

Halogen-free Special Rubber-insulated Cables

with increased heat resistance

with plain conductor

SIENOPYR(120) (N)HXSGAFHXÖ 1,8/3 kV
SIENOPYR(120) (N)HXSGAFCHXÖ 1,8/3 kV

Halogen-free cables are used for preventive fire protection in buildings, plants and installations where large numbers of people congregate and/or valuable equipment is located. The low smoke emission facilitates rescue and fire-fighting. Special insulating and sheathing compounds prevent fire from spreading along the cables. Non-corrosive gases do not cause secondary damage.

SIENOPYR^(R)-cables contribute considerably to both.

Application

These cables are intended for use in:

- rail vehicles having fire protection grades 1 to 4 to DIN 5510. These cables may be employed both in- and outdoors, as long as they are out of hand's reach.

The outer cover serves to mechanically protect the insulation respectively the screen during installation. The outer cover does not offer protection against electric shock. Therefore precautionary measures must ensure that the unscreened cables are not normally accessible by hand during operation above 1000 V. The screen must be connected with earth potential. The cable ends must be protected against the ingress of water.

- conduits which are either surface-mounted, embedded on or in or under plaster, or enclosed within electrical installation ducts or within equipment housings.
- switchgear and distribution boards up to 1000 V for unfused connections (DIN VDE 0100-520).

In other respects, DIN VDE 0298-3 applies.





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Technical details

Design

based on DIN VDE 0250 part 602:

- finely stranded conductor of plain copper wires, class 5 according to DIN VDE 0295 and IEC 60228
- Insulation made of a halogen-free, cross-linked SIR compound (Silicon rubber)
- Shielded versions feature tinned copper, braided wires.
- Cover made of a halogen-free, cross-linked EVA compound which provides mechanical protection during installation (Ethylen-vinylacetat-copolymer)

Color of the outer cover: black

Marking, e.g.:

SIENOPYR(120) (N)HXSGAFHXOE 25 1,8/3 kV

Temperatures

Maximum permissible operation temperature at conductor 20 000 h 120 °C

Maximum permissible short-circuit temperature at conductor max. 5 s 350 °C

Lowest permissible temperatures for operation, handling, installation, transport and storage
flexing -25 °C
fixed -40 °C

Current-carrying capacity

The values refer to a cable under continuous operation, the shown installation method, ambient temperature 30 °C

For other ambient temperatures, the current rating is to calculate by applying the following factors f:

| | | | | | | | | | | | | | | | | | | | |
|----|------|------|------|------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| °C | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| f | 1.11 | 1.08 | 1.05 | 1.03 | 1.00 | 0.97 | 0.94 | 0.91 | 0.88 | 0.85 | 0.82 | 0.78 | 0.75 | 0.71 | 0.67 | 0.62 | 0.58 | 0.53 | 0.47 |

Special characteristics

- Burning behavior
Tested to DIN EN 50265-2-1 (VDE 0482 part 265-2-1) and to DIN EN 50266-2-4 (VDE 0482 part 266-2-4)
- Halogen free
Tested to DIN EN 50267-2-2 (VDE 0482 part 267-2-2)
- Low smoke
Tested to DIN EN 50268-2 (VDE 0482 part 268-2)
- Oil resistant
Tested to DIN EN 60811-2-1 (VDE 0473 part 811-2-1)

Minimum bending radii

| | without screen | with screen |
|--|----------------|-------------|
| Fixed installation | 6 d | 6 d |
| Free-flexing | 10 d | 20 d |
| Free-flexing in bogie e.g. between carriage and traction motor | 8 d | 8 d |

d = max. outer diameter of cable

Continuous tensile stress

Max. 15 N/mm² refers to conductor's cross sectional area

Voltages

Rated voltage of cable (AC) U_0/U 1,8/3 kV

Maximum permissible operating voltage $U_{b,max}$

- single-phase and three-phase AC operation
line-earth / line-line 2,1/3,6 kV
- DC operation
line-earth / line-line 2,7/5,4 kV

AC test voltage (test duration) 6 kV (5 min.)



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SIENOPYR(120)

Selection data

with plain conductor

| Conductor rated cross-section mm ² | Order-No. | Conductor diameter (approx.) mm | Diameter over screen mm | Outer diameter of cable | | Minimum bending radii | | | Net weight per 1000 m approx. kg | perm. short-circuit current (1 s) *) kA | Fire load kJ/m |
|--|-----------|------------------------------------|----------------------------|-------------------------|------|--------------------------|--------------------|----------------|-------------------------------------|---|-------------------|
| | | | | min. | max. | fixed installation mm | free-flexing mm | in bogie mm | | | |

(N)HXSGAFHXÖ 1,8/3 kV (without screen)

| | | | | | | | | | | | |
|-----|----------|------|---|------|------|-----|-----|-----|------|-------|------|
| 2,5 | 5DF9 622 | 1,9 | - | 5,5 | 7,0 | 42 | 70 | 56 | 57 | 0,40 | 660 |
| 4 | 5DF9 623 | 2,5 | - | 6,5 | 7,3 | 44 | 73 | 58 | 74 | 0,64 | 759 |
| 6 | 5DF9 624 | 3,2 | - | 7,1 | 7,9 | 47 | 79 | 63 | 95 | 0,96 | 874 |
| 10 | 5DF9 625 | 4,1 | - | 8,5 | 9,3 | 56 | 93 | 74 | 147 | 1,60 | 1156 |
| 16 | 5DF9 626 | 5,6 | - | 9,9 | 11,1 | 67 | 111 | 89 | 219 | 2,56 | 1445 |
| 25 | 5DF9 627 | 6,8 | - | 12,1 | 13,3 | 80 | 133 | 106 | 333 | 4,00 | 2111 |
| 35 | 5DF9 628 | 8,1 | - | 13,2 | 14,4 | 86 | 144 | 115 | 434 | 5,60 | 2397 |
| 50 | 5DF9 630 | 9,6 | - | 14,6 | 16,1 | 97 | 161 | 129 | 585 | 8,00 | 2727 |
| 70 | 5DF9 631 | 11,2 | - | 16,2 | 17,7 | 106 | 177 | 142 | 790 | 11,20 | 3079 |
| 95 | 5DF9 632 | 13,2 | - | 19,0 | 20,5 | 123 | 205 | 164 | 1030 | 15,20 | 4122 |
| 120 | 5DF9 633 | 14,9 | - | 20,8 | 22,3 | 134 | 223 | 178 | 1281 | 19,20 | 4549 |
| 150 | 5DF9 634 | 16,6 | - | 22,8 | 24,3 | 146 | 243 | 194 | 1585 | 24,00 | 5341 |
| 185 | 5DF9 635 | 18,0 | - | 24,4 | 26,6 | 160 | 266 | 213 | 1911 | 29,60 | 6107 |
| 240 | 5DF9 636 | 21,2 | - | 28,0 | 30,2 | 181 | 302 | 242 | 2492 | 38,40 | 7461 |

(N)HXSGAFCHXÖ 1,8/3 kV (with screen)

| | | | | | | | | | | | |
|-----|----------|------|------|------|------|-----|-----|-----|------|-------|------|
| 4 | 5DF9 705 | 2,5 | 5,9 | 7,7 | 8,4 | 50 | 168 | 67 | 102 | 0,64 | 691 |
| 6 | 5DF9 706 | 3,2 | 6,5 | 8,3 | 9,0 | 54 | 180 | 72 | 127 | 0,96 | 1082 |
| 10 | 5DF9 707 | 4,1 | 7,9 | 9,8 | 10,5 | 63 | 210 | 84 | 186 | 1,60 | 1398 |
| 16 | 5DF9 708 | 5,6 | 9,4 | 11,1 | 12,3 | 74 | 246 | 98 | 264 | 2,56 | 1710 |
| 25 | 5DF9 710 | 6,8 | 11,5 | 13,6 | 14,8 | 89 | 296 | 118 | 405 | 4,00 | 2468 |
| 35 | 5DF9 711 | 8,1 | 12,7 | 14,6 | 15,8 | 95 | 316 | 126 | 512 | 5,60 | 2769 |
| 50 | 5DF9 712 | 9,6 | 14,3 | 16,1 | 17,6 | 106 | 352 | 141 | 671 | 8,00 | 3138 |
| 70 | 5DF9 690 | 11,2 | 15,8 | 17,5 | 19,0 | 114 | 380 | 152 | 882 | 11,20 | 3512 |
| 95 | 5DF9 691 | 13,2 | 18,5 | 20,6 | 22,1 | 133 | 442 | 177 | 1150 | 15,20 | 4600 |
| 120 | 5DF9 713 | 14,9 | 20,3 | 23,2 | 24,7 | 148 | 494 | 198 | 1411 | 19,20 | 5070 |
| 150 | 5DF9 687 | 16,6 | 22,0 | 24,2 | 25,7 | 154 | 514 | 206 | 1713 | 24,00 | 5919 |
| 185 | 5DF9 714 | 18,0 | 23,8 | 25,8 | 28,0 | 168 | 560 | 224 | 2050 | 29,60 | 6721 |
| 240 | 5DF9 715 | 21,2 | 27,6 | 29,6 | 31,8 | 191 | 636 | 254 | 2682 | 38,40 | 8168 |

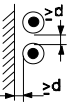


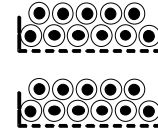

*) Permissible short-circuit currents I_{thz} for other break times t_k up to 5 s are calculated using the formula

$$I_{thz} = I_{thr} \sqrt{\frac{1s}{t_k}}$$



Halogen-free Special Rubber-insulated Cables
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 Current-carrying capacity

Continuous operation
 Maximum permissible operation temperature at conductor in °C : **120**
 Ambient temperature in °C : **30**

| Installation | 1. free in air or on perforated cable trays | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|------|---|-----|-----|-----|-----|-----|-----|--|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|
| |  Number of simultaneously loaded cables | |  | | | | | | |  | | | | | |  | | | | | |  | | | | | |
| Conversion factor | 1 | 2 | 3 | 4 | 6 | 8 | 10 | 16 | 20 | 4 | 6 | 8 | 10 | 16 | 20 | 4 | 6 | 8 | 10 | 16 | 20 | 4 | 6 | 8 | 10 | 16 | 20 |
| Copper conductor nom. cross section mm ² | Current-carrying capacity in A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,5 | 49 | 43 | 40 | 38 | 37 | 36 | 36 | 35 | 35 | 35 | 30 | 28 | 26 | 23 | 22 | 33 | 29 | 26 | 25 | 22 | 21 | 35 | 28 | 25 | 24 | 20 | 19 |
| 4 | 65 | 57 | 53 | 51 | 49 | 48 | 47 | 47 | 46 | 46 | 40 | 37 | 34 | 31 | 29 | 44 | 38 | 35 | 33 | 29 | 28 | 46 | 38 | 34 | 31 | 27 | 25 |
| 6 | 82 | 71 | 66 | 64 | 62 | 61 | 60 | 59 | 58 | 58 | 51 | 47 | 43 | 39 | 37 | 55 | 48 | 44 | 41 | 37 | 35 | 58 | 48 | 43 | 39 | 34 | 31 |
| 10 | 116 | 101 | 94 | 90 | 87 | 86 | 85 | 84 | 82 | 82 | 72 | 66 | 61 | 55 | 52 | 78 | 68 | 63 | 58 | 52 | 50 | 82 | 67 | 60 | 56 | 48 | 44 |
| 16 | 156 | 136 | 126 | 122 | 117 | 115 | 114 | 112 | 111 | 111 | 97 | 89 | 83 | 73 | 70 | 105 | 92 | 84 | 78 | 70 | 67 | 111 | 90 | 81 | 75 | 64 | 59 |
| 25 | 206 | 179 | 167 | 161 | 155 | 152 | 150 | 148 | 146 | 146 | 128 | 117 | 109 | 97 | 93 | 138 | 122 | 111 | 103 | 93 | 89 | 146 | 119 | 107 | 99 | 84 | 78 |
| 35 | 256 | 223 | 207 | 200 | 192 | 189 | 187 | 184 | 182 | 182 | 159 | 146 | 136 | 120 | 115 | 172 | 151 | 138 | 128 | 115 | 110 | 182 | 148 | 133 | 123 | 105 | 97 |
| 50 | 323 | 281 | 262 | 252 | 242 | 239 | 236 | 233 | 229 | 229 | 200 | 184 | 171 | 152 | 145 | 216 | 191 | 174 | 162 | 145 | 139 | 229 | 187 | 168 | 155 | 132 | 123 |
| 70 | 407 | 354 | 330 | 317 | 305 | 301 | 297 | 293 | 289 | 289 | 252 | 232 | 216 | 191 | 183 | 273 | 240 | 220 | 204 | 183 | 175 | 289 | 236 | 212 | 195 | 167 | 155 |
| 95 | 486 | 423 | 394 | 379 | 365 | 360 | 355 | 350 | 345 | 345 | 301 | 277 | 258 | 228 | 219 | 326 | 287 | 262 | 243 | 219 | 209 | 345 | 282 | 253 | 233 | 199 | 185 |
| 120 | 571 | 497 | 463 | 445 | 428 | 423 | 417 | 411 | 405 | 405 | 354 | 325 | 303 | 268 | 257 | 383 | 337 | 308 | 286 | 257 | 246 | 405 | 331 | 297 | 274 | 234 | 217 |
| 150 | 659 | 573 | 534 | 514 | 494 | 488 | 481 | 474 | 468 | 468 | 409 | 376 | 349 | 310 | 297 | 442 | 389 | 356 | 330 | 297 | 283 | 468 | 382 | 343 | 316 | 270 | 250 |
| 185 | 750 | 653 | 608 | 585 | 563 | 555 | 548 | 540 | 533 | 533 | 465 | 428 | 398 | 353 | 338 | 503 | 443 | 405 | 375 | 338 | 323 | 533 | 435 | 390 | 360 | 308 | 285 |
| 240 | 900 | 783 | 729 | 702 | 675 | 666 | 657 | 648 | 639 | 639 | 558 | 513 | 477 | 423 | 405 | 603 | 531 | 486 | 450 | 405 | 387 | 639 | 522 | 468 | 432 | 369 | 342 |
| 300 | 1041 | 906 | 843 | 812 | 781 | 770 | 760 | 750 | 739 | 739 | 645 | 593 | 552 | 489 | 468 | 697 | 614 | 562 | 521 | 468 | 448 | 739 | 604 | 541 | 500 | 427 | 396 |
| 400 | 1250 | 1088 | 1013 | 975 | 938 | 925 | 913 | 900 | 888 | 888 | 775 | 713 | 663 | 588 | 563 | 838 | 738 | 675 | 625 | 563 | 538 | 888 | 725 | 650 | 600 | 513 | 475 |



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 SIENOPYR(120) (N)HXSGAFHXÖ, (N)HXSGAFCHXÖ
 Current-carrying capacity

Continuous operation
 Maximum permissible operation temperature at conductor in °C : **120**
 Ambient temperature in °C : **30**

| Installation | 2. on a surface | | | | 3. under a surface (ceiling) | | | | | | | | | 4. in a tube, channel or housing | | | | | | | | | | | | | | |
|---|--------------------------------|------|------|------|------------------------------|------|------|------|------|------|------|------|------|----------------------------------|-----|-----|------|-----|------|------|------|-----|------|------|------|------|------|--|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of simultaneously loaded cables | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 | 16 | 20 | |
| Conversion factor | 1 | 0,85 | 0,79 | 0,75 | 0,95 | 0,81 | 0,72 | 0,68 | 0,66 | 0,64 | 0,63 | 0,62 | 0,61 | 1 | 0,8 | 0,7 | 0,65 | 0,6 | 0,57 | 0,54 | 0,52 | 0,5 | 0,48 | 0,45 | 0,43 | 0,41 | 0,38 | |
| Copper conductor nom. cross section mm ² | Current-carrying capacity in A | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2,5 | 47 | 40 | 37 | 35 | 44 | 38 | 34 | 32 | 31 | 30 | 29 | 29 | 28 | 37 | 30 | 26 | 24 | 22 | 21 | 20 | 19 | 19 | 18 | 17 | 16 | 15 | 14 | |
| 4 | 62 | 52 | 49 | 46 | 59 | 50 | 44 | 42 | 41 | 40 | 39 | 38 | 38 | 49 | 40 | 35 | 32 | 30 | 28 | 27 | 26 | 25 | 24 | 22 | 21 | 20 | 19 | |
| 6 | 78 | 66 | 62 | 58 | 74 | 63 | 56 | 53 | 51 | 50 | 49 | 48 | 48 | 62 | 50 | 44 | 41 | 37 | 36 | 34 | 32 | 31 | 30 | 28 | 27 | 26 | 24 | |
| 10 | 110 | 94 | 87 | 83 | 105 | 89 | 79 | 75 | 73 | 71 | 69 | 68 | 67 | 88 | 71 | 62 | 57 | 53 | 50 | 48 | 46 | 44 | 42 | 40 | 38 | 36 | 34 | |
| 16 | 148 | 126 | 117 | 111 | 141 | 120 | 107 | 101 | 98 | 95 | 93 | 92 | 90 | 119 | 95 | 83 | 77 | 71 | 68 | 64 | 62 | 59 | 57 | 53 | 51 | 49 | 45 | |
| 25 | 196 | 166 | 155 | 147 | 186 | 159 | 141 | 133 | 129 | 125 | 123 | 121 | 119 | 157 | 125 | 110 | 102 | 94 | 89 | 85 | 81 | 78 | 75 | 70 | 67 | 64 | 59 | |
| 35 | 243 | 207 | 192 | 182 | 231 | 197 | 175 | 165 | 161 | 156 | 153 | 151 | 148 | 195 | 156 | 136 | 126 | 117 | 111 | 105 | 101 | 97 | 93 | 88 | 84 | 80 | 74 | |
| 50 | 307 | 261 | 242 | 230 | 292 | 249 | 221 | 209 | 203 | 196 | 193 | 190 | 187 | 245 | 196 | 172 | 160 | 147 | 140 | 133 | 128 | 123 | 118 | 110 | 106 | 101 | 93 | |
| 70 | 387 | 329 | 305 | 290 | 367 | 313 | 278 | 263 | 255 | 247 | 244 | 240 | 236 | 309 | 247 | 217 | 201 | 186 | 176 | 167 | 161 | 155 | 148 | 139 | 133 | 127 | 118 | |
| 95 | 462 | 392 | 365 | 346 | 439 | 374 | 332 | 314 | 305 | 295 | 291 | 286 | 282 | 369 | 295 | 259 | 240 | 222 | 211 | 199 | 192 | 185 | 177 | 166 | 159 | 151 | 140 | |
| 120 | 542 | 461 | 429 | 407 | 515 | 439 | 391 | 369 | 358 | 347 | 342 | 336 | 331 | 434 | 347 | 304 | 282 | 260 | 247 | 234 | 226 | 217 | 208 | 195 | 187 | 178 | 165 | |
| 150 | 626 | 532 | 495 | 470 | 595 | 507 | 451 | 426 | 413 | 401 | 394 | 388 | 382 | 501 | 401 | 351 | 326 | 301 | 285 | 270 | 260 | 250 | 240 | 225 | 215 | 205 | 190 | |
| 185 | 713 | 606 | 563 | 534 | 677 | 577 | 513 | 485 | 470 | 456 | 449 | 442 | 435 | 570 | 456 | 399 | 371 | 342 | 325 | 308 | 296 | 285 | 274 | 257 | 245 | 234 | 217 | |
| 240 | 855 | 727 | 675 | 641 | 812 | 693 | 616 | 581 | 564 | 547 | 539 | 530 | 522 | 684 | 547 | 479 | 445 | 410 | 390 | 369 | 356 | 342 | 328 | 308 | 294 | 280 | 260 | |
| 300 | 989 | 841 | 781 | 742 | 940 | 801 | 712 | 672 | 653 | 633 | 623 | 613 | 603 | 791 | 633 | 554 | 514 | 475 | 451 | 427 | 411 | 396 | 380 | 356 | 340 | 324 | 301 | |
| 400 | 1188 | 1009 | 938 | 891 | 1128 | 962 | 855 | 808 | 784 | 760 | 748 | 736 | 724 | 950 | 760 | 665 | 618 | 570 | 542 | 513 | 494 | 475 | 456 | 428 | 409 | 390 | 361 | |



| | |
|--|---|
| Markenname <i>Trade mark</i> | Bauartkurzzeichen <i>Type designation</i> |
|--|---|



SIENOPYR(120)

(N) HX SGAF C HXÖ

25

1,8/3 kV

Sondertyp, in Anlehnung an die Norm
Special type, similar to the standard

Halogenfreie Isolierung, vernetzt
Halogen-free insulation, cross-linked

Bauart: Sonder-Gummiaderleitung
mit feindrähtigem Leiter
*Type: Special Rubber-insulated cable
with finely stranded copper conductor*

Kupferschirm
Copper screen

Halogenfreie Hülle, vernetzt, ölbeständig
Halogen-free sheath, cross-linked, oil resistant

Leiternennquerschnitt 25 mm²
Nominal cross-section

Nennspannung der Leitung (Wechselspannung) U_0/U
Rated AC-voltage of cable