

INFORMATION SHEET FOR PYRO MI INSTALLATION DESIGN DATA

The following tables 1 to 9 of current ratings, volt drop values, resistances and correction factors are for cables exposed to touch or plastic covered.

In accordance with the IEE Wiring Regulations a cable with an outer covering or in contact with combustible building materials, may be used up to a temperature of 70°C, which is achieved using the 'exposed to touch' current ratings in an ambient temperature of 30°C.

Bare copper sheathed cables which are not exposed to touch and are not in contact with combustible materials may be operated at their **"not exposed to touch"** current ratings and will achieve a sheath temperature of 105°C in an ambient temperature of 30°C.

For current ratings and volt drop values for **"not exposed to touch conditions"** refer to the current edition of the IEE Wiring Regulations BS7671.

Bare copper sheathed cables are suitable for continuous operation at temperatures upto 250°C or in understood conditions to much higher temperatures. (Please refer to Technical Support Team at: nVent.com)

For single-core cables, the sheaths of the circuit are assumed to be connected together at both ends. For bare cables exposed to touch, the tabulated current ratings should be multiplied by 0.9.

TABLE 1 CURRENT-CARRYING CAPACITIES (AMP) REF. METHOD 1 CLIPPED DIRECT

AMBIENT TEMPERATURE: 30°C. SHEATH OPERATING TEMPERATURE: 70°C

NOMINAL CROSS-SECTION AREA OF CONDUCTOR	2 SINGLE-CORE CABLES OR 1 TWO-CORE CABLE, SINGLE-PHASE AC OR DC	3 SINGLE-CORE CABLES IN TREFOIL OR 1 THREE-CORE CABLE, THREE PHASE AC	3 SINGLE-CORE CABLES IN FLAT FORMATION THREE PHASE AC	1 FOUR-CORE CABLE 3 CORES LOADED THREE PHASE AC	1 FOUR-CORE CABLE ALL CORES LOADED	1 SEVEN-CORE CABLE ALL CORES LOADED	1 TWELVE-CORE CABLE ALL CORES LOADED	1 NINETEEN-CORE CABLE ALL CORES LOADED
mm ²	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
1	18.5	15	-	15	13	10	-	-
1.5	23	19	-	19.5	16.5	13	-	-
2.5	31	26	-	26	22	17.5	-	-
4	40	-	-	-	-	-	-	-

LIGHT DUTY 500V

HEAVY DUTY 750V

mm ²	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
1.5	25	21	-	21	18	14.5	12	10
2.5	34	28	-	28	25	19.5	16	-
4	45	37	-	37	32	-	-	-
6	57	48	-	47	41	-	-	-
10	77	65	70	64	55	-	-	-
16	102	86	92	85	72	-	-	-
25	133	112	120	110	94	-	-	-
35	163	137	147	-	-	-	-	-
50	202	169	181	-	-	-	-	-
70	247	207	221	-	-	-	-	-
95	296	249	264	-	-	-	-	-
120	340	286	303	-	-	-	-	-
150	388	327	346	-	-	-	-	-

TABLE 1 CURRENT-CARRYING CAPACITIES (AMP) REF. METHOD 1 CLIPPED DIRECT

AMBIENT TEMPERATURE: 30°C. SHEATH OPERATING TEMPERATURE: 70°C

NOMINAL CROSS-SECTION AREA OF CONDUCTOR	2 SINGLE-CORE CABLES OR 1 TWO-CORE CABLE, SINGLE-PHASE AC OR DC	3 SINGLE-CORE CABLES IN TREFOIL OR 1 THREE-CORE CABLE, THREE PHASE AC	3 SINGLE-CORE CABLES IN FLAT FORMATION THREE PHASE AC	1 FOUR-CORE CABLE 3 CORES LOADED THREE PHASE AC	1 FOUR-CORE CABLE ALL CORES LOADED	1 SEVEN-CORE CABLE ALL CORES LOADED	1 TWELVE-CORE CABLE ALL CORES LOADED	1 NINETEEN-CORE CABLE ALL CORES LOADED
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HEAVY DUTY 750V

185	440	371	392	-	-	-	-	-
240	514	434	457	-	-	-	-	-
300	790	630	661	-	-	-	-	-
400	930	750	787	-	-	-	-	-

CABLE SELECTION

Cables should be selected in accordance with the Wiring Regulations BS7671.

Determine the minimum acceptable current rating (It) as described in Appendix 4 of the regulations, if necessary using table 6 or 7.

Select the appropriate method of installation from table 5.

Select a cable having a current rating not less than the calculated (It) from the appropriate table.

Calculate the volt drop using the figures given in tables 3 or 4, ensuring that the voltage supplied will not be less than the lower limit in the B.S. relevant to the equipment, or alternatively, that volt drop from the origin of the supply to the fixed equipment is not greater than 4%.

Check that the maximum earth fault loop impedance (kS) will be less than the value for the appropriate protective device given in table 41B1 or 41B2 of the regulations. Values of R1&R2 are given on tables 8 & 9. (ZE) may be calculated or obtained from the supply authority.

The protective conductor area always complies with regulation 543-01 table 54G, see tables 8 or 9. Check regulation 434 giving short circuit constraints is satisfied.

TABLE 2 CURRENT-CARRYING CAPACITIES (AMP) REF. METHOD 11
(ON PERFORATED CABLE TRAY HORIZONTAL OR VERTICAL)
AMBIENT TEMPERATURE: 30°C. SHEATH OPERATING TEMPERATURE: 70°C

NOMINAL CROSS-SECTIONAL AREA OF CONDUCTOR	2 SINGLE-CORE CABLES TOUCHING. SINGLE-PHASE AC OR DC	1 TWO-CORE CABLES SINGLE-PHASE AC OR DC	1 THREE-CORE CABLE THREE-PHASE AC	1 FOUR-CORE CABLE 3 CORES LOADED THREE-PHASE AC	1 FOUR-CORE CABLE ALL CORES LOADED	1 SEVEN-CORE CABLE ALL CORES LOADED	1 TWELVE-CORE CABLE ALL CORES LOADED	1 NINETEEN-CORE CABLE ALL CORES LOADED	3 SINGLE-CORE CABLES THREE-PHASE AC			
									VERTICAL SPACED	HORIZONTAL SPACED	TOUCHING	TREFOIL
mm ²	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
1	-	19.5	16.5	16	14	11	-	-	-	-	-	-
1.5	-	25	21	21	18	14	-	-	-	-	-	-
2.5	-	33	28	28	24	19	-	-	-	-	-	-
4	-	44	-	-	-	-	-	-	-	-	-	-

TABLE 2 CURRENT-CARRYING CAPACITIES (AMP) REF. METHOD 11
(ON PERFORATED CABLE TRAY HORIZONTAL OR VERTICAL)
AMBIENT TEMPERATURE: 30°C. SHEATH OPERATING TEMPERATURE: 70°C

NOMINAL CROSS-SECTIONAL AREA OF CONDUCTOR	2 SINGLE-CORE CABLES TOUCHING. SINGLE-PHASE AC OR DC	1 TWO-CORE CABLES SINGLE-PHASE AC OR DC	1 THREE-CORE CABLE THREE-PHASE AC	1 FOUR-CORE CABLE 3 CORES LOADED THREE-PHASE AC	1 FOUR-CORE CABLE ALL CORES LOADED	1 SEVEN-CORE CABLE ALL CORES LOADED	1 TWELVE-CORE CABLE ALL CORES LOADED	1 NINETEEN-CORE CABLE ALL CORES LOADED	3 SINGLE-CORE CABLES THREE-PHASE AC			
									VERTICAL SPACED	HORIZONTAL SPACED	TOUCHING	TREFOIL
mm ²	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps	Amps
1.5	-	26	22	23	20	15.5	13	11	-	-	-	-
2.5	-	36	30	30	27	21	17	-	-	-	-	-
4	-	47	40	40	35	-	-	-	-	-	-	-
6	-	60	51	51	44	-	-	-	-	-	-	-
10	78	82	69	68	59	-	-	-	80	90	73	69
16	104	109	92	89	78	-	-	-	105	119	97	92
25	135	142	120	116	101	-	-	-	135	154	125	120
35	165	-	-	-	-	-	-	-	164	187	153	147
50	204	-	-	-	-	-	-	-	202	230	188	182
70	251	-	-	-	-	-	-	-	246	279	229	223
95	301	-	-	-	-	-	-	-	294	333	275	267
120	346	-	-	-	-	-	-	-	335	382	314	308
150	395	-	-	-	-	-	-	-	380	431	358	352
185	448	-	-	-	-	-	-	-	424	482	405	399
240	524	-	-	-	-	-	-	-	472	537	471	466
300	807	-	-	-	-	-	-	-	779	883	778	646
400	950	-	-	-	-	-	-	-	930	1053	929	769

TABLE 3 VOLT DROPS FOR SINGLE PHASE OPERATION (MV/A/M)

AMBIENT TEMPERATURE: 30°C. SHEATH OPERATING TEMPERATURE: 70°C.

**NOMINAL
CROSS-
SECTIONAL
AREA OF
CONDUCTORS****TWO SINGLE-CORE TOUCHING****MULTICORE CABLES**

mm ²	mV/A/mr	mV/A/mx	mV/A/mz	mV/A/mr	mV/A/mx	mV/A/mz
1	–	–	–	42	–	–
1.5	–	–	–	28	–	–
2.5	–	–	–	17	–	–
4	–	–	–	10	–	–
6	–	–	–	7	–	–
10	4.2	–	–	4.2	–	–
16	2.6	–	–	2.6	–	–
25	1.65	0.200	1.65	1.65	0.145	1.65
35	1.20	0.195	1.20	–	–	–
50	0.89	0.185	0.91	–	–	–
70	0.62	0.180	0.64	–	–	–
95	0.46	0.175	0.49	–	–	–
120	0.37	0.170	0.41	–	–	–
150	0.30	0.170	0.34	–	–	–
185	0.25	0.165	0.29	–	–	–
240	0.190	0.160	0.25	–	–	–
300	0.150	0.160	0.22	–	–	–
400	0.112	0.160	0.20	–	–	–

TABLE 4 VOLT DROPS FOR THREE PHASE OPERATION (MV/A/M)
AMBIENT TEMPERATURE: 30°C. SHEATH OPERATING TEMPERATURE: 70°C.

NOMINAL CROSS- SECTIONAL AREA OF CONDUCTORS	THREE SINGLE-CORE CABLES									MULTICORE CABLES		
	TREFOIL TOUCHING			FLAT FORMATION TOUCHING			SPACED 1 CABLE DIA APART					
mm²	mV/A/ mr	mV/A/ mx	mV/A/ mz	mV/A/ mr	mV/A/ mx	mV/A/ mz	mV/A/ mr	mV/A/ mx	mV/A/ mz	mV/A/ mr	mV/A/ mx	mV/A/ mz
1	—	—	—	—	—	—	—	—	—	36	—	—
1.5	—	—	—	—	—	—	—	—	—	24	—	—
2.5	—	—	—	—	—	—	—	—	—	14	—	—
4	—	—	—	—	—	—	—	—	—	9.1	—	—
6	—	—	—	—	—	—	—	—	—	6.0	—	—
10	3.6	—	—	3.6	—	—	3.6	—	—	3.6	—	—
16	2.3	—	—	2.3	—	—	2.3	—	—	2.3	—	—
25	1.45	0.170	1.45	1.45	0.25	1.45	1.45	0.32	1.50	1.45	0.125	1.45
35	1.05	0.165	1.05	1.05	0.24	1.10	1.05	0.31	1.10	—	—	—
50	0.78	0.160	0.80	0.79	0.24	0.83	0.82	0.31	0.87	—	—	—
70	0.54	0.155	0.56	0.55	0.23	0.60	0.58	0.30	0.65	—	—	—
95	0.40	0.150	0.43	0.41	0.22	0.47	0.44	0.29	0.53	—	—	—
120	0.32	0.150	0.36	0.33	0.22	0.40	0.36	0.28	0.46	—	—	—
150	0.26	0.145	0.30	0.29	0.21	0.36	0.32	0.27	0.42	—	—	—
185	0.21	0.140	0.26	0.25	0.21	0.32	0.28	0.26	0.39	—	—	—
240	0.165	0.140	0.22	0.21	0.20	0.29	0.26	0.25	0.36	—	—	—
300	0.130	0.139	0.19	0.16	0.19	0.25	0.18	0.25	0.31	—	—	—
400	0.097	0.139	0.17	0.12	0.18	0.22	0.14	0.24	0.28	—	—	—

TABLE 5 SCHEDULE OF METHODS OF INSTALLATION OF CABLES

(For methods 12, 13, 17, 18, 19 and 20 refer to Table 4a of the IEE Wiring Regulations)

(Methods 3, 4, 5, 6, 7, 10 and 14 do not apply to MI cables)

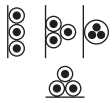
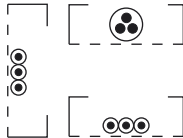
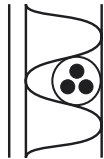
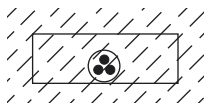
No.	Installation Method Description	Examples	Appropriate Reference Method for determining current-carrying capacities
OPEN AND CLIPPED DIRECT:			
1	Cables clipped direct to or lying on a non-metallic surface		Method 1 Use current ratings from Table 1
CABLES EMBEDDED DIRECT IN BUILDING MATERIALS:			
2	Cables embedded directly in masonry, plaster or the like (other than thermally insulating materials)		Method 1 Use current ratings from Table 1
IN TRUNKING:			
8	Cables in trunking on a wall or suspended in air		Use current rating from Table 1 multiplied by 0.8
9	Cables in flush floor trunking		Use current rating from Table 1 multiplied by 0.8
ON TRAYS:			
11	Cables on a perforated cable tray, bunched and unenclosed. A perforated cable tray is considered as a tray in which the holes occupy at least 30% of the surface		Use current rating from Table 2 multiplied by the appropriate correction factor from Table 6
CABLES IN BUILDING VOIDS:			
15	Cables installed directly in a thermally insulating wall or above a thermally insulating ceiling		Use current rating from Table 1 multiplied by 0.75 for cables in contact with thermal insulation on one side. For cables completely surrounded by thermal insulation multiply by 0.5 Use the current rating from Table 1 multiplied by the correction factor given below
16	Cables in ducts or voids formed by the building structure, other than thermally insulating materials		1. When the cable dia $\geq \frac{\text{Duct Dia}}{5}$ or $\frac{\text{Duct Perimeter}}{20}$ multiply by 0.8
			2. When the cable dia $\geq \frac{\text{Duct Dia}}{5}$ or $\frac{\text{Duct Perimeter}}{20}$ multiply by 0.75

TABLE 6 CORRECTION FACTORS FOR GROUPING

Correction factors for groups of more than one circuit of single-core cables, or more than one multicore cable
(to be applied to the corresponding current-carrying capacities for single circuits in Tables 1 and 2)

REFERENCE METHOD OF INSTALLATION (SEE TABLE 5)		CORRECTION FACTOR (C _g) NUMBER OF CIRCUITS OR MULTICORE CABLES													
		2	3	4	5	6	7	8	9	10	12	14	16	18	20
BUNCHED AND CLIPPED DIRECT TO A NON- METALLIC SURFACE (METHOD 1)		0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.39	0.38
SINGLE LAYER CLIPPED TO A NON-METALLIC SURFACE (METHOD 1)	Spaced* Touching	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.70	-	-	-	-	-	-
		0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90

CABLES ON PERFORATED CABLE TRAY (METHOD 11)

Multicore cables - horizontal	Spaced* Touching	0.90	0.80	0.80	-	0.75	-	-	0.75	-	-	-	-	-	-
		1.0	1.0	0.95	-	0.90	-	-	-	-	-	-	-	-	-
Multicore cables - vertical	Spaced* Touching	0.90	0.90	0.90	-	0.85	-	-	-	-	-	-	-	-	-
		0.90	0.80	0.75	-	0.75	-	-	0.70	-	-	-	-	-	-
Single core cables - single layer touching	Vertical Horizontal	0.85	-	-	-	-	-	-	-	-	-	-	-	-	-
		0.90	0.85	-	-	-	-	-	-	-	-	-	-	-	-
Single core cables in trefoil - separated	Vertical Horizontal	0.90	0.90	-	-	-	-	-	-	-	-	-	-	-	-
		1.0	0.95	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 7 CORRECTION FACTORS FOR AMBIENT TEMPERATURE

AMBIENT TEMPERATURE °C	FUSE TO BS 88, BS 1361 OR MCB	SEMI-ENCLOSED FUSE TO BS 3036
25	1.03	1.03
30	1.0	1.0
35	0.93	0.96
40	0.85	0.93
45	0.77	0.89
50	0.67	0.86
55	0.57	0.79
60	0.45	0.62
65	0.31	0.42
70	–	–

*‘Spaced’ means a clearance between adjacent surfaces of at least one cable diameter (D_e).

Where the horizontal clearances between adjacent cables exceeds $2D_e$, no correction factor need be applied.

NOTES:

- The factors in the table are applicable to groups of cables all of one size. The value of current derived from application of the appropriate factors is the maximum continuous current to be carried by any of the cables in the group.
- If, due to known operating conditions, a cable is expected to carry not more than 30% of its grouped rating, it may be ignored for the purpose of obtaining the rating factor for the rest of the group. For example, a group of N loaded cables would normally require a group reduction factor of C_g applied to the tabulated I_t .

However, if M cables in the group carry loads which are not greater than $0.3 C_{glt}$ amperes the other cables can be sized by using the group rating factor corresponding to (N-M) cables.

TABLE 8 RESISTANCE & EARTH FAULT LOOP IMPEDANCE FOR MULTI-CORE CABLES

Values of R_1 should be multiplied by 1.21 to establish the live conductor resistance under operating conditions (70°C).

CABLE SIZE REFERENCE		EARTH-FAULT LOOP IMPEDANCE AT 70°C ($R_1 + R_2$) CABLE EXPOSED TO TOUCH OR PLASTIC COVERED		
BARE CABLE CC LSF COVERED CCM	MAXIMUM CONDUCTOR RESISTANCE @ 20°C (R_1)	MAXIMUM SHEATH RESISTANCE @ 20°C (R_2)		EFFECTIVE SHEATH AREA
FOLLOWED BY	Ω/km	Ω/km	Ω/km	mm^2
500V GRADE				
2L1	18.1	3.95	26.34	5.4
2L1.5	12.1	3.35	18.41	6.3
2L2.5	7.41	2.53	11.82	8.2
2L4	4.61	1.96	8.03	11
3L1	18.1	3.15	25.44	6.7
3L1.5	12.1	2.67	17.64	7.8
3L2.5	7.41	2.23	11.48	9.5
4L1	18.1	2.71	24.94	7.7
4L1.5	12.1	2.33	17.26	9.1
4L2.5	7.41	1.85	11.05	11
7L1	18.1	2.06	24.20	10
7L1.5	12.1	1.78	16.64	12
7L2.5	7.41	1.36	10.49	15

750V GRADE

2H1.5	12.1	1.90	16.77	11
2H2.5	7.41	1.63	10.80	13
2H4	4.61	1.35	7.10	16
2H6	3.08	1.13	5.00	18
2H10	1.83	0.887	3.215	24
2H16	1.15	0.695	2.177	30
2H25	0.727	0.546	1.496	38
3H1.5	12.1	1.75	16.60	12
3H2.5	7.41	1.47	10.61	14
3H4	4.61	1.23	6.96	17
3H6	3.08	1.03	4.89	20
3H10	1.83	0.783	3.097	27
3H16	1.15	0.622	2.094	34
3H25	0.727	0.500	1.444	42
4H1.5	12.1	1.51	16.33	14
4H2.5	7.41	1.29	10.41	16
4H4	4.61	1.04	6.75	20
4H6	3.08	0.887	4.72	24
4H10	1.83	0.690	2.991	30
4H16	1.15	0.533	1.994	39
4H25	0.727	0.423	1.357	49
7H1.5	12.1	1.15	15.92	18
7H2.5	7.41	0.959	10.04	22
12H1.5	12.1	0.744	15.463	29
12H2.5	7.41	0.630	9.663	34
19H1.5	12.1	0.57	15.266	37

TABLE 9 RESISTANCE AND EARTH FAULT LOOP IMPEDANCE FOR SINGLE-CORE CABLES

The cable sheaths are assumed to be connected together at both ends.

Values of R1 should be multiplied by 1.21 to establish the live conductor resistance under operating conditions (70°C).

CABLE SIZE REFERENCE	PHASE CONDUCTOR	1 CABLE ISOLATED		TWO CABLES SINGLE-PHASE		THREE CABLES THREEPHASE		FOUR CABLES THREEPHASE		
BARE CABLE CC LSF COVERED CCM	CSA	RESISTANCE @ 20°C (R1) (MAX)	EFFECTIVE SHEATH AREA	SHEATH RESISTANCE AT 20°C (R ₂) (MAX)	EFFECTIVE SHEATH AREA	EARTH-FAULT LOOP IMPEDANCE AT 70°C (R ₁ +R ₂)	EFFECTIVE SHEATH AREA	EARTH-FAULT LOOP IMPEDANCE AT 70°C (R ₁ +R ₂)	EFFECTIVE SHEATH AREA	EARTH-FAULT LOOP IMPEDANCE AT 70°C (R ₁ +R ₂)
FOLLOWED BY	mm ²	Ω/km	mm ²	Ω/km	mm ²	Ω/km	mm ²	Ω/km	mm ²	Ω/km
CABLE EXPOSED TO TOUCH OR PLASTIC										
1H 10	10	1.83	9	2.23	19	3.475	28	3.053	38	2.843
1H 16	16	1.16	12	1.81	23	2.415	35	2.073	46	1.903
1H 25	25	0.727	15	1.40	30	1.673	45	1.408	60	1.276
1H 35	35	0.524	18	1.17	36	1.298	53	1.076	71	0.966
1H 50	50	0.387	22	0.959	44	1.013	66	0.831	88	0.741
1H 70	70	0.268	27	0.767	54	0.758	81	0.614	109	0.541
1H 95	95	0.193	32	0.646	65	0.599	97	0.477	130	0.416
1H 120	120	0.153	37	0.556	75	0.500	112	0.395	150	0.343
1H 150	150	0.124	44	0.479	87	0.421	131	0.331	175	0.286
1H 185	185	0.101	54	0.412	108	0.355	161	0.278	215	0.239
1H 240	240	0.0775	70	0.341	141	0.287	211	0.222	281	0.190
1H 300	300	0.0620	87	0.280	174	0.233	261	0.181	348	0.154
1H 400	400	0.0465	117	0.223	234	0.183	351	0.141	468	0.120

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