Each of the IO chassis contains a IO extender IO-0001 module, which connects to the IO-bus. The IO extender module drives the Horizontal **IO Bus**, which relays the signals from the IO-bus to the IO modules via a flatcable. The Horizontal IO bus back plane is located on top of each IO chassis. The Horizontal IO bus and the flatcables of the IO modules are covered with a sheet steel cover which provides optimum EMC/RFI immunity. The cover plate contains a paper strip which holds the relevant process tagging for signal identification.



Figure 31 — Back view of typical Safety Manager with redundant Controller and a IO chassis

IO modules

The **IO modules** are constructed on a European standard-size instrument card. The height of the front panel of the modules is 3 HE (3U), their width is 4 TE (4 HP). A total of 18 IO modules can be placed per IO chassis. All IO modules are equipped with standard 32-pin DIN 41612F connectors. All IO chassis are provided with an IO backplane, which contains matching 32-pin connectors with key coding to prevent mis-insertion of the IO modules.



Figure 32 — Example of the high density SAI-1620m module

Safety Manager provides an extensive selection of digital and analog input and output interfaces, with different characteristics, to meet the demands of a wide range of field equipment. Table 12 on the next page lists the input and output interfaces available with Safety Manager.

Interface	Properties			
Digital Input	24 Vdc, 48 Vdc and 110 Vdc 24 Vdc (loop-monitored) 120-230 Vac Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG Class [Eex ia] IIC intrinsically safe (Through external devices)			
Digital Output	24 Vdc, 48 Vdc, 60 Vdc and 110 Vdc 24 Vdc, 48 Vdc (loop-monitored) 120-230 Vac Dry contact outputs Class [Eex ia] IIC intrinsically safe (Through external devices)			
Analog Input	 0-20 mA, 4-20 mA, 0-25mA 0-20 mA and 4-20 mA with HART support (Through external devices) 0-5 V, 1-5 V, 0-10 V and 2-10 V Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG Resistance Temperature Device (RTD) (Through external devices) Thermocouple, types E, J, K and T (Through external devices) 			
Analog Output	0-20 mA and 4-20 mA Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG			

Table	12 —	Safety	Manager	input	and	output	interfaces
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All Safety Manager IO modules are galvanically or optically isolated between external and internal power supply. Safe IO modules can be used for safety loops up to and including SIL3.

Safe modules can also be used for control applications, offering the benefits of Safety Manager diagnostic and fault-reporting functions with or without automatically isolating faults. (Automatic isolation of faults is configurable.)