



GL700 • *Embedded Gold*

Single Pair Ethernet Switch

5 x 100BASE-T1 • 2 x 1000BASE-T

4-Way Power + Data M8 Hybrid Connectors

Automotive Ethernet • Industrial Ethernet



Overview

The **GL700 Embedded Gold** is a Single Pair Ethernet (SPE) switch designed for rugged industrial applications. The PCB assembly is provided with five 100BASE-T1 (IEEE 802.3bw) ports and in addition two 1000BASE-T RJ45 jacks for uplink and port expansion.

The 4-way circular M8 Hybrid SPE connectors are covered by the IEC 63171-6, combining power and data distribution. Any GL700 SPE port can deliver up to 2.3A at voltages up to 57V, individually protected by an eFuse.

The M12-A power input connector accepts 9-57VDC. As an option the board can be equipped with a terminal block power connector.

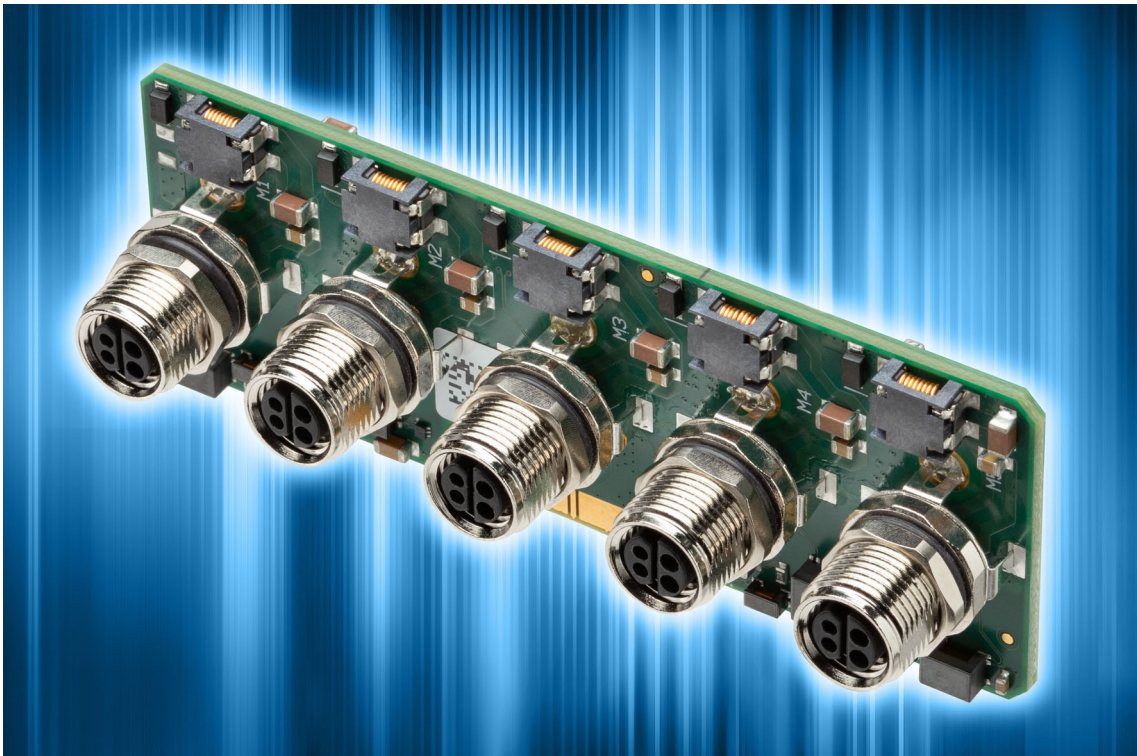
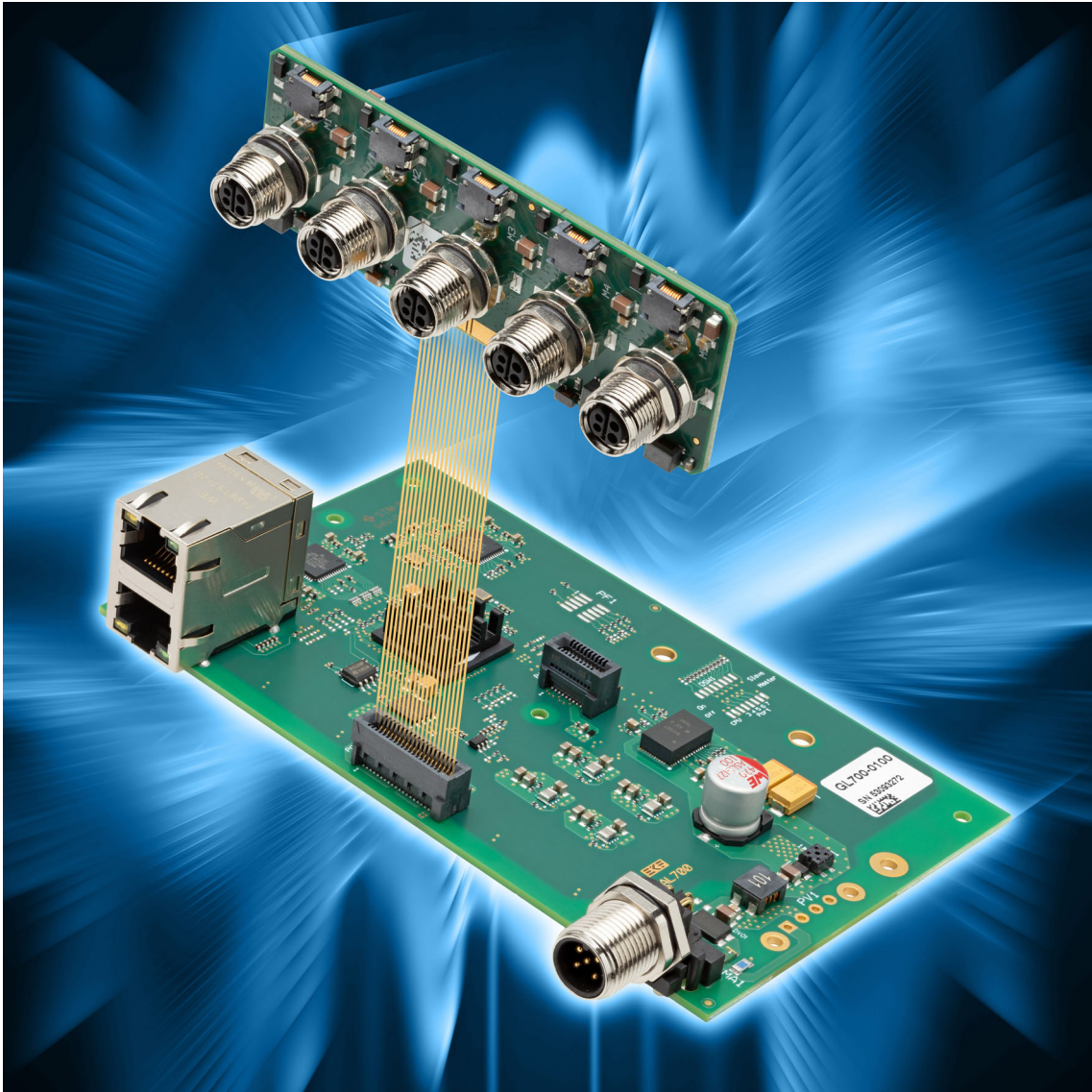
The GL700 is equipped with the Marvell® 88Q5072 Automotive Ethernet switch and is configured by default for self-managed operation. Its PHYs are fully inter-operable with the Open Alliance BroadR-Reach® (OABR) standard for automotive connectivity.

The GL700 is an assembly of the basic PCB and a riser card which accommodates the M8 Hybrid connectors. Switch port expansion (daisy-chaining) can be easily achieved by means of RJ45 Ethernet patch cables, connecting two or more GL700 together.

As **GL710**, the switch is also available with a mezzanine CPU card (GC370) for additional protocol support such as AVB/TSN, and Wi-Fi 6 wireless communication.



GL700 Basic Switchboard



GL702 Front I/O PCB

Technical Features

General

- ▶ 100BASE-T1 IEEE 802.3bw Ethernet switch
- ▶ PCB assembly, intended for rugged applications, ready-for-use (*Embedded Gold*)
- ▶ 5 x M8 Hybrid circular connectors (data & power), IEC 63171-6 (style 6J-M8CI), 100BASE-T1
- ▶ 2 x RJ45 1000BASE-T Gigabit Ethernet connector
- ▶ Intended for industrial and automotive use
- ▶ Self-managed operation
- ▶ AVB/TSN protocol stack under development
- ▶ PCB Dimensions (basic card): 133mm (W) x 78mm (D) w/o connector overlap
- ▶ M12-A DC power connector
- ▶ Sales option terminal block power connector
- ▶ 9-57VDC Wide range power input operation
- ▶ GC370 CPU card can be stacked for AVB/TSN protocol support

Front I/O

- ▶ 2 x RJ45 connector 1000BASE-T, 100BASE-TX, 10BASE-T compliant
- ▶ 5 x 100BASE-T1 SPE front ports M8 Hybrid (4-way IEC 63171-6 style 6J-M8CI), data pair hipot isolated by transformers, power output protected by eFuse* (set to 1A by default), power output voltage corresponds approximately to power input voltage
- ▶ 1 x M12-A 5-pin DC power input, for internal circuitry and as source for M8 Hybrid power lines

* due to supply chain issues eFuses may be replaced by ordinary chip fuses

Power Requirements (DC Input)

- ▶ DC Power input, 9-57V (e.g. 12VDC, 24VDC, 48VDC)
- ▶ Absolute maximum input voltage 62VDC
- ▶ Internal power consumption 2.5W max.
- ▶ DC Power input fast acting chip fuse (PCB soldered type - no replacement on-site)
- ▶ Protected against reverse polarity
- ▶ ESD protection (TVS)
- ▶ Common mode input filter
- ▶ Option terminal block 3.5mm pitch 4-position screw lock power input
- ▶ Power input voltage must be chosen to meet power output voltage requirements via the M8 Hybrid connector ports

Technical Features

Power Conditions M8 Hybrid SPE Connectors (DC Output)

- ▶ DC Output voltage 9V to 57V
- ▶ Output current limited to 1A per M8 Hybrid connector by default
- ▶ Current limit 0.1A to 2.23A custom specific on request
- ▶ Industrial eFuse* TPS26600 assigned to each M8 Hybrid connector (circuit breaker w. auto-retry)
- ▶ DC Input voltage must be equal to DC output voltage provided at M8 Hybrid connectors (consider minor voltage drop between DC input voltage at M12 input power connector and M8 Hybrid connectors caused by internal circuitry)

* due to supply chain issues eFuses may be replaced by ordinary chip fuses

Single Pair Ethernet Switch

- ▶ Marvell® 88Q5072 11-port Automotive Ethernet switch AEC-Q100 Grade 2 qualified
- ▶ 802.1Qat SR Aware 20Gbps switching engine
- ▶ 2 Mbit packet memory +16 MAX addresses
- ▶ Queue controller 8-Level QoS per port
- ▶ 256 entry TCAM (ingress & egress)
- ▶ 3 color ingress policy
- ▶ Hardware support for Layer 3 static routing
- ▶ AVB/TSN per queue shaping 802.1Qav/Qbv
- ▶ 802.1AS & IEEE 1588/PTP
- ▶ Advanced security features including deep packet inspection engine (DPI)
- ▶ DoS (Denial of Service engine)
- ▶ On-Board EEPROM up to 512kb for switch configuration
- ▶ Integrated high-performance ARM® Cortex® M7 CPU 350MHz w. 1MB SRAM
- ▶ Integrated IEEE 802.3bw 100BASE-T1 PHYs Single Pair Ethernet SPE
- ▶ SPE PHYs configured as Master by default
- ▶ Fully inter-operable w. Open Alliance BroadR-Reach® (OABR) PHYs
- ▶ 2 x front port RJ45 receptacles GbE 1000BASE-T (2 x 88EA1512 RGMII/SGMII PHY)
- ▶ 5 x front port connectors M8 Hybrid (88Q5072 integrated 100BASE-T1 PHYs)
- ▶ 2 x 5Gbps SERDES internal mezzanine connectors for custom specific hardware expansion
- ▶ Switch expansion option (daisy-chaining) by connecting two or more GL700 via RJ45 patch cables
- ▶ GL710 available (GL700 with GC370 CPU card for protocol support)

Technical Features

Applications

- ▶ Industrial networks - IIoT
- ▶ AVB/TSN ready
- ▶ Automotive gateway
- ▶ In-vehicle networking
- ▶ Automotive test equipment
- ▶ Rugged environments
- ▶ Edge computing
- ▶ Transportation
- ▶ Construction vehicles
- ▶ Harvester

Software under Development (GL710)

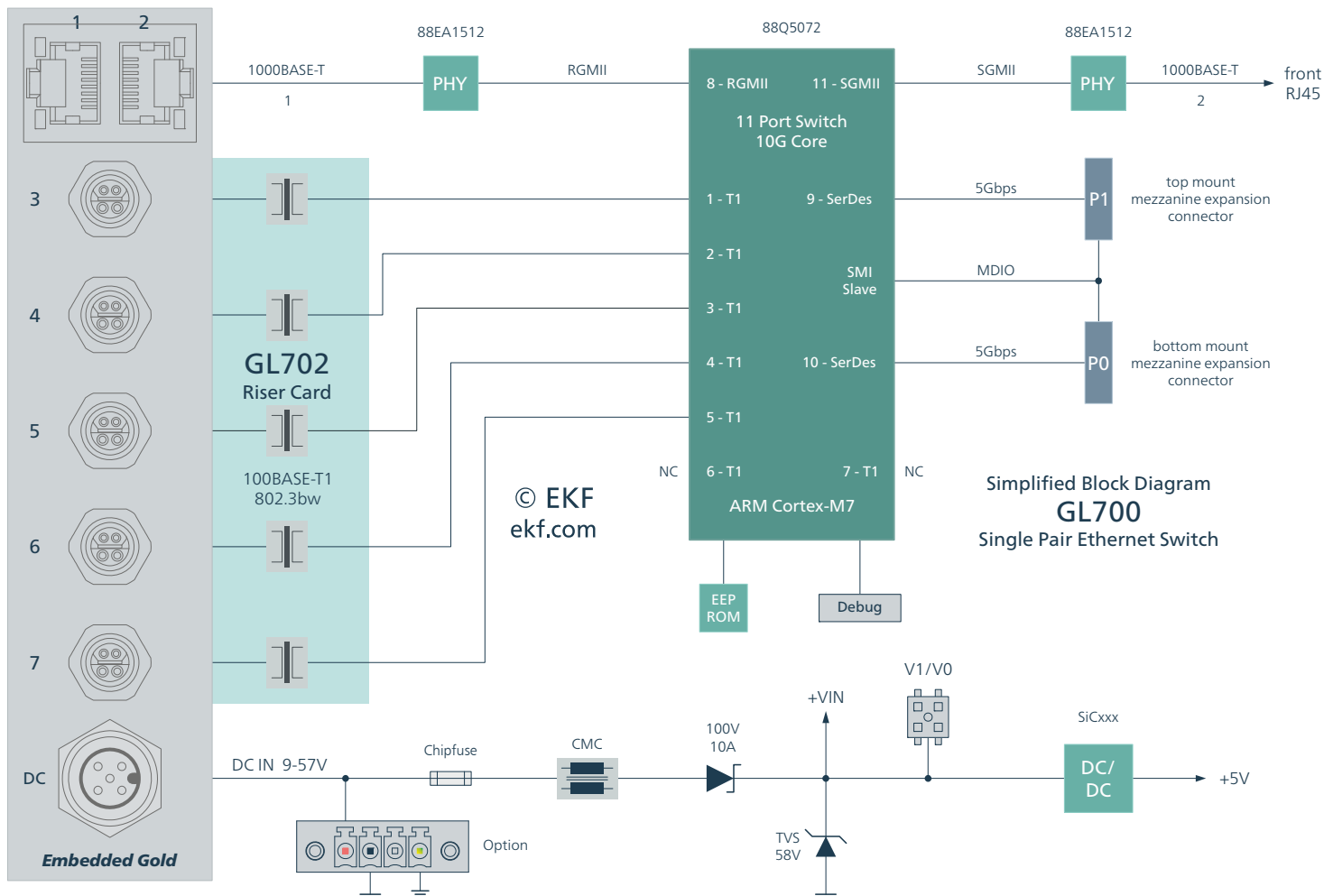
- ▶ AVB/TSN
- ▶ More to come

Environmental, Regulatory

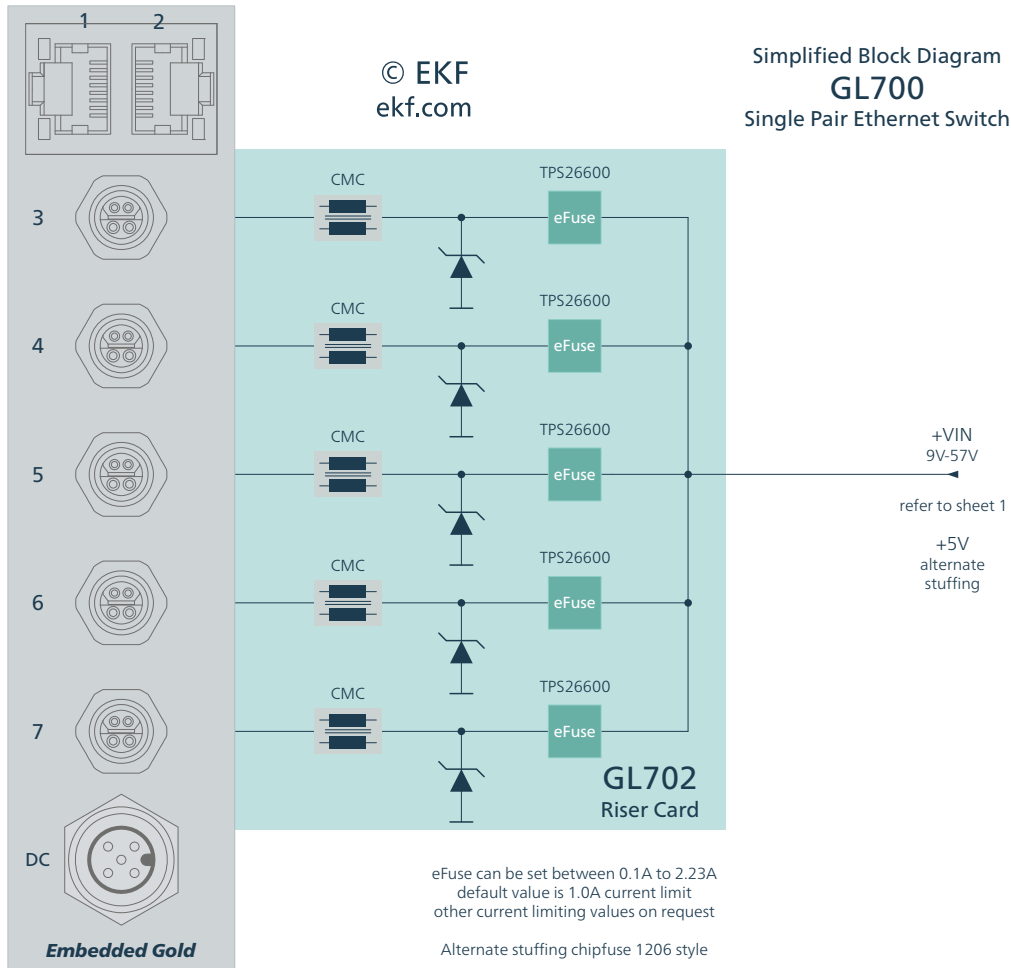
- ▶ Designed & manufactured in Germany
- ▶ ISO 9001 certified quality management
- ▶ Long term availability
- ▶ Rugged solution
- ▶ RoHS compliant
- ▶ Coating, sealing, underfilling on request
- ▶ Operating temperature -40°C to +85°C (industrial temperature range)
- ▶ Storage temperature -40°C to +85°C, max. gradient 5°C/min
- ▶ Humidity 5% ... 95% RH non condensing
- ▶ Altitude -300m ... +3000m
- ▶ Shock 15g 0.33ms, 6g 6ms
- ▶ Vibration 1g 5-2000Hz
- ▶ EC Regulatory EN55035, EN55032, EN62368-1
- ▶ MTBF tbd years

all items may be subject to technical changes w/o further notice

Block Diagram



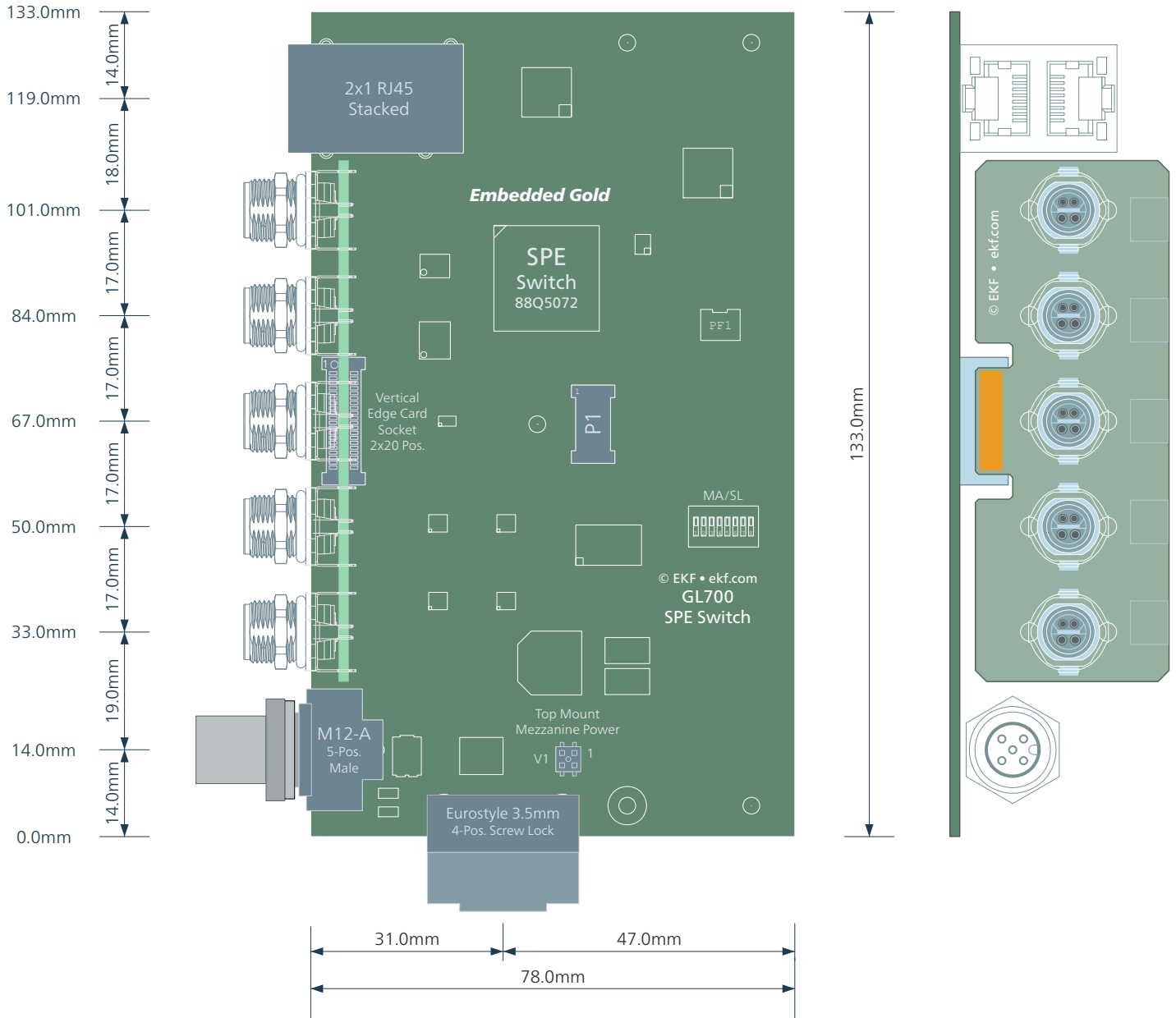
By default, all SPE ports are configured as 'Master'. The GL700 may be provided however with an internal Dip-switch for setting any port individually as 'Slave' (refer to chapter Master/Slave Configuration).



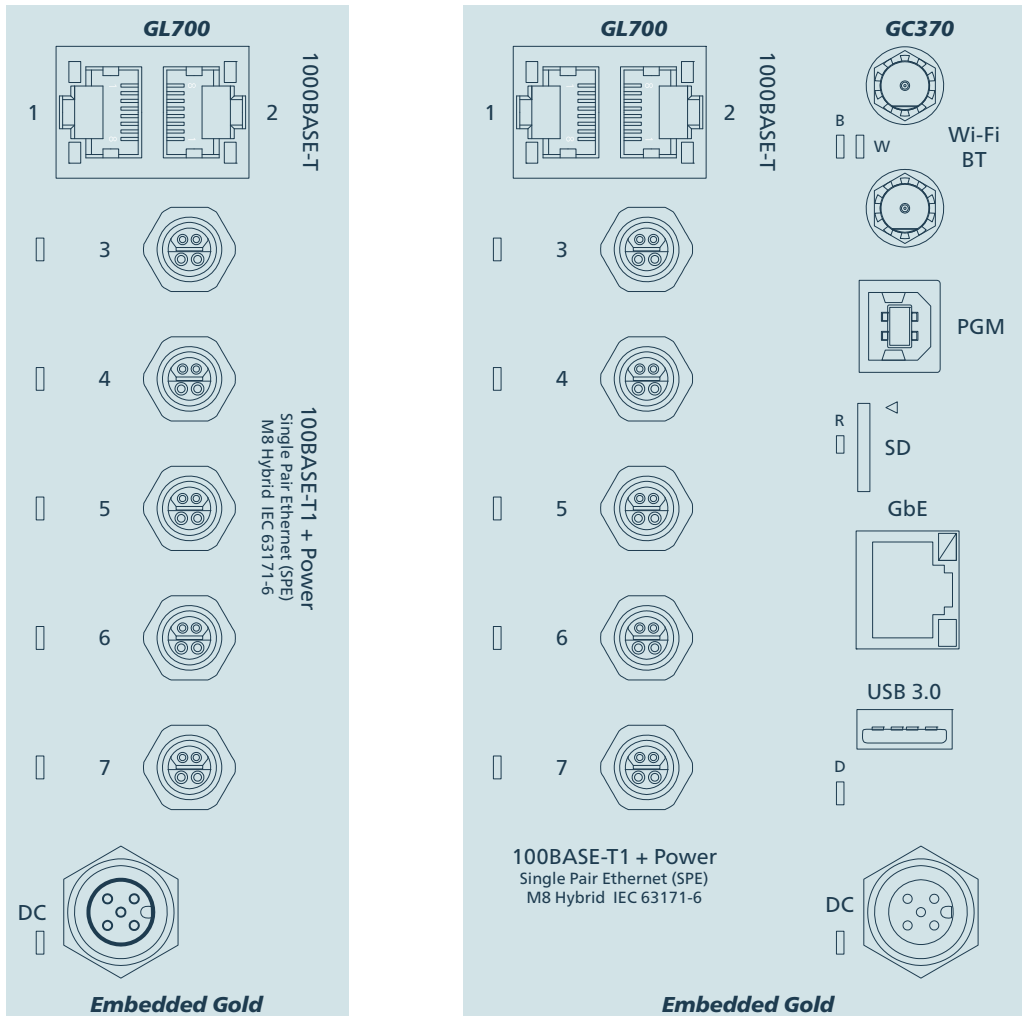
The M8 Hybrid connectors are wired as outputs with respect to their power pins. Do not impose external power to the M8 Hybrid power pins. When connecting GL700 switches via their M8 Hybrid ports, a cable with only data pair wires (pin 1/2) must be used.

Due to supply-chain issues the eFuses may be replaced by ordinary chip fuses temporarily

Dimensions



Recommended Panel Design



DC LED Status		
green	✓	DC input power present (9-44VDC, brightness varies w. input voltage)
blue	✓	DC input power present (44-57VDC)
red	✗	DC input power overvoltage (>57VDC) !! absolute maximum input voltage 65VDC !!
red	✗	DC input power reverse polarity - swap wires connected to M12-A pins 2/4
red	1)	Internal fault (main chip fuse broken)
off	✗	DC input power not present or very low voltage
off	✗	DC input power not applied to M12-A connector pins 2/4

1) SMD component - no replacement on-site

M8 Hybrid Power & Data Connectors

M8 Hybrid IEC 63171-6 4-Position Female PCB Connector			
	$+V_{SPE}=9-57VDC$	1	BI_DA+
		2	BI_DA-
		3	+V _{SPE}
		4	-V (GND)
		Shield	FE

The M8 Hybrid connector system is comprised of a power and a data pair. The output voltage at the M8 Hybrid power pins reflects the input power voltage of the GL700 box, applied at the M12-A input power connector. A decent voltage drop should be considered, caused by internal filtering and circuit protection components, which should not exceed 0.75V. The maximum individual output current for each M8 Hybrid connector is defined by an eFuse*, and set to 1A by default (up to 2.3A on request). The maximum GL700 continuous output current in total is limited by the M12-A input power connector (4A). The M8 Hybrid connectors itself are specified as IP67, however the GL700 box is only IP20 rated (caused e.g. by the RJ45 connectors).

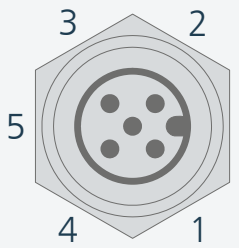


M8 Hybrid

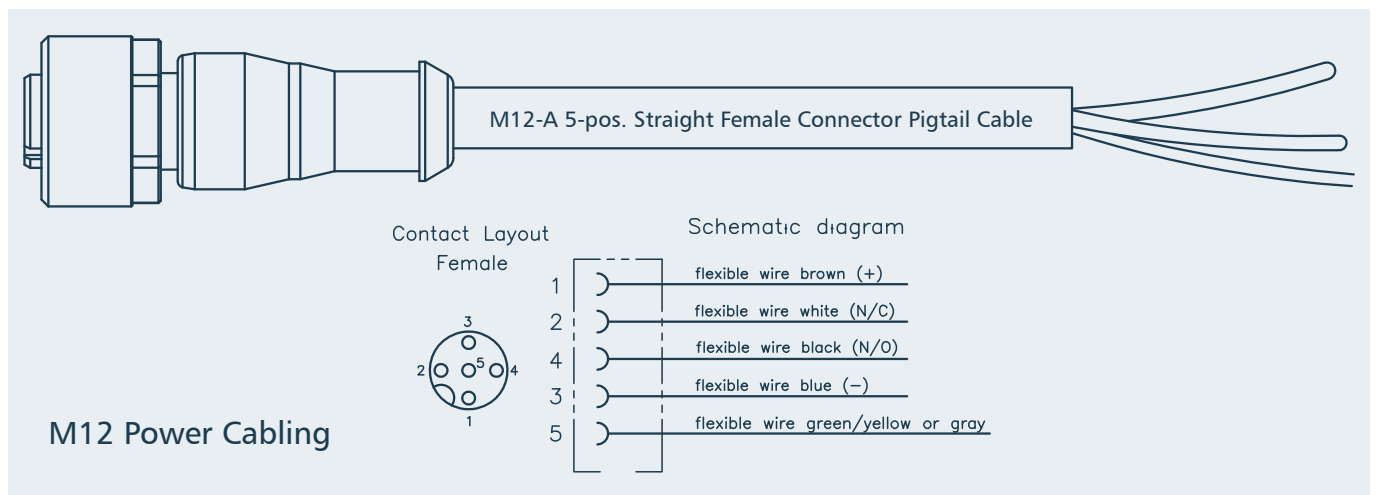
Mating shielded cordsets are available e.g. from Tyco Electronics. The maximum 40m cable length is defined by the 100BASE-T1 Ethernet specification. Both single ended and double ended cable assemblies can be ordered, from 0.5m to 40m cable length.

* Due to supply chain issues the eFuses may be replaced by ordinary chip fuses

M12-A Power Connector

M12-A 5-Position Male 4A/Pin			
 <p>271.10.005.10</p>	<p>+V=9-57VDC</p>	1	+V
		2	Reserved
		3	-V (GND)
		4	Reserved
		5	FE (Shield)

Mating Pigtail Cable Assemblies 1.5m w. Female Straight Plug	
EKF Part No.	271.10.505.22.015
Phoenix Contact	1669822
Tyco	2273035-1



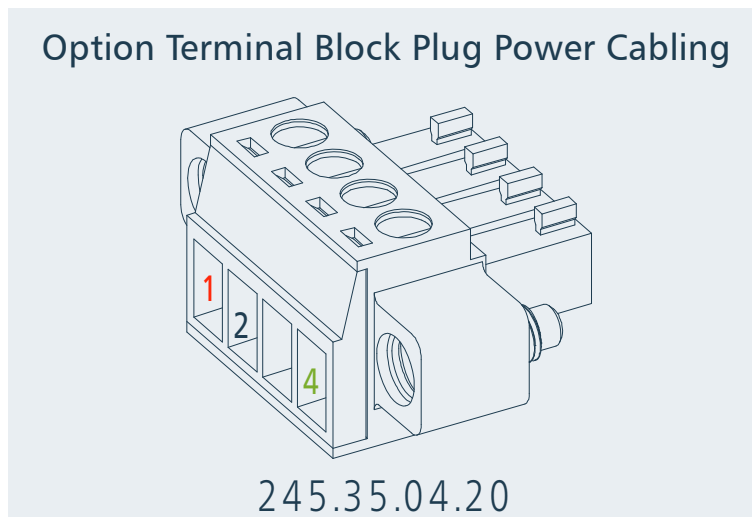
M12 Pigtail Cable
Phoenix Contact

Terminal Block Power Connector Pin Assignment (Sales Option)

3.50mm 4-Position Terminal Block 8A/Contact			
<p>245.35.04.00</p> <p>1 2 3 4</p>	<p>+V=9-57VDC</p>	1	+V
		2	-V (GND)
		3	RSV
		4	FE (Shield)

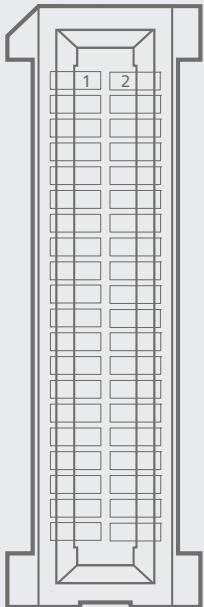
Mating Plugs w. Screw Lock	
EKF	245.35.04.20
FCI Amphenol	20020000-C041B01LF
Molex	39504-0004
Phoenix Contact	1847071
Tyco	284510-4

Option Terminal Block Plug Power Cabling



Placement of the terminal block is optional (consider before ordering)

Riser Card Connector

J-RISER				
 <p style="text-align: right; font-size: small;">290.1.040.080 © EKF ekf.com</p>	+V	1	2	GND
	+V	3	4	1-
	+V	5	6	1+
	+V	7	8	GND
	+V	9	10	2-
	+V	11	12	2+
	+V	13	14	GND
	+V	15	16	3-
	+V	17	18	3+
	RSV	19	20	GND
	GND	21	22	4-
	GND	23	24	4+
	GND	25	26	GND
	GND	27	28	5-
	GND	29	30	5+
	GND	31	32	GND
	GND	33	34	GND
	RSV	35	36	RSV
	SHIELD	37	38	RSV
	SHIELD	39	40	RSV

M8 Hybrid data line numbers 1 - 5 correspond to front panel Ethernet port numbering 3 - 7

table above for EKF internal reference only

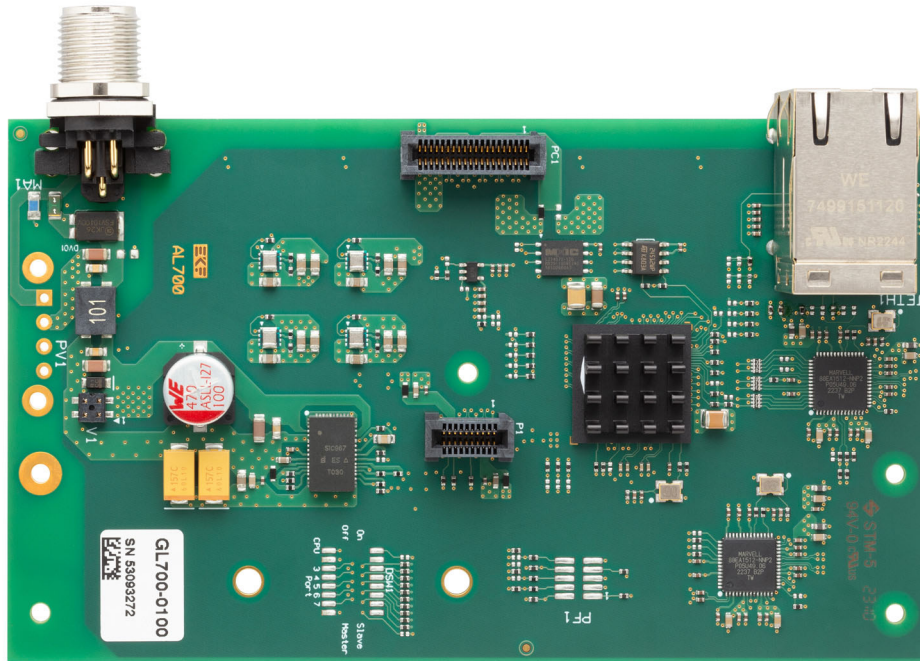
88Q5072 Port Assignment

Front Connector Numbering vs. Switch Port Numbers				
F/P Connector	Ethernet	Ethernet Switch Port	Type	PHY
1 - RJ45	1000BASE-T	8	RGMII	88EA1512
2 - RJ45	1000BASE-T	11	SGMII	88EA1512
3 - M8 Hybrid	100BASE-T1	1	SPE	88Q5072
4 - M8 Hybrid	100BASE-T1	2	SPE	88Q5072
5 - M8 Hybrid	100BASE-T1	3	SPE	88Q5072
6 - M8 Hybrid	100BASE-T1	4	SPE	88Q5072
7 - M8 Hybrid	100BASE-T1	5	SPE	88Q5072

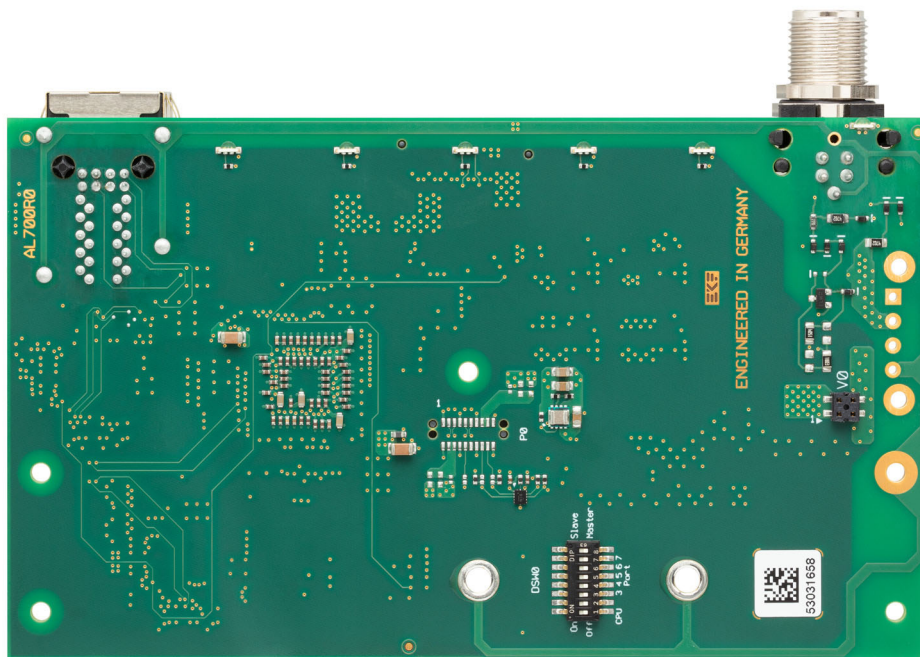
Master/Slave Configuration

SPE Port Configuration (Factory Default = Master) Dip-Switch either Top/Bottom Mount			
Dip-Switch #	F/P Connector	Master	Slave
1	-	-	-
2	-	-	-
3	3 - M8 Hybrid	OFF	ON
4	4 - M8 Hybrid	OFF	ON
5	5 - M8 Hybrid	OFF	ON
6	6 - M8 Hybrid	OFF	ON
7	7 - M8 Hybrid	OFF	ON
8	-	-	-

The M8 Hybrid connectors are wired as outputs with respect to their power pins, regardless of the particular Master/Slave port configuration. Do not impose external power to the M8 Hybrid power pins. **When connecting GL700 switches via their M8 Hybrid ports, a cable with only data pair wires (pin 1/2) must be used.** For easy daisy-chaining of GL700 boards, the RJ45 1000BASE-T jacks are recommended instead. Each GL700 must be powered individually via either its M12-A circular connector or the optional terminal block connector.



GL700 Basic Switchboard (Top View)



GL700 Basic Switchboard (Bottom View)

Ordering Information

For popular GL700 SKUs please contact sales@ekf.de

Related Products

GC370	ARM® V8 Industrial Microcontroller
GJ200	PoE+ Injector
GL100	M12-X 5 to 15 port unmanaged GbE switch
GL110	M12-X 5 port GbE switch w. ARM® V8 CPU
GL200	RJ45 8 port unmanaged GbE switch
GL210	RJ45 8 port GbE switch w. ARM® V8 CPU
GL220	RJ45 8 port unmanaged PoE+ GbE switch
GL230	RJ45 8 port PoE+ GbE switch w. ARM® V8 CPU
GL600	SPE IEC 63171-6 connectors 7 port switch
GL610	SPE IEC 63171-6 connectors 7 port switch w. ARM® V8 CPU



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