

## Technical section

### EMI screen system & fire performance

#### EMI screen system

For applications where electromagnetic interference is of particular concern we have classified suitable conduit systems by means of symbols. These are related in an ascending scale of performance from Standard EMI Screen (products featuring a stainless steel overbraid) through to High EMI Screen (products featuring a tinned copper overbraid). Contact us for full details.



Standard EMI Screen	Super Low Fire Hazard	Inherent Low Fire Hazard
Screening level 40db @ 100MHz	Screening level 60db @ 100MHz	Screening level 75db @ 100MHz

#### Fire performance

Adaptaflex has introduced a set of symbols to help the user specify conduit systems for installations where fire performance is of particular concern.

Each symbol encompasses a range of properties relevant to the high specification materials used in the construction of the conduit.

They are in an ascending scale of performance from Low Fire Hazard (LFH) featuring zero halogen through to Super Low Fire Hazard (SLFH) featuring zero nitrogen. In addition, Inherent Low Fire Hazard systems (ILFH) are classified as being all metal systems.



Property	Low Fire Hazard	Enhanced Low Fire Hazard	Super Low Fire Hazard	Inherent Low Fire Hazard
	LFH	ELFH	SLFH	ILFH
Oxygen Index ISO4589	31% ≥ OI ≥ 28%	OI ≥ 32%	OI ≥ 32%	Inherent Low Fire Hazard
BS6853 Smoke Density 3m <sup>3</sup>	0.02 ≥ A0 ≥ 0.03	0.005 ≥ A0 ≥ 0.02	0.02 A0 ≤ 0.005	i.e. Type S, SS, SPB STC, SSB & SSBGS Metallic Conduit & Fittings
Zero Halogen	■	■	■	
Zero Phosphorus	■	■	■	
Zero Sulphur	■	■	■	
London Underground	Concession	Approved	Approved	
Toxicity Index NES713 Issue 3	5.0 ≥ TI ≥ 6.0	0.5 ≥ TI ≥ 5.0	TI ≤ 0.5	
NFF16-102	I3F2	I2F2	I2F1	















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### IP ratings

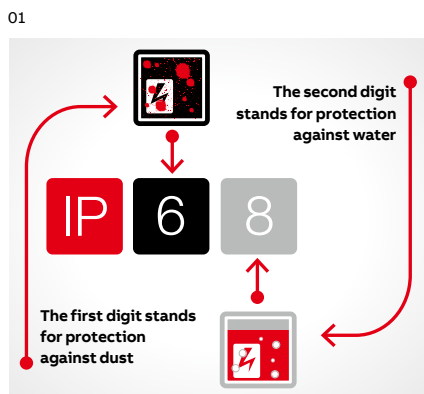
IP suitability ratings are a system for classifying the degree of protection provided by enclosures of electrical equipment.

#### Protection against solid bodies

Degree of protection for persons against access to hazardous parts inside the enclosure and/or against the ingress of solid foreign objects.

		No protection
		Objects greater than 50 mm, accidental touch by hands
		Objects greater than 12 mm, accidental touch by fingers
		Objects greater than 2.5 mm, e.g. tools/wires
		Objects greater than 1 mm, e.g. tools/wires/small wires
		Protected against dust - limited ingress (no harmful deposits)
		Totally protected against dust (dust-tight)

01 IP ratings  
The higher the number, the greater the degree of protection; they apply ONLY to properly installed equipment.



#### Protection against water

Degree of protection of equipment inside enclosures against damage from the ingress of water.

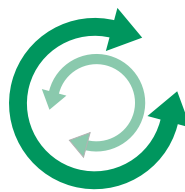
		No protection
		Protected against vertically falling drops of water
		Protected against direct sprays of water 15° from vertical
		Protected against sprays of water to 60° from vertical
		Protected against water sprayed from all directions - limited ingress permitted
		Protected against low pressure jets of water from all directions - limited ingress permitted
		Protected against strong pressure jets of water, heavy seas - limited ingress permitted
		Protection against the effects of immersion between 15cm - 1 m
		Protection against long periods of immersion under a quoted pressure, e.g. 2 bar at 24 hours
		IP69 Automotive standard DIN40050 and signifies resistance to high pressure jets of water (up to 80 bar) from any angle

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Fitting characteristics



Fitting swivels independently of conduit for installation purpose but is not suitable as a rotating joint in constantly moving applications.



Fitting rotates independently of the conduit to act as a rotating joint within constantly moving applications.

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### Chemical resistance

Chemical resistance comparison table

Chemicals	Products														
	PA, PR, PADL, SN	PI, PF	CP	KF, RF, SP	PP	PK	Fittings PA66	ATS Elastomer Seal	S (including braid)	SS (including braid)	LFH-SP	SPL, SPUL	SPLHC	TC braid	Fittings nickel plated brass
Astm no.1	2	2	2	0	2	2	2	2	2	2	0	2	2	2	2
Astm no.2	2	2	2	0	2	2	2	2	2	2	1	2	1	2	2
Astm no.3	2	2	2	0	1	2	2	2	2	2	1	2	1	2	2
Acetic Acid (10%)	1	1	2	1	2	2	1	1	0	2	2	2	2	1	2
Acetone	2	2	1	0	2	2	2	1	2	2	0	0	2	2	2
Aluminium Chloride	1	2	0	1	2	2	1	2	0	1	2	2	2	1	-
Aniline	1	0	0	0	2	1	1	0	2	2	1	0	2	2	2
Benzaldehyde	1	1	1	0	1	2	1	1	2	2	0	0	1	2	2
Benzene	2	2	1	0	1	2	2	1	2	2	0	0	0	2	2
Carbon tetrachloride	2	2	0	1	1	2	2	1	2	2	0	1	1	2	2
Chlorine Water	0	0	1	0	1	0	0	0	0	0	1	0	2	0	2
Chloroform	0	0	0	0	1	2	0	1	2	2	0	0	1	2	2
Citric acid	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Copper sulphate	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2
Cresol	0	0	-	1	2	1	0	0	2	2	0	1	2	1	2
Diesel oil	2	2	2	1	2	2	2	2	2	2	1	2	2	2	2
Diethylamine	2	1	1	1	2	2	2	0	2	2	2	1	2	2	2
Ethanol	2	1	2	0	2	2	2	1	2	2	1	0	2	2	2
Ether	2	2	-	1	2	2	2	2	2	2	0	1	2	2	2
Ethylamine	2	1	-	1	2	2	2	0	2	2	1	1	1	2	2
Ethylene Glycol	2	2	2	1	2	2	2	2	0	2	2	1	2	2	2
Ethyl ethanoate	1	2	2	0	2	2	1	0	2	2	0	0	2	2	2
Freon 32	2	2	2	1	2	2	2	1	0	2	0	1	0	2	2
Hydrchloric acid (10%)	0	1	1	2	2	2	0	1	0	0	0	2	2	0	2
Hydrchloric acid (36%)	0	0	0	1	2	2	0	0	0	0	0	2	2	0	2
Hydrogen peroxide (35%)	1	1	1	2	2	2	1	0	0	2	1	2	1	2	2
Hydrogen peroxide (87%)	0	0	0	2	1	2	0	0	0	2	0	2	0	1	2
Lactic acid	1	2	0	1	2	2	1	2	0	2	2	1	1	2	2
Lubricating oil	2	2	2	1	2	2	2	2	2	2	1	2	1	2	2
Methanol	1	1	2	0	2	2	1	1	2	2	1	0	2	2	2
Methyl bromide	0	0	-	0	1	2	0	0	2	2	0	0	1	2	2
MEK	2	2	2	1	0	2	2	2	1	2	2	0	0	2	2
Nitric acid (10%)	0	0	1	2	2	2	0	0	0	0	2	2	2	0	2
Nitric acid (70%)	0	0	0	2	2	0	0	0	0	0	0	2	2	0	2
Oxalic acid	1	2	1	1	2	2	1	1	0	2	2	2	2	1	2
Ozone (gas)	0	0	-	1	1	2	0	2	0	2	2	1	1	2	2
Paraffin oil	2	2	2	1	2	2	2	2	2	2	1	2	2	2	2
Petrol	2	2	2	0	2	2	2	2	2	2	0	2	2	2	2
Phenol	0	0	0	1	0	1	0	1	2	2	0	1	2	1	2

**Chemical resistance comparison table**

Chemicals	Products														
	PA, PR, PADL, SN	PI, PF	CP	KF, RF, SP	PP	PK	Fittings PA66	ATS Elastomer Seal	S (including braid)	SS (including braid)	LFH-SP	SP, SPUL	SPLHC	TC braid	Fittings nickel plated brass
Sea water	2	2	2	2	2	2	2	2	0	2	2	2	2	2	1
Silver nitrate	2	2	-	2	2	2	2	2	0	2	2	2	2	2	2
Skydrol	2	2	2	0	2	2	2	1	2	2	0	0	2	2	2
Sodium chloride	2	2	2	2	2	2	2	2	0	2	2	2	2	2	1
Sodium hydroxide (10%)	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2
Sodium hydroxide (60%)	2	1	0	1	2	2	2	1	0	1	2	2	2	2	2
Sulphur dioxide (gas)	0	0	1	2	2	2	0	0	0	0	1	2	2	1	0
Sulphuric acid (10%)	0	1	2	2	2	2	0	1	0	0	2	2	2	0	0
Sulphuric acid (70%)	0	0	0	2	2	0	0	0	0	0	1	2	2	0	0
Toluene	2	2	1	0	2	2	2	0	2	2	1	0	0	2	2
Transformer oil	2	2	2	1	2	2	2	2	2	2	1	2	1	2	2
1,1,1-Trichloroethane	2	2	1	0	1	2	2	1	0	2	1	0	1	2	2
Trichloroethylene	1	0	0	0	1	2	1	1	0	2	1	0	0	2	2
Turpentine	2	2	2	1	0	2	2	1	2	2	0	1	0	2	2
Vegetable oil	2	2	2	1	2	2	2	2	2	2	1	2	2	2	2
Vinyl acetate	1	2	-	0	2	2	1	0	0	2	0	0	2	2	2
Water	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2
White spirit	2	2	-	1	2	2	2	1	2	2	0	1	1	2	2
Zinc chloride	0	2	1	2	2	2	0	2	0	2	2	2	2	1	2

**Note:** The information above is given as a guide only and is based on published technical data and experience.

The chemical resistance of the above products is dependant on factors such as chemical exposure, concentration of the chemical and temperature. The above chemicals are valid for a temperature of 23°C.

Use of the above table is at the users own discretion and risk. Those using it must satisfy themselves that their application presents no health and safety risks.

The end user should assess compatibility with their application and contact Adaptaflex for further information.

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### Cable carrying capacity (wire fill)

#### Introduction

UK Wiring regulations BS7671 recommend that the total cross sectional area of the sum of individual cables shall not exceed 40% of the cross sectional area of the conduit based on using 3 or more cables. The tables below enable you to calculate the number of conductors that can be run within a piece of flexible conduit.

#### Instructions

- **Step 1:** Establish the number and size of each wire to be run in the conduit
- **Step 2:** Look on the Cross Sectional Area (CSA) chart (table 1), look up the CSA taken up by each of the wires from STEP 1
- **Step 3:** Add all the CSA values together (Total CSA)
- **Step 4:** Look on the conduit fill value chart (table 2).
- Choose a conduit with a 40% fill value higher than the total CSA from STEP 3

Table 1 - Cross Sectional Area (CSA) chart

Nominal conductor size (mm)	Number of wires							
	1	2	3	4	5	10	15	20
1	6.6	13.2	19.8	26.4	33	66	99	132
1.5	7.6	15.2	22.8	30.4	38	76	114	152
2.5	9.6	19.2	28.8	38.4	48	96	144	192
4	14.5	29	43.5	58	72.5	145	217.5	290
6	18.8	37.6	56.4	75.2	94	188	282	376
10	29.3	58.6	87.9	117.2	146.5	293	439.5	586
16	40.2	80.4	120.6	160.8	201	402	603	804
25	63.8	127.6	191.4	255.2	319	638	957	1276
35	83.5	167	250.5	334	417.5	835	1252	1670
50	113	226	339	452	565	1130	1695	2260
70	149	298	447	596	745	1490	2235	-
95	204	408	612	816	1020	2040	-	-

Table 2 - Wire fill of plastic & metallic conduit

Nominal diameter (mm)	Plastic conduit		Metallic conduit	
	100% fill	40% fill	100% fill	40% fill
10	33.2	13	25.5	10.2
13	72.4	29	58.1	23.2
16	109.4	44	83.3	33.3
18	158.4	63	160.6	64.2
21	213.8	86	243.3	97.3
28	369.8	148	452.4	181
34	602.6	241	855.3	342.1
42	973.1	390	1164.2	465.7
54	1698.2	680	1963.5	785.4
80	3520	1410	3473.2	1389.3
106	6500	2600	-	-

#### Example - What size of conduit to use?

- **Step 1:** 4 x 2.5mm conductors, 2 x 10mm conductors and 3 x 50mm conductors
- **Step 2:** The CSA of Four 2.5mm conductors is 38.4, Two 10mm conductors is 58.6, Three 50mm conductors is 339
- **Step 3:** Total of these groups is  $38.4 + 58.6 + 339 = 436$
- **Step 4:** Using Table 2 the conduit is either 54mm (680) Plastic or 50mm (465.7) Metallic

- **Note:** 42mm Plastic is 390 which is smaller than 436 therefore not recommended

The information given above relates to PA - Standard weight conduit and Adaptalok fittings or SPL with M-Type fittings.

It is given in good faith and should be used only as a guide in conjunction with the relevant wiring regulations.

# Technical section

## IEC61386 classifications

Non-metallic & metallic - IEC61386 classifications table

	With fitting	Compression strength	Impact strength	Minimum temperature	Maximum temperature	Bending properties	Electrical properties	IP rating solids	IP rating water	Corrosion resistance	Tensile strength	Products	
												Non-flame propagating	Suspended load capacity
<b>Non-metallic conduit</b>													
PA LIGHT	AT	2	4	2	4	4	0	6	7	-	1	1	0
PA STANDARD	AT	2	4	2	4	4	0	6	7	-	1	1	0
PA HEAVY	AT	2	4	2	4	4	0	6	7	-	2	1	0
PF STANDARD	AT	1	3	5	4	4	0	6	7	-	1	1	0
PF HEAVY	AT	2	4	5	4	4	0	6	7	-	1	1	0
PI STANDARD	AT	1	3	5	4	4	0	6	7	-	1	1	0
PI HEAVY	AT	2	4	5	4	4	0	6	7	-	1	1	0
PR	AT	2	4	2	4	4	0	6	7	-	1	1	0
CP	AT	1	4	4	5	4	0	6	7	-	1	1	0
KF LIGHT	KC	2	2	2	1	2	2	4	0	-	1	1	0
KF STANDARD	KC	2	3	2	1	2	2	4	0	-	2	1	0
KF MEDIUM	KC	3	3	2	1	2	2	4	0	-	1	1	0
PK	PK	2	4	5	6	4	2	6	7	-	1	1	0
PKTC	PB	2	4	5	6	4	3	6	7	-	3	1	0
PKSS	PB	2	4	5	6	4	3	6	7	-	3	1	0
PRTC	PB	2	4	2	4	4	1	6	7	-	3	1	0
PRSS	PB	2	4	2	4	4	1	6	7	-	3	1	0
PRSS	PB	2	4	2	4	4	1	6	7	-	3	1	0
<b>Metallic conduit</b>													
S	S	4	4	5	6	4	0	4	0	1	4	1	5
SS	S	4	4	5	6	4	0	4	0	4	4	1	5
SP	SP(M)	4	4	2	2	4	2	6	5	-	4	1	5
SN	SP(M)	4	4	4	5	4	0	6	5	-	4	1	5
LFH-SP	SP(M)	4	4	2	3	4	0	6	5	-	4	1	5
SPL AL	SPL(M)	4	4	2	3	4	2	6	7	-	4	1	5
SPLHC	SPL(M)	4	4	5	5	4	0	6	7	-	4	1	5
SB	SB	4	5	5	6	4	1	4	0	1	4	1	5
STC	SB	4	4	5	6	4	1	4	0	1	4	1	5
SSB	SB	4	4	5	6	4	1	4	0	4	4	1	5
SSBGS	SB	4	4	5	6	4	1	4	0	1	4	1	5
SPB	SPB	4	4	2	2	4	3	5	4	-	4	1	5
SPTC	SPB	4	4	2	2	4	3	5	4	-	4	1	5
SPLHCB	SPLB	4	4	5	5	4	1	6	7	-	5	1	5

Performance classification key

Classification level	(N)	(J)	(°C)	(°C)				(N)	(N)			
0						Not declared		0	N/A	Not declared	Not declared	
1	125	0.5	5	60	Rigid	Conductor		1	Low	100	4	20
2	320	1	-5	90	Pliable	Insulator		2	Medium	250	7	30
3	750	2	-15	105	Pliable/semi rigid	Con/Ins	3	3	Med-hi	500		150
4	1250	6	-25	120	Flexible		4	4	High	1000		450
5	4000	20	-45	150			5	5		2500		850
6				250			6	6				
7								7				