

# KEY SPECIFICATIONS FOR PALO ALTO NETWORKS INTERFACES AND TRANSCEIVERS

The data interfaces implemented by Palo Alto Networks® are based on industry standards and implementation agreements primarily authored by the Institute of Electrical and Electronics Engineers (IEEE) 802.3 committee and the Small Form Factor (SFF) Committee. Each interface definition is supported by specifications and agreements defining the electromechanical coupling, electrical and optical signals, as well as management properties of compliant implementations.

Palo Alto Networks next-generation firewalls utilize Ethernet interfaces in a mix of fixed form factor and pluggable formats, including 10Mb/100Mb/1Gb tri-rate copper; 100Mb/1Gb/10Gb tri-rate copper; 1Gb SFP; 10Gb SFP+; 40Gb QSFP+ and 100Gb QSFP28.

Fiber optic transceiver implementations are based on either multi-mode fiber (MMF) or single-mode fiber (SMF). It is critical to use a transceiver matched to the fiber deployed in the facility. Multi-mode transceivers must be used with MMF, and single-mode transceivers must be used with SMF. Educational material regarding fiber optics may be found online from multiple sources, such as The Fiber Optic Association ([www.foa.org](http://www.foa.org)).

MMF is a low-cost, high-speed option for interconnections within a data center or building with distance limits measured in hundreds of meters. SMF supports longer distances measured in tens of kilometers.

## Platform Interfaces

The number of data plane interfaces supported by each of the Palo Alto Networks products is shown below. Management plus high availability-related interfaces are shown in [square brackets]. The vertical bar separator represents an exclusive OR condition, for example, "8|4" indicates either eight (8) or four (4). On platforms allowing dual rate SFP/SFP+ or QSFP+/QSFP28, ranges (e.g., 0–16) indicate the mix of port speeds that are supported depending on the specific transceivers used.

Product	IEEE 802.3 and SFF Standardized Interfaces							
	10Mb/ 100Mb/ 1Gb Cu	100Mb/ 1Gb/10Gb Cu	100Mb FX/ 1Gb SFP	1Gb SFP	10Gb SFP+	10Gb XFP	40Gb QSFP+	100Gb QSFP28
PA-200	4 [1]							
PA-220, PA-500	8 [1]							
PA-220R	6 [1]		2					
PA-820	4 [3]			8				
PA-850	4 [3]			8 4	0 4			
PA-3020, PA-3050	12 [3]			8				
PA-3060	8 [3]			8	2			
PA-3220	12 [3]			8 4	0 4 [1]			
PA-3250	12 [3]			8 0	0 8 [1]			
PA-3260	12 [3]			8 0	0 8 [1]		4	
PA-5020	12 [3]			8				
PA-5050, PA-5060	12 [3]			8	4			
PA-5220	[3]	4		0–16 ↔ 0–16 [2]			4 [1]	
PA-5250, PA-5260, PA-5280	[3]	4		0–16 ↔ 0–16 [2]			0–4 [0 1] ↔ 0–4 [0 1]	
PA-7050-SMC, PA-7080-SMC	[3]						[2]	
PA-7000-20G-NPC, PA-7000-20GXM-NPC	12			8	4			
PA-7000-20GQ-NPC, PA-7000-20GQXM-NPC					12		2	
M-100, GP-100, WF-500	3 [1]							
M-500	3 [1]				2			
M-200	4							
M-600	4				2			

NOTE: Systems may also include RS-232 serial ports and USB ports for management and administrative tasks. Please refer to each system's respective Hardware Reference Guide for information on these interfaces.

## Pluggable Transceiver and Cable Assembly Specifications

Customers deploying 1, 10, 40 or 100 gigabit fiber interfaces will need to decide between short haul (SX)/long haul (LX)/extremely long haul (ZX) for 1 gigabit connections or short reach (SR) / long reach (LR) / extended reach (ER) for 10, 40 and 100 gigabit connections using the technical specifications shown below. All Palo Alto Networks fiber transceivers utilize either a duplex LC type connector or 12-strand ribbon fiber MPO type connector.

In the table below, MMF is nominally 50/125µm in either OM3 or OM4 grade and SMF as specified by ITU-T G.652 is nominally 9/125µm; G.652 allows for 8.6–9.5/125µm. A multi-mode transceiver should only be used with MMF optic cable, and a single-mode transceiver should only be used with SMF optic cable. NOTE: the LC style connector is used on both multi-mode and single-mode transceivers.

The MPO fiber optic cable connector on 40 gigabit QSFP+ SR4 (PAN-QSFP-40GBASE-SR4) and 100 gigabit QSFP28 SR4 (PAN-QSFP-100GBASE-SR4) transceivers contains guide pins for alignment inside the transceiver per standards and requires cables with guide pin holes for alignment. For direct connection between a pair of QSFP+ or QSFP28 transceivers, 12-strand MPO-terminated ribbon fiber crossover cable without guide pins (commonly referred to as a type-B crossover cable) is used.

Palo Alto Networks Transceiver and Cable Assembly Specifications									
Palo Alto Networks Part Name (SKU)	Ethernet Data Rate (Gbps)	Media Connector	Media Type	Maximum Distance (m or km)	Wave Length (λ nm)	Power Max (W)	Operating Temp (°C)	Storage Temp (°C)	Relative Humidity (%)
PAN-QSFP28-100GBASE-LR4	100	LC	SMF	10km	1295.56 1300.05 1304.58 1309.14	< 4	0 – 70	-40 – 85	0 – 85
PAN-QSFP28-100GBASE-SR4	100	MPO	MMF	70m OM3 100m OM4	850	< 3.5	0 – 70	-40 – 85	0 – 85
PAN-QSFP28-AOC-10M	100	n/a	n/a	10m	n/a	< 3.5	0 – 70	-40 – 85	0 – 85
PAN-QSFP-40GBASE-ER4	40	LC	SMF	40km	1271 1291 1311 1331	< 3.5	0 – 70	-40 – 85	0 – 85
PAN-QSFP-40GBASE-LR4	40	LC	SMF	10km	1271 1291 1311 1331	< 3.5	0 – 70	-40 – 85	0 – 85
PAN-QSFP-40GBASE-SR4	40	MPO	MMF	100m OM3 150m OM4	850	< 1.5	0 – 70	-40 – 85	0 – 85
PAN-QSFP-AOC-10M	40	n/a	n/a	10m	n/a	< 1.5	0 – 70	-40 – 85	0 – 85
PAN-SFP-CG	1	RJ-45	Cat5 >	100m	n/a	< 1.2	-40 – 85	-40 – 85	-
PAN-SFP-LX	1	LC	SMF	10km	1310	< 1.9	-40 – 85	-40 – 85	-
PAN-SFP-PLUS-CU-5M	10	SFP+	Cu	5m	n/a	passive	-	-	-
PAN-SFP-PLUS-ER	10	LC	SMF	40km	1550	< 1.5	-5 – 70	-40 – 85	0 – 85
PAN-SFP-PLUS-LR	10	LC	SMF	10km	1310	< 1	-5 – 70	-40 – 85	0 – 85
PAN-SFP-PLUS-SR	10	LC	MMF	300m OM3 450m OM4	850	< 1	-5 – 70	-40 – 85	0 – 85
PAN-SFP-SX	1	LC	MMF	550m	850	< 0.5	-10 – 85	-40 – 85	0 – 85
PAN-SFP-ZX	1	LC	SMF	80km	1550	< 0.7	-40 – 85	-40 – 85	0 – 85
PAN-XFP-LR	10	LC	SMF	10km	1310	< 1.5	-5 – 75	-40 – 85	0 – 85
PAN-XFP-SR	10	LC	MMF	300m	850	< 1.5	-5 – 70	-40 – 85	0 – 85

NOTE: Minimum link distance for all connections is two meters. Palo Alto Networks policy regarding the use of third-party transceivers is posted online at <https://www.paloaltonetworks.com/services/support/support-policies/third-party-components-support>.

## Transceiver and Cable Assembly Descriptions and Applicability

Palo Alto Networks Part Name (SKU)	Description	Platform Applicability
PAN-QSFP28-100GBASE-LR4	QSFP28 form factor, 100Gb LR4 optical transceiver, long reach 10km, SMF, duplex LC, IEEE 802.3ba 100GBASE-LR4 compliant	PA-5260, PA-5250
PAN-QSFP28-100GBASE-SR4	QSFP28 form factor, 100Gb SR4 optical transceiver, short reach 100m OM4 (70m OM3), 12-strand MPO, MMF, IEEE 802.3ba 100GBASE-SR4 compliant	PA-5260, PA-5250
PAN-QSFP28-AOC-10M	QSFP28 form factor, 100Gb active optical cable with 2 transceivers and 10m of cable permanently bonded as an assembly	PA-5260, PA-5250
PAN-QSFP-40GBASE-ER4	QSFP+ form factor, 40Gb ER4 optical transceiver, extended reach 40km, SMF, duplex LC, IEEE 802.3ba 40GBASE-ER4 compliant	PA-7000 Series, PA-5200 Series
PAN-QSFP-40GBASE-LR4	QSFP+ form factor, 40Gb LR4 optical transceiver, long reach 10km, SMF, duplex LC, IEEE 802.3ba 40GBASE-LR4 compliant	PA-7000 Series, PA-5200 Series
PAN-QSFP-40GBASE-SR4	QSFP+ form factor, 40Gb SR4 optical transceiver, short reach 100m OM3, 12-strand MPO connector, IEEE 802.3ba 40GBASE-SR4 compliant	PA-7000 Series, PA-5200 Series
PAN-QSFP-AOC-10M	QSFP+ form factor, 40Gb active optical cable with 2 transceivers and 10m of cable permanently bonded as an assembly	PA-7000 Series, PA-5200 Series
PAN-SFP-CG	SFP form factor, 1Gb copper transceiver, 100m over Cat5 RJ-45, IEEE 802.3ab 1000BASE-T compliant	PA-7000 Series, PA-5200 Series, PA-5000 Series, PA-4000 Series, PA-3000 Series, PA-2000 Series, PA-800 Series
PAN-SFP-LX	SFP form factor, LX 1Gb optical transceiver, 10km reach, SMF, duplex LC, IEEE 802.3ab 1000BASE-LX compliant	PA-7000 Series, PA-5200 Series, PA-5000 Series, PA-4000 Series, PA-3000 Series, PA-2000 Series, PA-800 Series
PAN-SFP-PLUS-CU-5M	SFP+ form factor, 10Gb direct attach twinax passive cable with 2 transceiver ends and 5m of cable permanently bonded as an assembly, IEEE 802.3ae 10GBASE-CR compliant	PA-7000 Series, PA-5200 Series, PA-5060, PA-5050, PA-3200 Series, PA-3060, PA-850, M-500
PAN-SFP-PLUS-ER	SFP+ form factor, ER 10Gb optical transceiver, extended reach 40km, SMF, duplex LC, IEEE 802.3ae 10GBASE-ER compliant	PA-7000 Series, PA-5200 Series, PA-5060, PA-5050, PA-3060, PA-850, M-500
PAN-SFP-PLUS-LR	SFP+ form factor, LR 10Gb optical transceiver, long reach 10km, SMF, duplex LC, IEEE 802.3ae 10GBASE-LR compliant	PA-7000 Series, PA-5200 Series, PA-5060, PA-5050, PA-3060, PA-850, M-500
PAN-SFP-PLUS-SR	SFP+ form factor, SR 10Gb optical transceiver, short reach 300m, OM3 MMF, duplex LC, IEEE 802.3ae 10GBASE-SR compliant	PA-7000 Series, PA-5200 Series, PA-5060, PA-5050, PA-3060, PA-850, M-500
PAN-SFP-SX	SFP form factor, SX 1Gb optical transceiver, 550m reach on OM2 MMF, duplex LC, IEEE 802.3z 1000BASE-SX compliant	PA-7000 Series, PA-5200 Series, PA-5000 Series, PA-4000 Series, PA-3000 Series, PA-2000 Series, PA-800 Series
PAN-SFP-ZX	SFP form factor, ZX 1Gb optical transceiver, 80km reach, SMF, duplex LC	PA-7000 Series, PA-5200 Series, PA-5000 Series, PA-4000 Series, PA-3000 Series, PA-2000 Series, PA-800 Series
PAN-XFP-LR	XFP form factor, LR 10Gb optical transceiver, long reach 10km, SMF, duplex LC, IEEE 802.3ae 10GBASE-LR compliant	PA-4060
PAN-XFP-SR	XFP form factor, SR 10Gb optical transceiver, short reach 300m, OM3 MMF, duplex LC, IEEE 802.3ae 10GBASE-SR compliant	PA-4060

Refer to “SFF-8024, Specification for SFF Cross Reference to Industry Products” for a list of applicable SFF documents. SFF specifications are available at <http://www.snia.org/sff/specifications> or <ftp://ftp.seagate.com/sff>.

Through the IEEE Standards Association, industry and government support, select IEEE standards are available for download at no charge. For access to the “IEEE Standard for Ethernet,” visit <http://standards.ieee.org/about/get/802/802.3.html>.



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