

for stationary installations where the cables hardly move. Stranded wires consist of several individual strands. This is used for making flexible and highly flexible cables; it is well suited for use in non-stationary applications.

The size of the copper wires is indicated in AWG (American Wire Gauge). An overview of the sizes is provided below.

As the wire cross section increases (smaller AWG numbers), the signal attenuation in the cable (IL = Insertion Loss) lowers and the range of the data cable lengthens. This is why PROFINET cables (e.g. type A with four AWG22/1 wires) operate with a 100 metre range and why patch/connecting cables (with only AWG26/7 wire strands) are intended for 20 to 40 metre ranges.

Type 1
(massive copper wire, excerpt from ASTM B286)

AWG					Maximum DC resistance of 20 °C			
AWG specification	Cross-sectional area		Nominal diameter		Tinned surfaces		Bare copper wires or silver-plated surfaces	
	cmils	mm ²	in.	mm	Ω/1000 ft	Ω/km	Ω/1000 ft	Ω/km
22	640	0.324	0.0253	0.643	17.2	56.430	16.5	54.133
24	404	0.205	0.0201	0.511	27.2	89.238	26.2	85.958
26	253	0.128	0.0159	0.404	44.5	145.997	41.9	137.467
28	159	0.081	0.0126	0.320	70.8	232.283	66.8	219.160

Type 2
(stranded copper wire, excerpt from ASTM B286)

Wire construction								Max. DC resistance of 20 °C			
AWG specification	Number of wire cores	Diameter of the individual wires		Calculated cross-sectional area		Maximum permitted diameter		Tinned surfaces		Bare copper wires or silver-plated	
		in.	mm	cmils	mm ²	in.	mm	Ω/1000 ft	Ω/km	Ω/1000 ft	Ω/km
22-19	19	0.0063	0.160	754	0.382	0.033	0.84	15.9	52.165	14.8	48.556
22- 7	7	0.0100	0.254	700	0.355	0.031	0.79	16.7	54.790	15.6	51.181
24-19	19	0.0050	0.127	475	0.241	0.027	0.69	25.4	83.333	23.6	77.428
24- 7	7	0.0080	0.203	448	0.227	0.025	0.64	26.2	85.958	24.5	80.381
26-19	19	0.0040	0.102	304	0.154	0.022	0.56	40.1	131.56	37.3	122.37
26- 7	7	0.0063	0.160	278	0.141	0.020	0.51	42.6	139.76	39.7	130.24
28-19	19	0.0031	0.079	183	0.093	0.017	0.43	67.7	222.11	63.1	207.02
28- 7	7	0.0050	0.127	175	0.089	0.016	0.40	68.2	223.75	63.6	208.66

Cross sections of copper wires