



# Traction cable

## RADOX 4 GKW-AX 1800V M

### Product description:

**RADOX 4 GKW-AX 1800V M**

Nominal voltage:

Single core cables with reduced wall thickness

1800 / 3000 V AC

Hazard level:

M (extra low temperature, extra oil and extra fuel resistant)

### General Properties :

Halogen free, electron-beam cross-linked cables with improved behaviour in case of fire, easy to strip, soldering resistant and flexible. The cables are in accordance to EN 50264-3-1, but significantly thinner until 25 mm<sup>2</sup>.

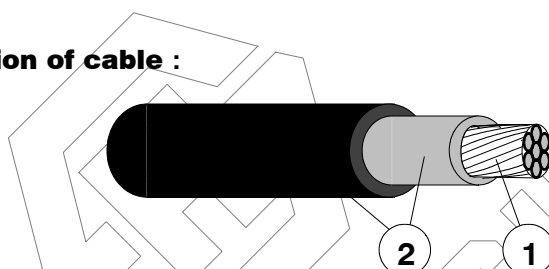
### Application :

The cables are intended for permanent installation in rail vehicles or for applications in which a limited alternating bending stress occur during service.

Guidelines for selection and installation are described in the standards EN 50355 and EN 50343.

For unscreened cables the guidelines of EN 50153 shall be followed.

### General composition of cable :



1. Conductor : stranded tin plated copper, acc. to EN 60228 cl. 5
2. Insulation : inner layer RADOX EI 110, colour: white  
outer layer RADOX EI 109, colour : black (see Table 1), coloured (see Table 2)
- Cable marking : HUBER+SUHNER RADOX 4 GKW-AX 1800V 1X[cross section] M [part No.] - [batch No.] [prod.- place]

### Technical Data :

|                                                    |                |                |      |
|----------------------------------------------------|----------------|----------------|------|
| Voltage rating cond.- earth                        | U <sub>0</sub> | 1800           | V AC |
| Voltage rating cond.- cond.                        | U              | 3000           | V AC |
| maximum permissible Voltage rating AC cond.- earth |                | 2100           | V AC |
| maximum permissible Voltage rating AC cond.- cond. | U <sub>m</sub> | 3600           | V AC |
| maximum permissible Voltage rating DC cond.- earth | V <sub>0</sub> | 2700           | V DC |
| maximum permissible Voltage rating DC cond.- cond. |                | 4500           | V DC |
| Test voltage.                                      |                | 6500           | V AC |
| Temperature range                                  |                | - 50 ... + 120 | °C   |

### Min. bending radius

|                   |           |       |
|-------------------|-----------|-------|
| fixed             | D ≤ 12 mm | 3 x D |
|                   | D > 12 mm | 4 x D |
| sporadic movement | D ≤ 12 mm | 4 x D |
|                   | D > 12 mm | 5 x D |

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The product fulfils the test and specification requirements described in this document for the stated areas of application and operating conditions. HUBER+SUHNER AG does not expressly or implicitly guarantee performance under additional or changed conditions. Deviations are to be agreed upon in writing.

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### NB:

The upper temperature limit is determined by long term ageing according to EN 50305 Par. 7 and extrapolation to 20,000 hours.

The lower temperature limit is determined by bending and elongation tests according to EN 60811-1-4 Par. 8, respectively low temperature behaviour tests for static conditions, e.g. for fixed installation according to GOST 20.57.406-81 - method 204-1 and GOST 17491-80.

The specified bending radii require a careful and proper handling using proven fastening technologies.

### The cables are in conformity with:

|                                                                 |                                                                    |                                 |
|-----------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------|
| <b>Fire protection on railway vehicles, hazard level</b>        | <b>HL1 - HL3</b>                                                   | <b>EN 45545</b>                 |
| Vertical flame spread                                           | $50 < L \leq 540$ mm                                               | EN 60332-1-2                    |
| Vertical flame spread, bunched, $D \leq 6$ mm                   | $L \leq 1.5$ m                                                     | EN 50305, 9.1.2                 |
| Vertical flame spread, bunched, $6 < D < 12$ mm                 | $L \leq 2.5$ m                                                     | EN 50305, 9.1.1 (EN 60332-3-25) |
| Vertical flame spread, bunched, $D \geq 12$ mm                  | $L \leq 2.5$ m                                                     | EN 60332-3-24                   |
| Smoke density                                                   | $T \geq 70$ %                                                      | EN 61034-2                      |
| Toxicity                                                        | $ITC \leq 6$                                                       | EN 50305, 9.2                   |
| <b>Fire protection on railway vehicles, level of protection</b> | <b>1 - 4</b>                                                       | <b>DIN 5510</b>                 |
| Vertical flame spread                                           | $50 < L \leq 540$ mm                                               | EN 60332-1-2                    |
| Vertical flame spread, bunched, $D \leq 6$ mm                   | $L \leq 1.5$ m                                                     | EN 50305, 9.1.2                 |
| Vertical flame spread, bunched, $6 < D < 12$ mm                 | $L \leq 2.5$ m                                                     | EN 60332-3-25                   |
| Vertical flame spread, bunched, $D \geq 12$ mm                  | $L \leq 2.5$ m                                                     | EN 60332-3-24                   |
| Smoke density                                                   | $T \geq 60$ %                                                      | EN 61034-2                      |
| Corrosivity of combustion gases                                 | $pH \geq 4.3$ , $C \leq 10$ $\mu$ S/mm                             | EN 50267-2-2                    |
| Amount of halogen acid gas                                      | $HCl + HBr \leq 0.5$ %                                             | EN 50267-2-1                    |
| Content of fluorine                                             | $HF \leq 0.1$ %                                                    | EN 60684-2, 45.2                |
| Toxicity                                                        | $ITC \leq 3$                                                       | EN 50305, 9.2                   |
| <b>Fire protection on railway vehicles, category</b>            | <b>A1, A2, B</b>                                                   | <b>NF F16-101</b>               |
| Fire protection on railway vehicles, class                      | C / F1                                                             | NF F16-101                      |
| Vertical flame spread                                           | $50 < L \leq 540$ mm                                               | NF C32-070, 2.1                 |
| Vertical flame spread, bunched                                  | $L \leq 300$ mm                                                    | NF C32-070, 2.2                 |
| Smoke index                                                     | $I.F. \leq 5$                                                      | X10-702-2, NF X70-100-1         |
| <b>Fire protection on railway vehicles, hazard level</b>        | <b>LR1 - LR4</b>                                                   | <b>UNI CEI 11170</b>            |
| Vertical flame spread                                           | $50 < L \leq 540$ mm                                               | EN 60332-1-2                    |
| Vertical flame spread, bunched, $D \leq 6$ mm                   | $L \leq 1.5$ m                                                     | EN 50305, 9.1.2                 |
| Vertical flame spread, bunched, $6 < D < 12$ mm                 | $L \leq 2.5$ m                                                     | EN 60332-3-25                   |
| Vertical flame spread, bunched, $D \geq 12$ mm                  | $L \leq 2.5$ m                                                     | EN 60332-3-24                   |
| Smoke density                                                   | $T \geq 70$ %                                                      | EN 61034-2                      |
| Corrosivity of combustion gases                                 | $pH \geq 4.3$ , $C \leq 10$ $\mu$ S/mm                             | EN 50267-2-2                    |
| Amount of halogen acid gas                                      | $HCl + HBr \leq 0.5$ %                                             | EN 50267-2-1                    |
| Toxicity                                                        | $ITC \leq 3$                                                       | EN 50305, 9.2                   |
| <b>Fire protection on railway vehicles, category</b>            | <b>Ia, Ib, II</b>                                                  | <b>BS 6853, GM/RT 2130</b>      |
| Vertical flame spread                                           | $50 < L \leq 540$ mm                                               | EN 60332-1-2                    |
| Vertical flame spread, bunched                                  | $L \leq 2.5$ m                                                     | EN 50266, BS 6853 An. D.8.7     |
| Smoke density                                                   | $A_0 \leq BS 6853$                                                 | BS 6853 An. D.8.7               |
| Toxicity                                                        | $R \leq 1.0$                                                       | BS 6853 An. B.1                 |
| <b>Fire protection on railway vehicles</b>                      | <b>Fulfilled</b>                                                   | <b>NFPA 130</b>                 |
| Vertical flame spread, bunched                                  | $L \leq 1.5$ m                                                     | UL 1685, 12 (FT4 exp.)          |
| Smoke density                                                   | $TSR \leq 150$ m <sup>2</sup> , $PSRR \leq 0.40$ m <sup>2</sup> /s | UL 1685, 12 (FT4 exp.)          |



# Traction cable

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### Requirement of hazard level code M

(acc. to EN 50264- 1 or EN 50306- 1)

Extra low temperature ..... - 40 °C

Extra oil resistance ..... IRM 902, 72h, 100°C

Extra fuel resistance ..... IRM 903, 168h, 70°

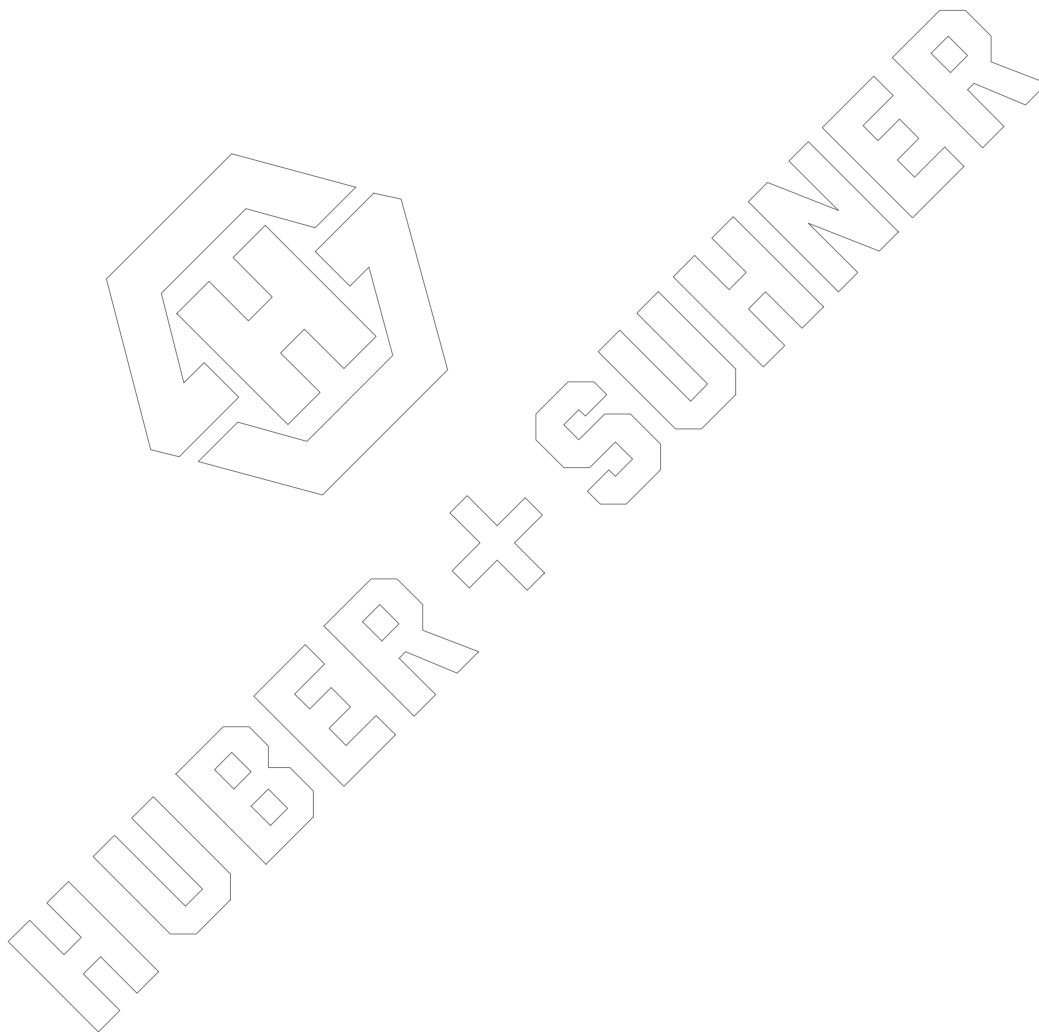
### Applicable documents :

H+S 557 578

Current rating for single core cables

Doc.No. 0000356416

Technical Specification RADOX 4/9 GKW- AX





# Traction cable

## RADOX 4 GW-AX 1800V M

**Table 1 :** Isolation outer layer colour: black

| Cable type<br>mm <sup>2</sup> | Conductor construction<br>n x mm | Conductor nom D<br>mm | Cable dia.<br>mm | R <sub>20</sub> <sup>1)</sup><br>max<br>Ω / km | C <sub>H2O</sub> <sup>2)</sup><br>nom<br>pF/m | Fireload<br>nom kJ /<br>m | Weight<br>copper cable<br>kg / 100m | H+S<br>Part. Nr. |
|-------------------------------|----------------------------------|-----------------------|------------------|------------------------------------------------|-----------------------------------------------|---------------------------|-------------------------------------|------------------|
| 0.5                           | 19x0.18                          | 0.88                  | 2.45±0.10        | 38.5                                           | 236                                           | 91                        | 0.44 1.1                            | 84 118 052       |
| 0.75                          | 24x0.18                          | 1.10                  | 2.65±0.10        | 26.7                                           | 276                                           | 102                       | 0.70 1.4                            | 84 118 059       |
| 1                             | 37x0.18                          | 1.22                  | 3.00±0.10        | 20.0                                           | 266                                           | 132                       | 0.88 1.8                            | 12 555 986       |
| 1.5                           | 37x0.23                          | 1.52                  | 3.35±0.10        | 13.7                                           | 307                                           | 157                       | 1.4 2.5                             | 12 536 686       |
| 2.5                           | 61x0.23                          | 1.94                  | 3.75±0.10        | 8.21                                           | 362                                           | 187                       | 2.2 3.5                             | 12 536 692       |
| 4                             | 61x0.29                          | 2.40                  | 4.50±0.10        | 5.09                                           | 396                                           | 257                       | 3.5 5.2                             | 12 536 694       |
| 6                             | 84x0.30                          | 2.93                  | 5.20±0.15        | 3.39                                           | 419                                           | 334                       | 5.2 7.4                             | 12 536 696       |
| 10                            | 80x0.40                          | 3.89                  | 6.40±0.15        | 1.95                                           | 488                                           | 467                       | 9.1 12                              | 12 545 527       |
| 16                            | 119x0.40                         | 5.30                  | 8.40±0.20        | 1.24                                           | 535                                           | 801                       | 13 19                               | 12 545 528       |
| 25                            | 182x0.40                         | 6.60                  | 10.2±0.3         | 0.795                                          | 565                                           | 1125                      | 21 28                               | 12 545 529       |
| 35                            | 266x0.40                         | 7.80                  | 11.7±0.3         | 0.565                                          | 607                                           | 1457                      | 30 40                               | 12 545 530       |
| 50                            | 378x0.40                         | 9.30                  | 13.5±0.3         | 0.393                                          | 660                                           | 1737                      | 43 54                               | 12 545 531       |
| 70                            | 348x0.50                         | 11.4                  | 15.8±0.3         | 0.277                                          | 755                                           | 2178                      | 61 75                               | 12 545 532       |
| 95                            | 444x0.50                         | 12.9                  | 17.5±0.3         | 0.210                                          | 808                                           | 2549                      | 78 95                               | 12 545 533       |
| 120                           | 570x0.50                         | 14.9                  | 19.8±0.3         | 0.164                                          | 862                                           | 3118                      | 100 120                             | 12 544 522       |
| 150                           | 722x0.50                         | 16.8                  | 22.1±0.3         | 0.132                                          | 894                                           | 3474                      | 127 150                             | 12 545 534       |
| 185                           | 874x0.50                         | 18.3                  | 24.0±0.3         | 0.108                                          | 903                                           | 4432                      | 153 182                             | 12 544 523       |
| 240                           | 1147x0.50                        | 21.1                  | 27.0±0.3         | 0.0817                                         | 994                                           | 5225                      | 201 235                             | 12 547 684       |
| 300                           | 1443x0.50                        | 23.7                  | 29.9±0.4         | 0.0654                                         | 1060                                          | 6106                      | 251 291                             | 12 552 906       |
| 400                           | 1952x0.50                        | 27.3                  | 34.1±0.5         | 0.0495                                         | 1115                                          | 7639                      | 342 392                             | 12 555 997       |

1) conductor resistance according to EN 60228

2) capacity in water



# Traction cable

## RADOX 4 GWK-AX 1800V M

**Table 2 :** Isolation outer layer colour: see table

| Cable type<br>mm <sup>2</sup> | Conductor construction<br>n x mm | nom D<br>mm | Cable dia.<br>mm | R <sub>20</sub> <sup>1)</sup><br>max<br>Ω / km | C <sub>H2O</sub> <sup>2)</sup><br>nom<br>pF/m | Fireload<br>nom<br>kJ / m | Weight<br>copper<br>kg / 100m | nom cable | Colour | H+S<br>Part. Nr. |
|-------------------------------|----------------------------------|-------------|------------------|------------------------------------------------|-----------------------------------------------|---------------------------|-------------------------------|-----------|--------|------------------|
| 0.5                           | 19x0.18                          | 0.88        | 2.45±0.10        | 38.5                                           | 236                                           | 91                        | 0.44                          | 1.1       | bn     | 84 118 053       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | bu     | 84 118 056       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | gy     | 84 118 058       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | rd     | 84 118 057       |
| 0.75                          | 24x0.18                          | 1.10        | 2.65±0.10        | 26.7                                           | 276                                           | 102                       | 0.70                          | 1.4       | rd     | 85 070 897       |
| 1                             | 37x0.18                          | 1.22        | 3.00±0.10        | 20.0                                           | 266                                           | 132                       | 0.88                          | 1.8       | ye     | 12 586 321       |
| 1.5                           | 37x0.23                          | 1.52        | 3.35±0.10        | 13.7                                           | 307                                           | 157                       | 1.4                           | 2.5       | ye     | 12 562 189       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | bu     | 12 543 842       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | gy     | 12 567 226       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | rd     | 12 555 769       |
| 2.5                           | 61x0.23                          | 1.94        | 3.75±0.10        | 8.21                                           | 362                                           | 187                       | 2.2                           | 3.5       | ye     | 85 067 621       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | bu     | 85 067 625       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | rd     | 12 554 310       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | gy     | 84 091 279       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | bn     | 12 584 664       |
| 4                             | 61x0.29                          | 2.40        | 4.50±0.10        | 5.09                                           | 396                                           | 270                       | 3.5                           | 5.3       | wh     | 85 023 707       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | rd     | 12 559 555       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | bu     | 85 066 538       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | ye     | 85 067 561       |
| 6                             | 84x0.30                          | 2.93        | 5.2±0.15         | 3.39                                           | 419                                           | 334                       | 5.2                           | 7.4       | wh     | 84 090 550       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | bu     | 12 568 594       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | rd     | 12 582 984       |
| 10                            | 80x0.40                          | 3.89        | 6.4±0.15         | 1.95                                           | 488                                           | 467                       | 9.1                           | 12        | bu     | 85 067 547       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | ye     | 85 067 546       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | rd     | 12 582 985       |
| 16                            | 119x0.40                         | 5.30        | 8.4±0.20         | 1.24                                           | 535                                           | 801                       | 13                            | 19        | ye     | 85 067 521       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | bu     | 85 067 520       |
|                               |                                  |             |                  |                                                |                                               |                           |                               |           | rd     | 12 566 008       |
| 25                            | 182x0.40                         | 6.60        | 10.2±0.3         | 0.795                                          | 565                                           | 1125                      | 21                            | 28        | rd     | 12 568 968       |



# Traction cable

## RADOX 4 GKW-AX 1800V M

**Table 2 :** Isolation outer layer colour: see table

| Cable type<br>mm <sup>2</sup> | Conductor <sup>nom</sup><br>construction D<br>n x mm mm |      | Cable<br>dia.<br>mm | R <sub>20</sub> <sup>1)</sup><br>max<br>Ω / km | C <sub>H2O</sub> <sup>2)</sup><br>nom<br>pF/m | Fireload<br>nom<br>kJ / m | Weight <sup>nom</sup><br>copper cable<br>kg / 100m |     | Colour | H+S<br>Part. Nr. |
|-------------------------------|---------------------------------------------------------|------|---------------------|------------------------------------------------|-----------------------------------------------|---------------------------|----------------------------------------------------|-----|--------|------------------|
| 35                            | 266x0.40                                                | 7.80 | 11.7±0.3            | 0.565                                          | 607                                           | 1457                      | 30                                                 | 40  | rd     | 12 568 008       |
|                               |                                                         |      |                     |                                                |                                               |                           |                                                    |     | bu     | 85 019 626       |
|                               |                                                         |      |                     |                                                |                                               |                           |                                                    |     | ye     | 85 019 627       |
| 50                            | 378x0.40                                                | 9.30 | 13.5±0.3            | 0.393                                          | 660                                           | 1737                      | 43                                                 | 54  | rd     | 12 582 459       |
| 70                            | 348x0.50                                                | 11.4 | 15.8±0.3            | 0.277                                          | 755                                           | 2178                      | 61                                                 | 75  | rd     | 12 566 010       |
| 95                            | 444x0.50                                                | 12.9 | 17.5±0.3            | 0.210                                          | 808                                           | 2549                      | 78                                                 | 95  | rd     | 12 582 460       |
| 120                           | 570x0.50                                                | 14.9 | 19.8±0.3            | 0.164                                          | 862                                           | 3118                      | 100                                                | 120 | rd     | 85 070 815       |
| 150                           | 722x0.50                                                | 16.8 | 22.1±0.3            | 0.132                                          | 894                                           | 3474                      | 127                                                | 150 | ye     | 85 067 495       |
|                               |                                                         |      |                     |                                                |                                               |                           |                                                    |     | bu     | 85 067 494       |
|                               |                                                         |      |                     |                                                |                                               |                           |                                                    |     | rd     | 85 067 468       |
| 185                           | 874x0.50                                                | 18.3 | 24.0±0.3            | 0.108                                          | 903                                           | 4432                      | 153                                                | 182 | rd     | 12 559 659       |

1) conductor resistance according to EN 60228

2) capacity in water