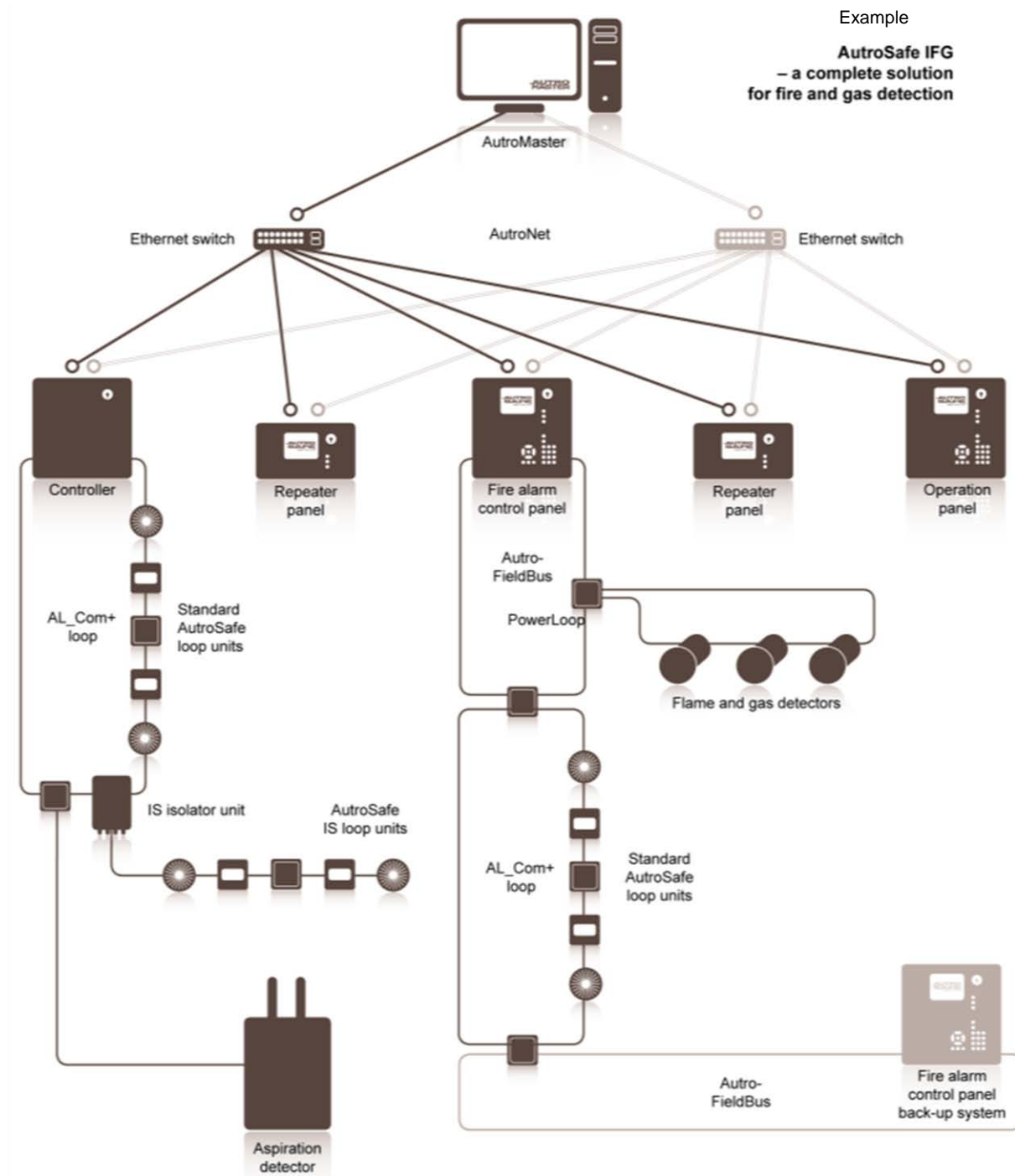


Cable Specifications – AutoSafe and Autoprime



Conversion table American Wire Gauge (AWG) to mm / mm²

AWG N°	Diam. mm	Area mm ²
8	3,260	8,350
9	2,910	6,620
10	2,590	5,270
12	2,050	3,310
13	1,830	2,630
15	1,450	1,650
17	1,150	1,040
18	1,024	0,8230
24	0,511	0,2050

This document specifies the cabling for Autronica’s interactive fire detection systems, and integrated fire and gas detection systems.

With respect to *absolute* requirements, the term “shall” is used consistently. The term “recommended” is used when different parameters or various considerations determine the best alternative solution. Measures referring to cable type, dimensions and lengths in the table on the back side of this document are given in metric units. For information on cable dimensions in American Wire Gauge (AWG), refer to the table above (Conversion table AWG to mm/mm²).

Definitions

Local Frame Earth The electrical connection to the framework at the described physical position, such as the frame or chassis of a cabinet, the power cable outlet etc.

Shield Generic notation of an electric barrier that attenuates an RF field. Shield could be realised as a metallic encapsulation around an electronic device (shielded cabinet) or around a cable (Shielded cable).

Dual Shield The shield contains two levels of barriers that must be electrically isolated. Each shield may consist of multiple layers, like foil + braid or braid+braid. The shield can be physically realised as; Foil, Mesh, Braid, Armour (defined below).

Foil A shield made of a metallic film or sheet that is 100% proof. In general 100 MHz and above as it requires a quite thin foil to enable flexibility. It will not be the best option for low frequency communication lines (below 10MHz). Note that if the foil type of shield is used, it is required that there is a wire available for termination of this shield (Pig tail).

Mesh A shield made of knitted wires to improve the coverage of the shield, compared to braid. This type of shield is rarely used.

Braid A shield made of weaved wires. This is the most common method for shielded cables, it makes the best price / performance. A double layer of braid is often used to increase the attenuation, this is especially effective at cable lengths above 0,03 of the frequency wavelength, which is 70 m at 133kHz (PowerLoop).

Armour A mechanical protection of the cable, normally a rigid braid inside the outer isolation. If the armour supports proper electrical conductance and shield coverage, this may be used as one of the required shields (PE).

Instrument Earth (IE) An earth reference that is normally used to reference measurements of electrical signals.

Protective Earth (PE) An earth reference that is normally used as a coupling path for unwanted electrical signals, like transients and over-voltage. The chassis or framework of the installation is normally considered to be the local Protective Earth. As the name implies, it is intended to provide a safe electrical potential for human safety.

Ground Synonym for Earth.

PowerLoop Cabling - Guidance Table

Type of shield (Dual)	Characteristics	Usability for PowerLoop
Foil + braid	Tradeoff to make good attenuation at both high and low frequencies.	Most commonly used alternative. Recommended to avoid long parallel paths. Contact Autronica for advice.
Foil + foil	Optimised for high frequency.	Not suitable to Powerloop. If foil is a thin metal film this cable shall not be used. One of the foils has to be at least 0,3mm thick copper to be acceptable at the low frequencies. (Aluminium foil has to be 0,5 mm).
Braid+braid	Improved attenuation in low/mid frequency range (compared to single braid shield).	Well suited.
Foil/braid +braid or Foil/braid + foil/braid	The extra foil in one (or both) of the shield layers improves attenuation both at high and low frequencies.	Well suited, especially for long parallel Powerloop cable runs.

Note. If foil is used for shield, the foil shall contain a separate wire in contact with this one, to be used as a pig tail for shield termination. Armour shall be made of a copper braid (or mesh) to ensure high conductivity. Armour shielding coverage shall be optically covering more than 60%, and conductance similar to the internal wire pair. Armour with less than 60% coverage shall include another shield layer to contain two layers of foil/braid or braid/braid to ensure proper low frequency shielding. A PowerLoop cable shall be contained in a dual shielded cable, i.e. multiple pair cable shall not contain two or more power loop cables. It is acceptable to arrange tour / retur of the same power loop cable within one such cable (two wire pairs), this requires each pair to be individually shielded. The intention is to keep the dual shield barrier between two adjacent powerloop cables.



Cable Specifications – AutroSafe and Autroprime

Cabling								
AI_Com Fire Detection Loops Autroprime	Detection Loop current setting (mA)	Max cable resistance (Ω)	Maximum capacitance (μF)	Cable length (m) for AWG 20 (0,5mm ²)	Cable length (m) for AWG 18 (0,75mm ²)	Cable length (m) for AWG 17 (1,0mm ²)	Cable length (m) for AWG 15 (1,5mm ²)	Cable length (m) for AWG 13 (2,5mm ²)
Low Current Detectors and I/O Units	100	105	0,5	1500	2250	3000	4500	7500
	150	58	0,5	829	1243	1657	2486	4143
	200	35	0,5	500	750	1000	1500	2500
	250	21	0,5	300	450	600	900	1500

Cabling								
AI_Com Fire Detection Loops Autroprime	Detection Loop current setting (mA)	Max cable resistance (Ω)	Maximum capacitance (μF)	Cable length (m) for AWG 20 (0,5mm ²)	Cable length (m) for AWG 18 (0,75mm ²)	Cable length (m) for AWG 17 (1,0mm ²)	Cable length (m) for AWG 15 (1,5mm ²)	Cable length (m) for AWG 13 (2,5mm ²)
High Current Detectors and I/O Units	100	112	0,5	1600	2400	3200	4800	8000
	150	78	0,5	1114	1671	2229	3343	5571
	200	55	0,5	786	1179	1571	2357	3929
	250	40	0,5	571	857	1143	1714	2857
	300	30	0,5	429	643	857	1286	2143
	350	23	0,5	329	493	657	986	1643
	400	18	0,5	257	386	514	771	1286

Cabling								
AI_Com Fire Detection Loops AutroSafe	Loop Driver Module	Max cable resistance (Ω)	Maximum capacitance (μF)	Cable length (m) for AWG 20 (0,5mm ²)	Cable length (m) for AWG 18 (0,75mm ²)	Cable length (m) for AWG 17 (1,0mm ²)	Cable length (m) for AWG 15 (1,5mm ²)	Cable length (m) for AWG 13 (2,5mm ²)
	Standard loop driver module BSD-310	50	0,5	650	1000	1300	2000	3300
	High-power version BSD-311 (High-current)	20	0,5	250	400	500	800	1300
In Integrated Fire & Gas Detection Systems, shielded cable is recommended. Cable dimension CSA 1.0mm ²								

Cable Specifications – AutoSafe and Autroprime

Cabling	Cable type / category	Cable dimension	Maximum cable length (m)	Maximum resistance (Ω) / capacitance (F)
PowerLoop	Dual shielded cable, twisted pair cables shall be used	The Power Loop Calculator Tool shall be used to determine the cable dimension. Typically CSA 2,5mm ²	1000m. The Power Loop Calculator Tool shall be used to determine the permissible cable length. Dual shielded cable shall be used. Long parallel PowerLoop cable runs may introduce cross-talk between PowerLoops, thus it is recommended to avoid such long parallel runs. The permissible length of parallel PowerLoop cable runs will depend on the quality of the cable shield. Segregation of parallel PowerLoop cable runs by 30cm (1 foot) will increase permissible parallel length significantly. Contact Autronica for design-advice for applications with long parallel Powerloop cable runs.	Maximum loop resistance depends on load. The Power Loop Calculator Tool shall be used to determine the maximum resistance.
AutroFieldBus (AFB)	Twisted-pair cables. Category 4, 5 or 6 Shielded cable required. Shielded by foil or braid.		Short length cables (< 600m): The cable length is limited to 600m. Capacitance per 1000m shall be less than 200nF. Medium length cables (< 1000m): The AutroFieldBus cable length is limited to 1000m. Capacitance per 1000m shall be less than 100nF. Cable length > 1000m: Boosters shall be used if the AutroFieldBus cable is more than 1km in length. Boosters shall be evenly spread round the AFB ring. NOTE: The maximum length for a total ring with Boosters is 2,8km (see also rightmost column). The booster can also be used in cases when different cable types (AFB cables) are used in a distributed system (see also rightmost column).	Characteristic impedance 100 Ω +/- 15%. Attenuation @100KHz, Max. 9 dB over full cable segments (or between boosters). Attenuation is defined by the wire to wire capacitance mostly, as long as the wire is at least 0.5mm ² . The total attenuation of the cable length shall not exceed 9 dB. If attenuation is not specified, normally the capacitance is defined. The capacitance shall not exceed the specified value in order to achieve the total communication length. All cable over full cable segment (or between boosters) shall be of same type and have equal specifications.

Cabling	Cable type / category	Cable dimension	Maximum cable length (m)
Ethernet –TCP/IP (AutroNet)	CAT 5 or 6, shielded or unshielded. Single-mode or multi-mode optic fibre		Maximum 100m Maximum fibre length is determined by the transmission budget calculated from specifications of fiber cable, equipment, loss by fibre cable joints and connectors.
AutroCom Serial RS-232	Multi-wired cable		Maximum 10m
AutroCom Serial VDR, ESPA, Modbus RS-422/RS-485	CAT 4, 5 or 6.		Maximum cable length 1000m - depending on the cable quality and baud rate. The transceiver is referenced to Earth in the AutoSafe panel. The transceiver at the other end shall be terminated and referenced to ensure low common mode voltage. For cable connections out of the AutoSafe installation cabinet or earth reference (or where common mode voltage noise is expected) a galvanic isolation shall be introduced in the communication path.
Power Supply / Cabling		Cable dimension according to system load and project spec.	