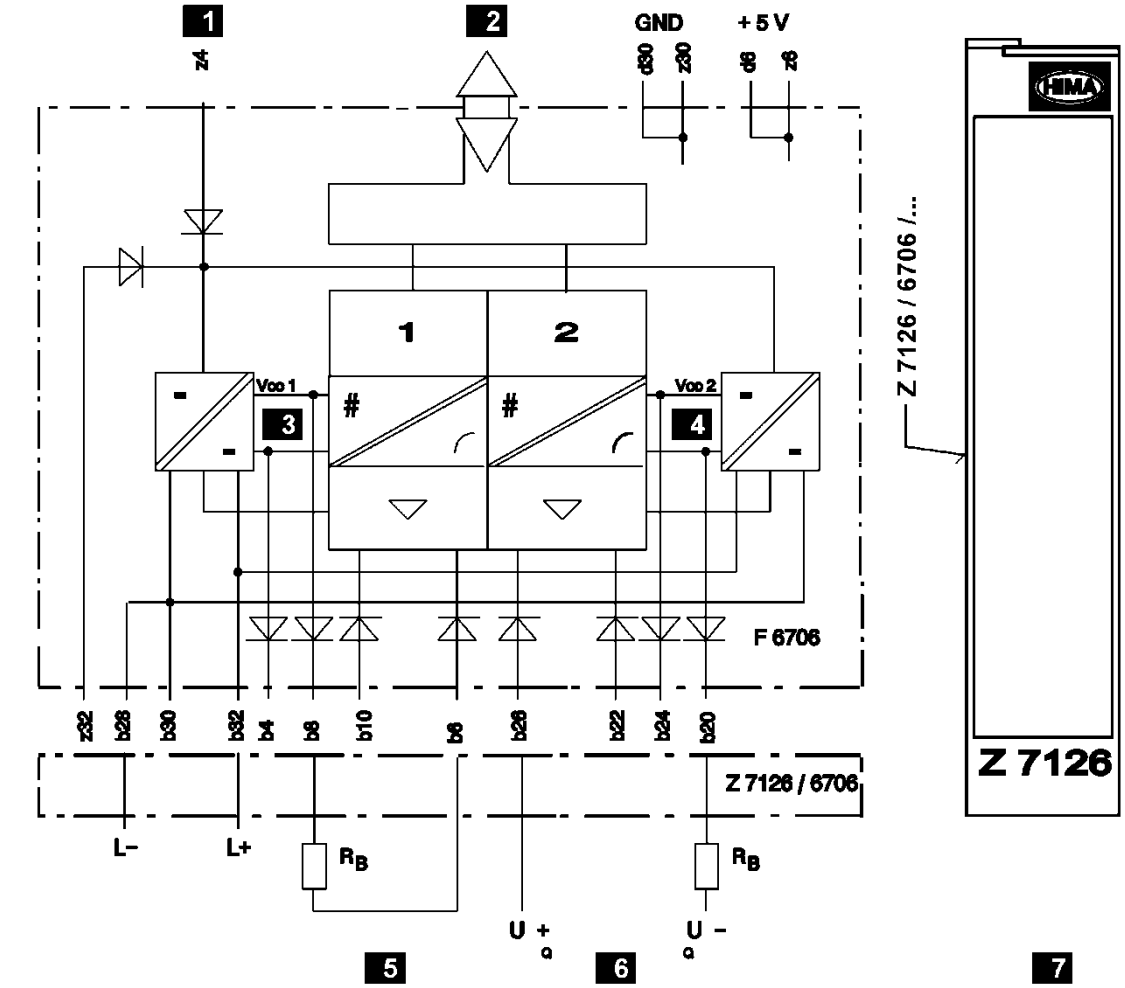
F 6706: Analog Output Module

- 2 channels for outputs 0/4...20 mA, each individual output electrically separated.
- Circuits with protective separation.
- Operated as current source.
- Operated as current sink.
- For HIQuad X (SILworX) and HIQuad (ELOP II).



1 Watchdog WD
2 I/O bus
3 Analog GND 1
4 Analog GND 2
5 Current source mode
6 Current sink mode
7 Cable plug, front view

Figure 1: Module Block Diagram and Cable Plug Front View

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Specifications

Resolution	12 bits (0…4095 steps)
Source voltage U_Q	
(current sink mode)	10…30 V
Load R_B	
Current source mode for AS03	$R_B \leq 550\ \Omega$ incl. line resistance to the load Connectors b8, b6 or b24, b22
Current sink mode for AS03	$R_B \leq (U_Q - 10\ V) / 21.3\ mA$ U_Q = Source voltage Connectors b4, b6 or b20, b26
Intrinsic error	≤ 0.1 % (20 µA) at 25 °C
Operating error limit	≤ 0.4 % at 0...+60 °C
Cable length	Max. 1000 m (observe load)
Withstand voltage	250 V against analog GND
Basic state during plug-in	I ≤ 20 µA
Current consumption WD	Max.30 mA
Space requirement	4 HP
Current consumption	40 mA at 5 VDC (via backplane) 100 mA at 24 VDC (via cable plug)

Output Module with Hardware Revision Status AS03

As of hardware revision status AS03, the F 6706 analog output module is equipped with two switches S2 (for output 1) and S3 (for output 2), see Figure 2. If necessary, the switches can be used to ensure compatibility with modules with revision AS01 and revision AS02 (see below). The two switches S2 and S3 are delivered set to *OFF* (default setting).

For **HW-AS01, AS02**: A load with line resistance of up to 750 Ω in current source mode can be connected to the output modules with revision AS01 and revision AS02. The load must be with line resistance ≤ (U_Q – 5 V) / 21.3 mA in current sink mode. If the position of the switches is ON, the values also apply to the output module with revision AS03.

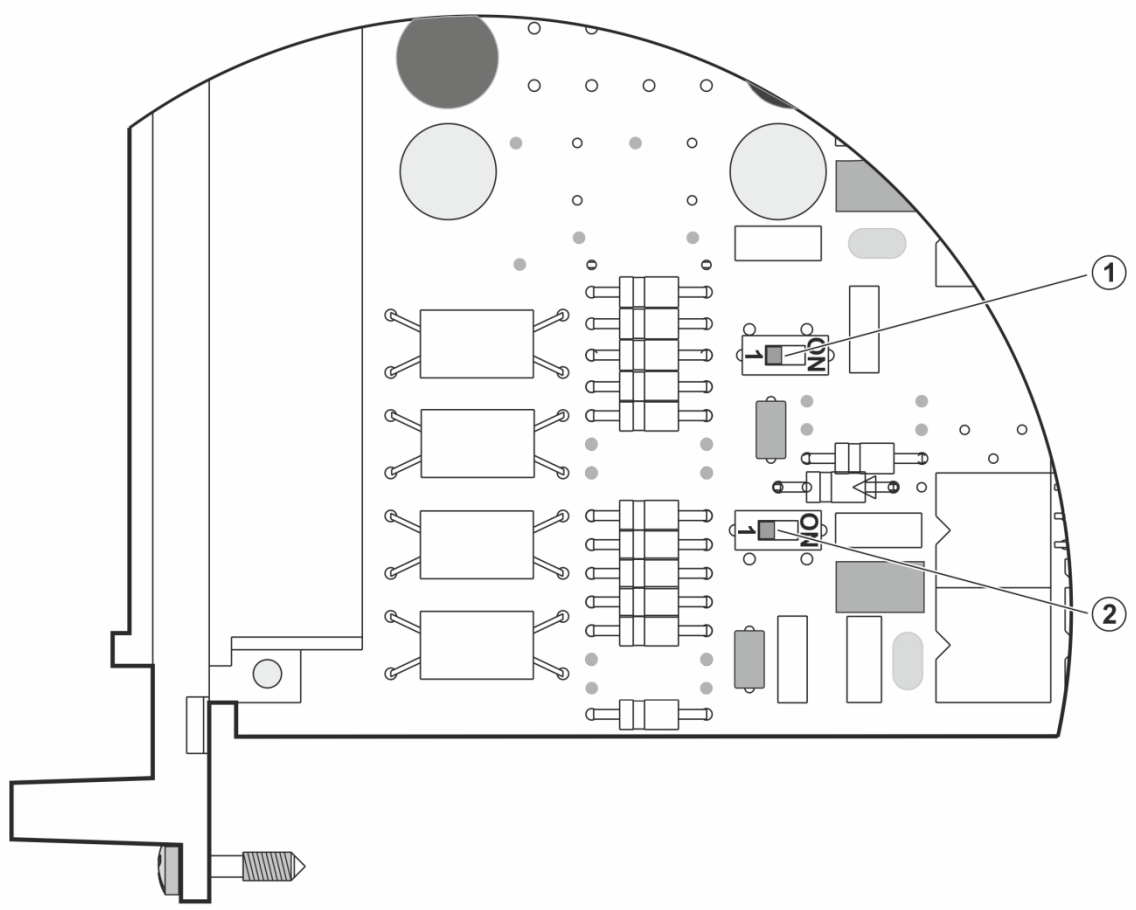
For AS03, HIMA recommends keeping the switches S2 and S3 set to *OFF* since this setting offers a higher immunity to interference.

Ensuring the Compatibility with Modules with AS01/AS02

Modules with hardware revision status as of AS03 can replace modules with revision status AS01 or revision status AS02 if the switches S2 and S3 have been set to *ON* (corresponding to revision status AS01 or AS02).

1. Use a suitable tool to move switch S2 for output 1 to the position *ON*.
2. Use a suitable tool to move switch S3 for output 2 to the position *ON*.
3. Check the final position of the switches!

► The module with AS03 is now compatible with modules with AS01/AS02.



1 Switch S3 for output 2, switch position *OFF*
2 Switch S2 for output 1, switch position *OFF*

Figure 2: F 6706 Module with Switches S2 and S3

Wiring

Refer to the corresponding tables for the wire color coding of the following cable plugs:

- Cable plug Z 7126/6706/Cx… (Table 1).
- Cable plugs Z 7126/6706/Cx/R1ser and Z 7126/6705/Cx/R2ser (Table 2). The two cable plugs are connected to one another with four wires for redundant connection of current (serial wiring), see Figure 4. The loads are connected on the R2ser cable plug.

Channel	Pin	Color	Connection
1	b8	WH	Cable: LiYCY 8 x 0.5 mm² (shielded)
	b6	BN	
	b4	PK	
	b10	GY	
2	b24	GN	
	b22	YE	
	b20	RD	
	b26	BU	
L+ (24 VDC)	b32	RD	Female connector 2.8 x 0.8 mm² q = 1 mm², l = 750 mm
L- (24 VDC)	b28	BK	
Shield		YEGN	Female connector 6.3 x 0.8 mm² q = 2.5 mm², l = 120 mm

Table 1: Wire Color Coding of the Cable Plug Z 7126/6706/Cx…

Channel	Pin	Color	Connection
1	b8	WH	Cable: LiYCY 8 x 0.5 mm² (shielded)
	b6	BN	
	---	PK	
	---	GY	
2	b24	GN	
	b22	YE	
	---	RD	
	---	BU	
L+ (24 VDC)	b32	RD	Female connector 2.8 x 0.8 mm² q = 1 mm², l = 750 mm
L- (24 VDC)	b28	BK	
Shield		YEGN	Female connector 6.3 x 0.8 mm² q = 2.5 mm², l = 120 mm

Table 2: Wire Color Coding of the Cable Plug Z 7126/6706/R1ser and R2ser...

i To avoid module faults, the channels not in use must be bridged.
- Channel 1: bridge between terminal b6 and terminal b8.
- Channel 2: bridge between terminal b22 and terminal b24.

Current Outputs 0/4...20 mA in ELOP II

The current outputs have a nominal range of 0/4...20 mA.

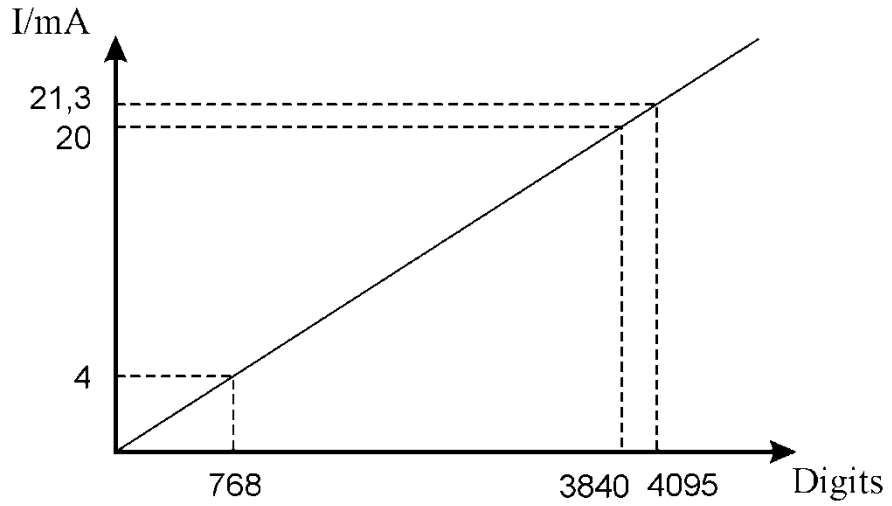
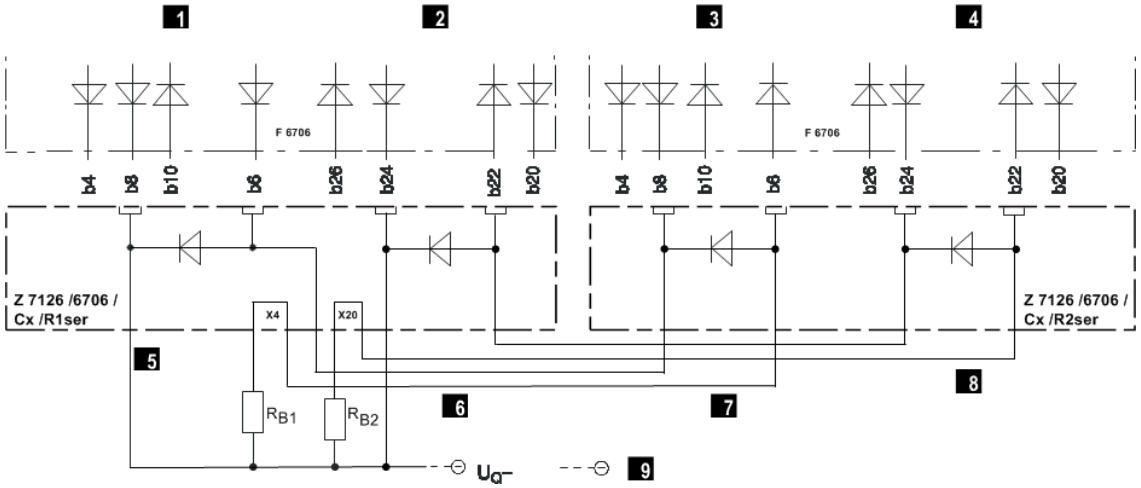


Figure 3: Current Outputs with 12 Bits = 4095 Digits = 21.3 mA

1 Applications

The F 6706 module converts digital signals into analog signals of 0/4...20 mA. The outputs of the F 6706 module are approved for use as current source and current sink.

1.1 Redundant Connection of Current in Series



1 Module 1, channel 1
2 Module 1, channel 2
3 Module 2, channel 1
4 Module 2, channel 2
5 Bypass module 1, channel 1
6 Bypass module 1, channel 2
7 Bypass module 2, channel 1
8 Bypass module 2, channel 2
9 The load may be connected to any potential

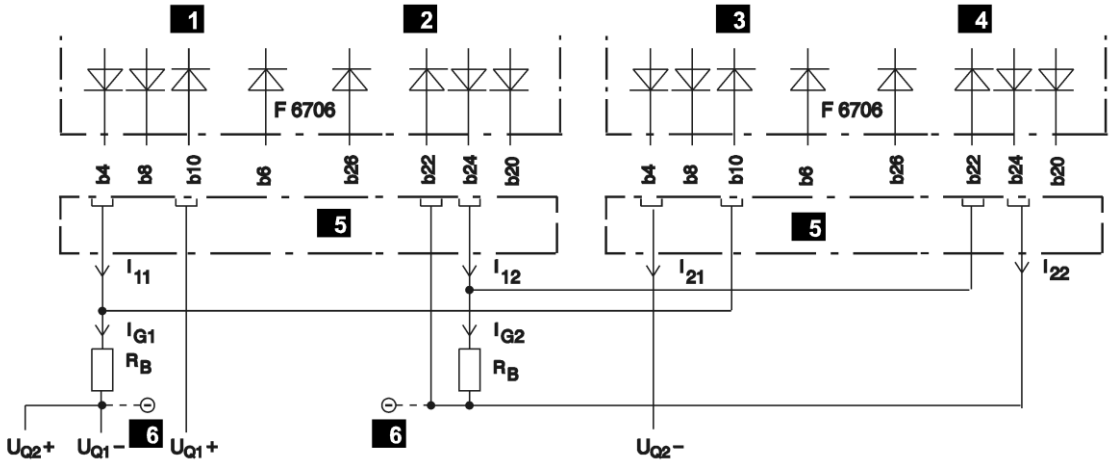
Figure 4: Redundant Connection of Current in Series

Channel 1 of module 1 is connected in series to channel 1 of module 2 and channel 2 is connected in series with channel 2 of module 2. The connections are bypassed using diodes so that, if one module fails, the redundant module can still carry the load current through the diode to load R_{B1} (and R_{B2} for the second channel).

The channels 1 and 2 of both modules are wired as current source.

The cable plugs 7126/6706/Cx/R1ser and Z 7126/6706/Cx/R2ser are equipped with diodes for the redundant wiring of both channels, see Figure 4.

1.2 Bipolar Current Connection



1 Module 1, channel 1
2 Module 1, channel 2
3 Module 2, channel 1
4 Module 2, channel 2
5 Special cable plug
6 The load may be connected to any potential

Figure 5: Bipolar Current Connection

Channel 1 on both modules is wired as a current sink and channel 2 on both modules as a current source.

The bipolar current connection is used to output signed currents from -20…+20 mA. The following points must be taken into account:

- The total current is the sum of the individual currents
  IG1 = I11 - I21 or IG2 = I12 - I22.
- The admissible load resistance remains the same.
- Module 1 provides the positive portion and module 2 the negative portion of the total current.
- For reasons of accuracy, only one module may provide or consume current. This point must be observed in the user program.

2 Configuration in SILworX

The module is configured in the Hardware Editor of the SILworX programming tool.

Observe the following points when configuring the module:

- To diagnose the module and channels, both the statuses and the measured value can be evaluated within the user program. For more information on the statuses and parameters, refer to the tables starting with Chapter 2.1.
- If a redundancy group is created, its configuration is defined in the tabs. The tabs specific to the redundancy group differ from those of the individual modules, see the following tables.

To evaluate the system parameters in the user program, they must be assigned to global variables. Perform this step in the Hardware Editor using the module's detail view.

The following tables present the system parameters for the module in the same order as in the SILworX Hardware Editor.

2.1 The Module Tab

The **Module** tab contains the following system parameters:

System parameters	Data type	R/W	Description
Name	---	W	Module name.
Noise Blanking	BOOL	W	Noise blanking performed by the system module allowed (activated/deactivated). After a transient fault, the system delays the fault response until the safety time. The user program retains its last valid process value. Default setting: Activated. Refer to the system manual (HI 803 211 E) for more details on noise blanking.
The following statuses and parameters can be assigned global variables and used in the user program.			
Explicitly Triggered Restart Required	BOOL	R	TRUE: The module must be explicitly required to restart. FALSE: ▪ Restart is necessary and the module performs it automatically. ▪ Module in the STOP state. ▪ Connection loss.
Background Test Noise Blanking Active	BOOL	R	TRUE: Error detected by a background test. FALSE: ▪ No errors detected by the background tests. ▪ Module in the STOP state. ▪ Connection loss.
Initialization Active	BOOL	R	TRUE: The module is performing initial tests. FALSE: ▪ The initial tests are complete. ▪ Module in the STOP state. ▪ Connection loss.
Module OK	BOOL	R	TRUE: No internal fault detected by the system. FALSE: ▪ Internal fault detected by the system. ▪ Module in the STOP state. ▪ Connection loss.
Module Process Value OK	BOOL	R	TRUE: No channel fault detected by the system. FALSE: ▪ At least one channel fault detected by the system. ▪ Module in the STOP state. ▪ Connection loss.

System parameters	Data type	R/W	Description
Restart on Error Suppressed	BOOL	W	Automatic restart after errors can be suppressed by the user. To cause the automatic restart to be performed after an error, the system parameter must have been set to FALSE for longer than the F-CPU safety time (does not apply to field faults). TRUE: No automatic restart after a module or channel fault. FALSE: Automatic restart after a module or channel fault. Default setting: FALSE

Table 3: The **Module** Tab in the Hardware Editor

2.2 The F 6706_1: Channels Tab

The **F 6706_1: Channels** tab contains the following system parameters for each channel:

System parameters	Data type	R/W	Description
Channel no.	---	R	Channel number, preset and cannot be changed.
4 mA	REAL	W	Data point used to calculate the process value at the lowest full scale (4 mA) of the channel. Default value: 4.0
20 mA	REAL	W	Data point used to calculate the process value at the upper full scale (20 mA) of the channel. Default value: 20.0
Process Value [REAL] ->	REAL	R	Process value determined using the data points 4 mA and 20 mA. Default value: 0
-> Process Value OK [BOOL]	BOOL	R	TRUE: Fault-free channel. No internal fault nor fault on the field side detected. Module initialization successfully completed. FALSE: ▪ Faulty channel. Internal fault or fault on the field side detected. ▪ The initial test has not been completely performed. ▪ Module in the STOP state. ▪ Connection loss.
-> Channel OK [BOOL]	BOOL	R	TRUE: Fault-free channel. The channel value is valid. FALSE: ▪ Faulty channel. ▪ Module in the STOP state. ▪ Connection loss.
Redund.	BOOL	R	Requirement: A redundant module must exist. TRUE: The channel redundancy for this channel is active. FALSE: The channel redundancy for this channel is not active. Default setting: TRUE

Table 4: Tab **F 6706_1: Channels** in the Hardware Editor

Global variables can be assigned to the system parameters with **->** and used in the user program. The values of the system parameters without **->** must be directly defined.

2.3 Description of Diagnostic Entry

The module is completely and automatically tested for safety-related errors during operation. The diagnostic entry is not 0 if one or more errors were detected in the module.

Defective modules must be replaced with a faultless module of the same type or with an approved replacement model.

Bit	Coding [1)]	Description
0	0x00000001	Hardware module fault.
1	0x00000002	The module in the slot was not deleted. The slot is either empty or equipped with incorrect module type.
2	0x00000004	Module defective (the error code is for internal purposes only).
…	…	
31	0x80000000	
[1)] The status may consist of several codings, e.g.: Module status = 0x80000001 (0x00000001 + 0x80000000).		

Table 5: Diagnostic Entry Coding