7.

5.3 Avisos de diagnóstico

Con cada evento de diagnóstico se emite un aviso de diagnóstico y en el módulo parpadea el LED ERROR. Los avisos de diagnóstico pueden leerse, p. ej., en el búfer de diagnóstico de la CPU. Los códigos de error pueden evaluarse mediante el programa de usuario.

Si el módulo se utiliza de forma descentralizada en un sistema ET 200MP con PROFIBUS DP, se pueden leer datos de diagnóstico con la instrucción RDREC o RD_REC a través de los registros 0 y 1. Encontrará la estructura de los registros en Internet, en el "Manual de producto Módulo de interfaz IM 155-5 DP ST (6ES7155-5BA00-0AB0)".

Tabla 5- 4 Avisos de diagnóstico, su significado y soluciones posibles

Aviso de diagnóstico	Código de error	Significado	Solución
Cortocircuito a M	1_H	Sobrecarga de la salida	Eliminar la sobrecarga
		Cortocircuito de la salida Q_V a M_{ANA}	Eliminar el cortocircuito
Rotura de hilo	6_H	Cableado del actuador sujeto a impedancia demasiado alta	Utilizar otro tipo de actuador o cablear de forma diferente (emplear cables de una sección mayor, p. ej.)
		Interrupción del cable entre módulo y actuador	Restablecer la conexión
		Canal no cableado (abierto)	• Desactivar canal (parámetro "Tipo de salida") • Cablear canal
Rebase por exceso	7_H	El valor de salida especificado por el programa de usuario está por encima del rango nominal/rango de saturación por exceso admisible.	Corregir el valor de salida
Rebase por defecto	8_H	El valor de salida especificado por el programa de usuario está por debajo del rango nominal/rango de saturación por defecto admisible.	Corregir el valor de salida
Falta tensión de carga	11_H	Falta la tensión de alimentación L+ del módulo	Conducir la tensión de alimentación L+ al módulo

Datos técnicos

6

Datos técnicos del AQ 4xU/I ST

	6ES7532-5HD00-0AB0
Nombre del producto	AQ 4xU/I ST
Información general	
Versión de producto HW	E01
Versión de firmware	V2.0.0
Función del producto	
Datos I&M	Sí; IM0 a IM3
Ingeniería con	
STEP 7 TIA Portal configurable/integrado desde versión	V12.0/V12.0
STEP 7 configurable/integrado desde versión	V5.5 SP3 / -
Modo de operación	
MSO	Sí
Configuración CiR en RUN	
Reparametrización en RUN	Sí
Calibración en RUN	Sí
Tensión de alimentación	
Tipo de tensión de alimentación	DC
Valor nominal (DC)	24 V
Rango admisible, límite inferior (DC)	20,4 V
Rango admisible, límite superior (DC)	28,8 V
Protección contra inversión de polaridad	Sí
Intensidad de entrada	
Consumo máx.	190 mA; (con alimentación de 24 V DC)
Potencia	
Potencia tomada del bus de fondo	0,6 W
Disipación	
Potencia disipada, típ.	4 W
Salidas analógicas	
Número de salidas analógicas	4
Salida de tensión, protección contra cortocircuito	Sí
Salida de tensión, corriente de cortocircuito, máx.	24 mA
Salida de intensidad, tensión en vacío, máx.	22 V
Tiempo de ciclo (todos los canales) mín.	3,2 ms; (independientemente del número de canales activados)

	6ES7532-5HD00-0AB0
Rangos de salida, tensión	
0 a 10 V	Sí
1 a 5 V	Sí
-10 a +10 V	Sí
Rangos de salida, intensidad	
0 a 20 mA	Sí
-20 a +20 mA	Sí
4 a 20 mA	Sí
Cableado de los actuadores	
para salida de tensión conexión a 2 hilos	Sí
para salida de tensión conexión a 4 hilos	Sí
para salida de intensidad conexión a 2 hilos	Sí
Resistencia de carga (en rango nominal de la salida)	
en salidas de tensión, mín.	1 kΩ; 0,5 kΩ con 1 ... 5 V
en salidas de tensión, carga capacitiva, máx.	1 µF
en salidas de intensidad, máx.	750 Ω
en salidas de intensidad, carga inductiva, máx.	10 mH
Longitud de cable	
Longitud de cable apantallado, máx.	800 m con intensidad, 200 m con tensión
Formación de valores analógicos	
Tiempo de integración y conversión/resolución por canal	
Resolución con rango de saturación por exceso (bits incl. signo), máx.	16 bits
Tiempo de conversión (por canal)	0,5 ms
Tiempo de estabilización	
para carga óhmica	1,5 ms
para carga capacitiva	2,5 ms
para carga inductiva	2,5 ms
Errores/precisiones	
Ondulación de salida (referida al rango de salida, ancho de banda de 0 a 50 kHz)	± 0,02 %
Error de linealidad (referido al rango de salida)	± 0,15 %
Error por temperatura (referido al rango de salida)	± 0,002 %
Diafonía entre las salidas, máx.	-100 dB
Repetibilidad en estado transitorio a 25 °C (referido al rango de salida)	± 0,05 %
Límite de error práctico en todo el rango de temperatura	
Tensión, referida al rango de salida	± 0,3 %
Intensidad, referida al rango de salida	± 0,3 %

	6ES7532-5HD00-0AB0
Límite de error básico (límite de error práctico a 25 °C)	
Tensión, referida al rango de salida	± 0,2 %
Intensidad, referida al rango de salida	± 0,2 %
Alarmas/diagnósticos/información de estado	
Valores sustitutivos aplicables	Sí
Alarmas	
Alarma de diagnóstico	Sí
Avisos de diagnóstico	
Diagnóstico	Sí
Vigilancia de la tensión de alimentación	Sí
Rotura de hilo	Sí; solo con tipo de salida Intensidad
Cortocircuito	Sí; solo con tipo de salida Tensión
Rebase por exceso/rebase por defecto	Sí
LED de diagnóstico	
LED RUN	Sí; LED verde
LED ERROR	Sí; LED rojo
Vigilancia de la tensión de alimentación	Sí; LED verde
Indicador de estado del canal	Sí; LED verde
para diagnóstico de canales	Sí; LED rojo
para diagnóstico de módulo	Sí; LED rojo
Aislamiento galvánico	
Aislamiento galvánico de canales	
entre los canales	No
entre los canales, en grupos de	4
entre los canales y el bus de fondo	Sí
entre los canales y la tensión de carga L+	Sí
Diferencia de potencial admisible	
entre MANA y M interna (UISO)	75 V DC/60 V AC (aislamiento básico)
entre S- y MANA (UCM)	+/- 8 V
Aislamiento	
Aislamiento ensayado con	707 V DC (Type Test)
Operación descentralizada	
Arranque optimizado	No
Dimensiones	
Anchura	35 mm
Altura	147 mm
Profundidad	129 mm
Pesos	
Peso, aprox.	310 g

Croquis acotado

A

Este anexo incluye el croquis acotado del módulo montado en un perfil soporte, así como un croquis acotado con tapa frontal abierta. Deben tenerse en cuenta las dimensiones al montar en armarios, salas de equipos, etc.

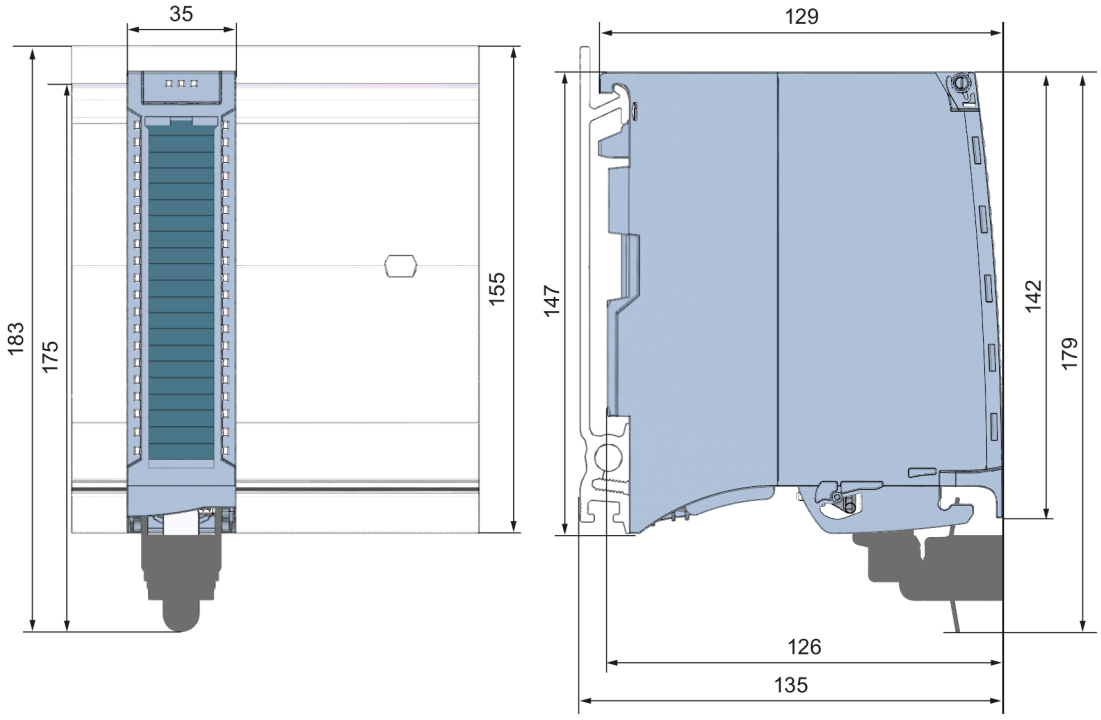


Figura A-1 Croquis acotado del módulo AQ 4xU/I ST

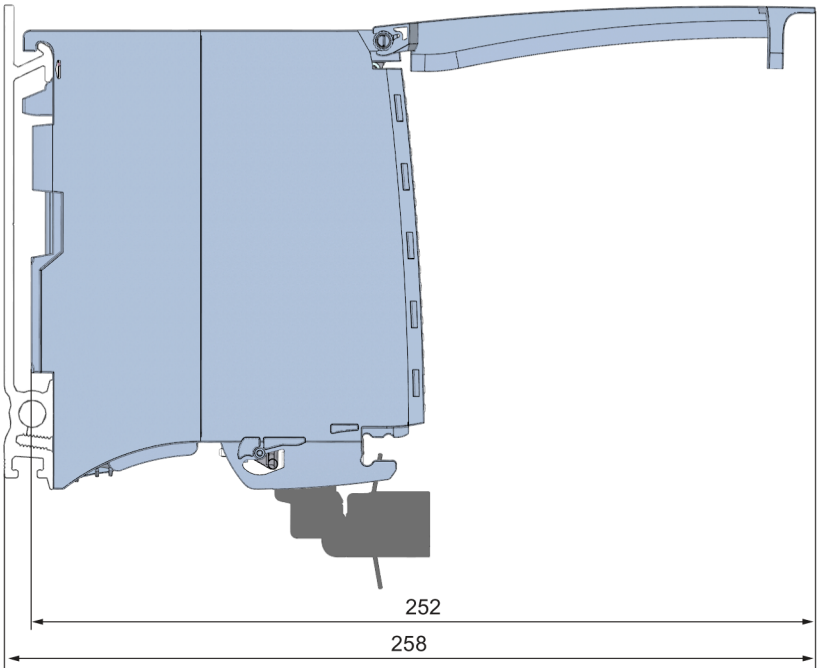


Figura A-2 Croquis acotado del módulo AQ 4xU/I ST, vista lateral con tapa frontal abierta

Registros de parámetros

B

B.1 Parametrización y estructura de los registros de parámetros

Los registros del módulo tienen una estructura idéntica, independientemente de que se configure el módulo con PROFIBUS DP o PROFINET IO.

Dependencias en la configuración con un archivo GSD

En la configuración del módulo con archivo GSD hay que tener en cuenta que los ajustes de algunos parámetros dependen de otros. El módulo comprueba la plausibilidad de los parámetros una vez que estos han sido transferidos al módulo.

Los parámetros dependientes de otros figuran en la siguiente tabla.

Tabla B- 1 Dependencias de los parámetros en la configuración con un archivo GSD

Parámetros específicos del dispositivo (archivo GSD)	Parámetros dependientes
Cortocircuito a M	Solo con **tipo de salida** Tensión
Rotura de hilo	Solo con **tipo de salida** Intensidad
Valor sustitutivo	Solo si se ha parametrizado **Reacción tras STOP de la CPU** -> **Aplicar valor sustitutivo**

Parametrización en el programa de usuario

La parametrización del módulo puede modificarse en RUN (p. ej., es posible modificar los valores de tensión o intensidad de canales concretos en RUN sin que ello afecte a los demás canales).

Modificación de parámetros en RUN

Los parámetros se transfieren al módulo mediante los registros 64 a 67 con la instrucción WRREC. Los parámetros ajustados con STEP 7 no se modifican en la CPU, es decir, los parámetros ajustados con STEP 7 vuelven a ser válidos tras un arranque.

El módulo comprueba la plausibilidad de los parámetros una vez que estos han sido transferidos al módulo.

Parámetro de salida STATUS

Si se producen errores al transferir los parámetros con la instrucción WRREC, el módulo seguirá funcionando con la parametrización utilizada hasta entonces. El parámetro de salida STATUS contiene no obstante el código de error correspondiente.

La instrucción WRREC y los códigos de error se describen en la ayuda en pantalla de STEP 7.

Funcionamiento del módulo aguas abajo de un módulo de interfaz PROFIBUS DP

Cuando el módulo funciona aguas abajo de un IM PROFIBUS DP, los registros de parámetros 0 y 1 no se pueden leer. Con los registros de parámetros 0 y 1 leídos se emiten los registros de diagnóstico 0 y 1. Puede obtener información adicional en el manual de producto del módulo de interfaz PROFIBUS DP, capítulo Alarmas en Internet (http://support.automation.siemens.com/WW/view/es/78324181).

Asignación de registro y canal

En la configuración como 1 x 4 canales, los parámetros se encuentran en los registros 64 a 67 y tienen la siguiente asignación:

- Registro 64 para canal 0
- Registro 65 para canal 1
- Registro 66 para canal 2
- Registro 67 para canal 3

En la configuración como 4 x 1 canales, el módulo se compone de 4 submódulos de un canal cada uno. Los parámetros para el canal se encuentran en el registro 64 y tienen la siguiente asignación:

- Registro 64 para canal 0 (submódulo 1)
- Registro 64 para canal 1 (submódulo 2)
- Registro 64 para canal 2 (submódulo 3)
- Registro 64 para canal 3 (submódulo 4)

Al transferir los registros, debe direccionarse el submódulo correspondiente.

Estructura de un registro

La siguiente figura muestra como ejemplo la estructura del registro 64 para el canal 0. En el caso de los canales 1 a 3, la estructura es idéntica. Los valores en los bytes 0 y 1 son fijos y no deben modificarse.

Los parámetros se activan poniendo a "1" el bit correspondiente.

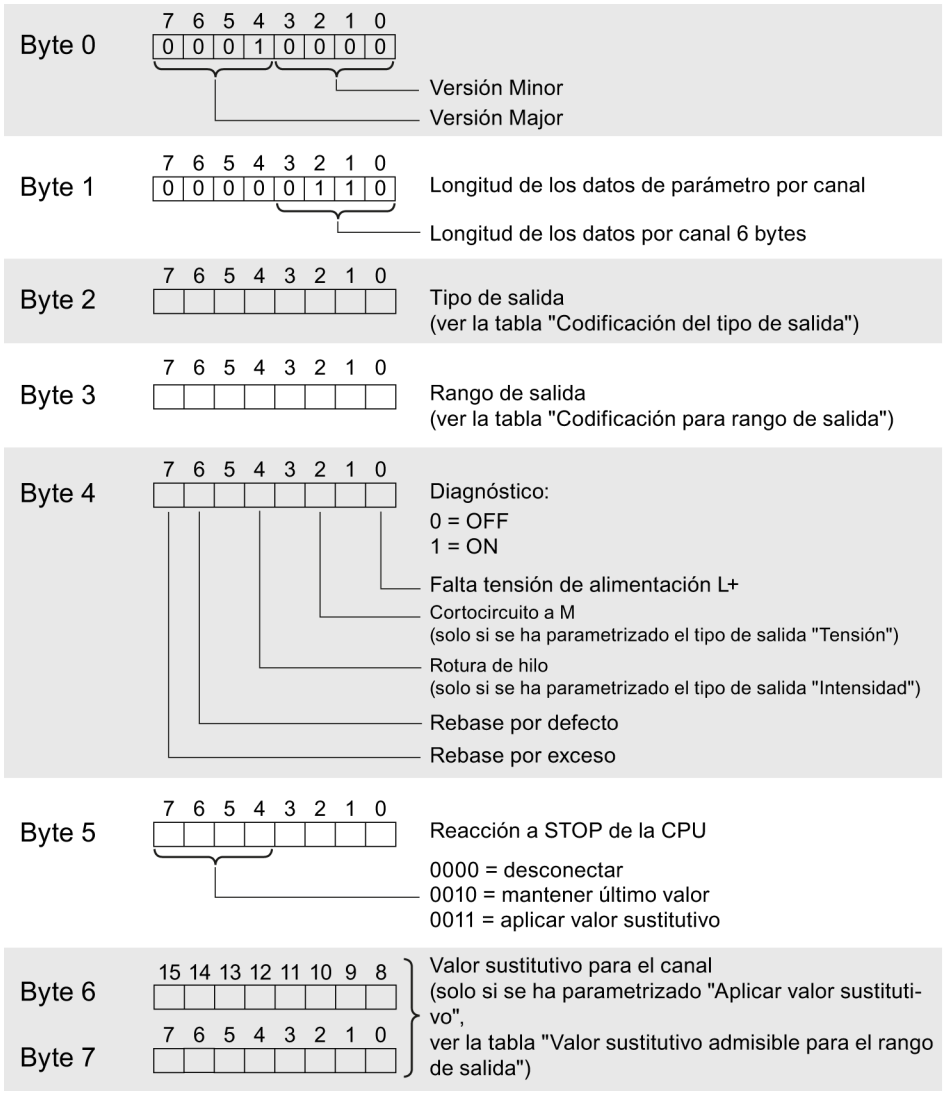


Figura B-1 Estructura del registro 64: bytes 0 a 7

Codificación del tipo de salida

La tabla siguiente contiene todos los tipos de salida del módulo de salidas analógicas con su codificación. Estos códigos deben introducirse en el byte 2 del registro para el canal correspondiente (ver figura anterior).

Tabla B- 2 Codificación del tipo de salida

Tipo de salida	Codificación
Desactivado	0000 0000
Tensión	0000 0001
Intensidad	0000 0010

Codificación de los rangos de salida

La tabla siguiente contiene todos los rangos de salida para tensión e intensidad del módulo de salidas analógicas con su codificación. Dicha codificación debe introducirse en el byte 3 de cada uno de los registros correspondientes (ver figura anterior).

Tabla B- 3 Codificación del rango de salida

Rango de salida para tensión	Codificación
1 a 5 V	0000 0011
0 a 10 V	0000 0010
±10 V	0000 0000
Rango de salida para intensidad	**Codificación**
0 a 20 mA	0000 0001
4 a 20 mA	0000 0010
±20 mA	0000 0000

Valores sustitutivos admisibles

La siguiente tabla contiene todos los rangos de salida para los valores sustitutivos admisibles. Estos valores sustitutivos deben introducirse en los bytes 6 y 7 del registro para el canal correspondiente (ver figura anterior). La representación binaria de los rangos de salida figura en el manual de funciones Procesamiento de valores analógicos para SIMATIC (en Internet).

Tabla B- 4 Valor sustitutivo admisible para el rango de salida

Rango de salida	Valor sustitutivo permitido
±10 V	-32512 ... +32511
1 a 5 V	-6912 ... +32511
0 a 10 V	0 ... +32511
±20 mA	-32512 ... +32511
4 a 20 mA	-6912 ... +32511
0 a 20 mA	0 ... +32511

Representación de valores analógicos

C

Introducción

En este anexo se exponen los valores analógicos para todos los rangos de salida aplicables con el módulo analógico AQ 4xU/I ST .

Resolución de valores medidos

Cada valor analógico se introduce en las variables alineado a la izquierda. Los bits marcados con "x" se ponen a "0".

Tabla C- 1 Resolución de los valores analógicos

Resolución en bits incl. signo	Valores		Valor analógico	
	decimal	hexadecimal	Byte alto	Byte bajo
16	1	1_H	Signo 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1

C.1 Representación de los rangos de salida

Las tablas siguientes contienen la representación digitalizada de los rangos de salida, separados por rangos de salida bipolares y unipolares. La resolución es de 16 bits.

Tabla C- 2 Rangos de salida bipolares

Valor dec.	Valor de salida en %	Palabra de datos																Rango
		2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	
32511	117,589	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	Valor de salida máximo*
32511	117,589	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	Rango de saturación por exceso
27649	100,004	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	
27648	100,000	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	Rango nominal
1	0,003617	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
0	0,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-1	-0,003617	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
-27648	-100,000	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	
-27649	-100,004	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	Rango de saturación por defecto
-32512	-117,593	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
-32512	-117,593	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Valor de salida mínimo**

* Si se especifica un valor > 32511, el valor de salida se limita a 117,589%.

** Si se especifica un valor < -32512, el valor de salida se limita a -117,593%.

Tabla C- 3 Rangos de salida unipolares

Valor dec.	Valor de salida en %	Palabra de datos																Rango
		2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	
32511	117,589	0	1	1	1	1	1	1	1	x	x	x	x	x	x	x	x	Valor de salida máximo*
32511	117,589	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	Rango de saturación por exceso
27649	100,004	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	
27648	100,000	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	Rango nominal
1	0,003617	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
0	0,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Valor de salida mínimo**

* Si se especifica un valor > 32511, el valor de salida se limita a 117,589%.

** Si se especifica un valor < 0, el valor de salida se limita a 0%.

C.2 Representación de valores analógicos en los rangos de salida de tensión

Las siguientes tablas muestran los valores decimales y hexadecimales (codificaciones) de los posibles rangos de salida de tensión.

Tabla C- 4 Rango de salida de tensión ±10 V

Valores			Rango de salida de tensión	Rango
	dec.	hex.	±10 V	
>117,589 %	>32511	>7EFF	11,76 V	Valor de salida máximo
117,589 %	32511	7EFF	11,76 V	Rango de saturación por exceso
	27649	6C01		
100 %	27648	6C00	10 V	Rango nominal
75 %	20736	5100	7,5 V	
0,003617 %	1	1	361,7 µV	
0 %	0	0	0 V	
	-1	FFFF	-361,7 µV	
-75 %	-20736	AF00	-7,5 V	
-100 %	-27648	9400	-10 V	
	-27649	93FF		Rango de saturación por defecto
-117,593 %	-32512	8100	-11,76 V	
<-117,593 %	<-32512	< 8100	-11,76 V	Valor de salida mínimo

Tabla C- 5 Rango de salida de tensión de 0 a 10 V

Valores			Rango de salida de tensión	Rango
	dec.	hex.	de 0 a 10 V	
>117,589 %	>32511	>7EFF	11,76 V	Valor de salida máximo
117,589 %	32511	7EFF	11,76 V	Rango de saturación por exceso
	27649	6C01		
100 %	27648	6C00	10 V	Rango nominal
75 %	20736	5100	7,5 V	
0,003617 %	1	1	361,7 µV	
0 %	0	0	0 V	
<0 %	<0	<0	0 V	Valor de salida mínimo

Tabla C- 6 Rango de salida de tensión de 1 a 5 V

Valores			Rango de salida de tensión	Rango
	dec.	hex.	de 1 a 5 V	
>117,589 %	>32511	>7EFF	5,70 V	Valor de salida máximo
117,589 %	32511	7EFF	5,70 V	Rango de saturación por exceso
	27649	6C01		
100 %	27648	6C00	5 V	Rango nominal
75 %	20736	5100	4 V	
0,003617 %	1	1	1 V +144,7 µV	
0 %	0	0	1 V	
	-1	FFFF	1 V -144,7 µV	Rango de saturación por defecto
-25 %	-6912	E500	0 V	
<-25 %	<-6912	< E500	0 V	Valor de salida mínimo

C.3 Representación de valores analógicos en los rangos de salida de intensidad

Las siguientes tablas muestran los valores decimales y hexadecimales (codificaciones) de los posibles rangos de salida de intensidad.

Tabla C- 7 Rango de salida de intensidad ±20 mA

Valores			Rango de salida de intensidad	Rango
	dec.	hex.	± 20 mA	
>117,589 %	>32511	>7EFF	23,52 mA	Valor de salida máximo
117,589 %	32511	7EFF	23,52 mA	Rango de saturación por exceso
	27649	6C01		
100 %	27648	6C00	20 mA	Rango nominal
75 %	20736	5100	15 mA	
0,003617 %	1	1	723,4 nA	
0 %	0	0	0 mA	
	-1	FFFF	-723,4 nA	
-75 %	-20736	AF00	-15 mA	
-100 %	-27648	9400	-20 mA	
	-27649	93FF		Rango de saturación por defecto
-117,593 %	-32512	8100	-23,52 mA	
<-117,593 %	<-32512	<8100	-23,52 mA	Valor de salida mínimo

Tabla C- 8 Rango de salida de intensidad de 0 a 20 mA

Valores			Rango de salida de intensidad	Rango
	dec.	hex.	de 0 a 20 mA	
>117,589 %	>32511	>7EFF	23,52 mA	Valor de salida máximo
117,589 %	32511	7EFF	23,52 mA	Rango de saturación por exceso
	27649	6C01		
100 %	27648	6C00	20 mA	Rango nominal
75 %	20736	5100	15 mA	
0,003617 %	1	1	723,4 nA	
0 %	0	0	0 mA	
<0 %	<0	<0	0 mA	Valor de salida mínimo

Tabla C- 9 Rango de salida de intensidad de 4 a 20 mA

Valores			Rango de salida de intensidad	Rango
	dec.	hex.	de 4 a 20 mA	
>117,589 %	>32511	>7EFF	22,81 mA	Valor de salida máximo
117,589 %	32511	7EFF	22,81 mA	Rango de saturación por exceso
	27649	6C01		
100 %	27648	6C00	20 mA	Rango nominal
75 %	20736	5100	16 mA	
0,003617 %	1	1	4 mA	
0 %	0	0	4 mA	
	-1	FFFF		Rango de saturación por defecto
-25 %	-6912	E500	0 mA	
<-25 %	<-6912	<E500	0 mA	Valor de salida mínimo

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