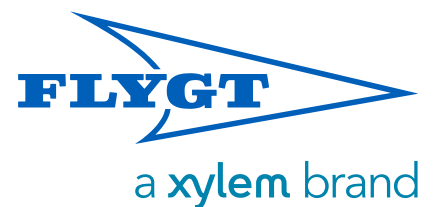


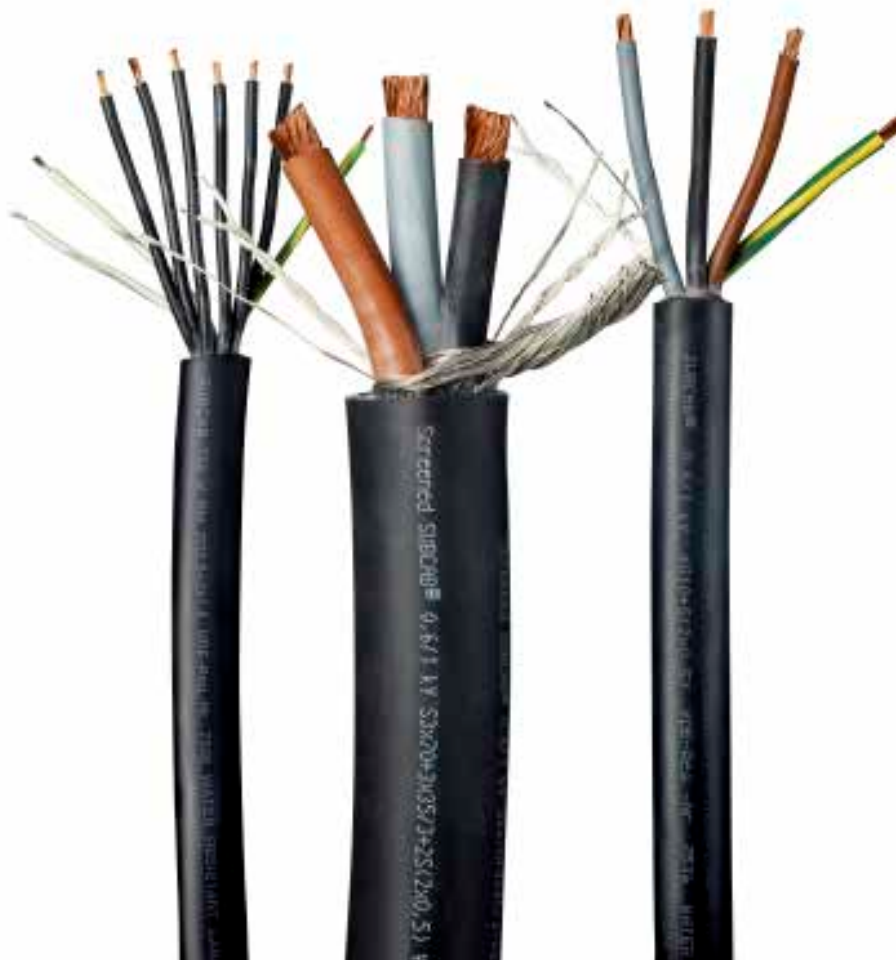


# Flygt Submersible Motor Cables



This brochure contains an overview of the Flygt motor cable assortment. The cables are especially designed for submersible use and made of carefully selected materials. The assortment contains the following cables for varying applications:

Flygt SUBCAB® .....	3-6
Flygt HCR (Heat and Chemical Resistant) .....	7-8
Silicone Cable (Heat Resistant).....	7-8
Medium Voltage Cable.....	7-8



# Flygt SUBCAB®

## Why choose a Flygt SUBCAB®?

Flygt SUBCAB® is a range of pump motor power cables especially developed by Xylem. They are made for use with Flygt pumps and mixers and make sure that the cable attached to your product will never let you down, whatever your application is. Choose Flygt SUBCAB® for a low life cycle cost, durability and minimum down time.

### **Long lifetime**

- » High temperature resistance: up to 70°C water temperature
- » Superior mechanical strength and high abrasion and tear resistance
- » Extremely low water absorption rate: Withstands water depths up to 50 m
- » Chemical resistance within pH 3-10
- » Ozone, oil and flame resistant

### **Ensures a reliable leak-free fit**

- » Tight outer diameter tolerances ensure a perfect fit with cable entry sleeve
- » Retains its mechanical and physical properties and withstands the high pressure of the seal sleeve

### **Prevents insulation deterioration**

- » Conductor insulation with a temperature rating of 90°C, which minimizes the risk for insulation cracks

### **Built-in monitoring cores**

- » Secure proper monitoring and easy connection of pump sensors
- » Eliminate the use of small auxiliary cables that often get damaged and are awkward to handle
- » Screened control cores specifically adapted for the use of the Flygt MAS 800 pump supervision system
- » All screened cables and all unscreened cables  $\geq 10$  mm<sup>2</sup> have built-in screened control cores

### **Screened versions for variable frequency drive (VFD) operation**

- » Reduce electromagnetic emissions to other electronics
- » Secure correct communication with supervision units

### **Complies with international standards**

- » See table at page 10

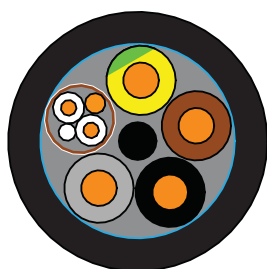
# General properties for Flygt SUBCAB®

Flygt SUBCAB® is designed for use with standard and explosion proof submersible products in applications where the ambient temperature does not exceed 70°C. The cable is also FM approved according to certificate number J.I. 0R8A0.AE.

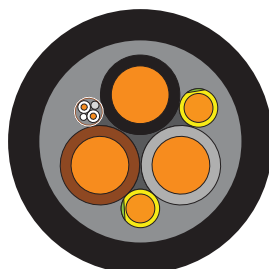
For remote pump control, Flygt provides a simple and reliable solution through its cables with control cores. You only need one cable instead of using the conventional pump control solution of a motor cable plus a separate control cable. The range includes cables with twisted pair of screened control cores specifically adapted for the use of Flygt MAS 800 pump supervision system.

The screened Flygt SUBCAB® is used with Variable Frequency Drives (VFD) to limit unwanted electromagnetic radiation. Typical applications for this cable include mines, quarries, and industrial areas.

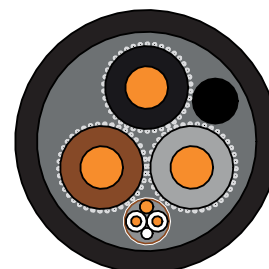
Feature	Flygt SUBCAB®	Screened Flygt SUBCAB®
Max. sheath and insulation temperature	70 °C and 90 °C (AWG 60 °C and 90 °C)	70 °C and 90 °C (AWG 60 °C and 90 °C)
Min. operating temperature	-40°C for fixed installations -25°C for flexible installations (bending radius ≥10 x outer cable diameter)	-40°C for fixed installations -25°C for flexible installations (bending radius ≥10 x outer cable diameter)
Outer sheathing material	Chlorinated polyethylene rubber (CPE type: 5GM5)	Chlorinated polyethylene rubber (CPE type: 5GM5)
Conductor insulation material	High density ethylene-propylene rubber (HEPR/3GI3) or Ethylene-propylene rubber (EPR/3GI3). Part numbers marked * in the assortment table below have EPR, the rest HEPR.	High density ethylene-propylene rubber (HEPR/3GI3)
Conductors material	Copper strands	Copper strands including screened tinned copper wires
Rated Voltage (phase to earth, phase to phase)	Europe: ≥ 10 mm <sup>2</sup> and 7G6+s(2x0,5): 600/1000 V. Remaining models: 450/750 V North America and Canada: 600 V	Europe: 600/1000 V North America and Canada: 600 V
More information	Flygt standard documents M1997.47.0004, M1997.47.0009, M1997.47.0024	Flygt standard document M1997.47 0023



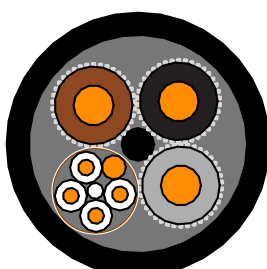
**Fig. 1**  
SUBCAB® - 10-35 mm<sup>2</sup>



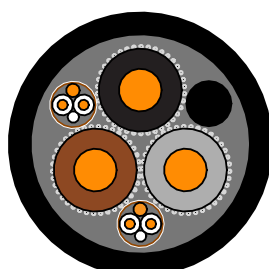
**Fig. 2**  
SUBCAB® - 50-120 mm<sup>2</sup>



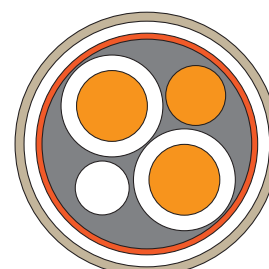
**Fig. 3**  
Screened SUBCAB® - 1.5 mm<sup>2</sup>



**Fig. 4**  
Screened SUBCAB® - 2.5-50 mm<sup>2</sup>



**Fig. 5**  
Screened SUBCAB® - 70-120 mm<sup>2</sup>



**Fig. 6**  
SUBCAB® - control element design in  
fig. 1,2,3 and 5

## Flygt SUBCAB® assortment

For instructions about how to read the SUBCAB® denominations, see page 11.

Type	Denomination (mm <sup>2</sup> )	Part no.	Nominal current capacity at 30°C (Amp)**	Outer diameter (mm)	Weight (kg/m)	Bending radius (cm)	Fig. no.
<b>Flygt SUBCAB® without control cores</b>							
3 core	3G1.5	94 20 40*	23	10 - 11	0.16	10	
	3G2.5	94 19 31*	32	11 - 12	0.24	11	
4 core	4G1.5	94 20 41*	23	10.5 - 11.5	0.20	10	
	4G2.5	94 20 42*	32	12.5 - 13.5	0.28	12	
	4G4	94 20 43*	42	16 - 17	0.44	16	
	4G6	94 20 44*	54	18 - 19	0.57	18	
<b>Flygt SUBCAB® with control cores</b>							
4 core	4G1.5 + 2x1.5	94 20 61*	23	15 - 16	0.32	15	
	4G2.5 + 2x1.5	94 20 59*	32	17 - 18	0.43	17	
	4G4 + 2x1.5	94 20 60*	42	20 - 22	0.63	20	
	4G6 + 2x1.5	94 20 56*	54	24 - 26	0.83	24	
	4G10 + S(2x0.5)	94 19 81	75	24 - 26	0.85	24	1
	4G16 + S(2x0.5)	94 19 82	100	26 - 28	1.30	26	1
	4G25 + S(2x0.5)	94 19 83	127	32 - 34	1.70	32	1
	4G35 + S(2x0.5)	94 19 84	157	35 - 37	2.24	35	1
	3x50 + 2G35/2 + S(2x0.5)	94 19 85	192	35 - 37	2.60	35	2
	3x70 + 2G35/2 + S(2x0.5)	94 19 86	246	38 - 41	3.30	38	2

\* EPR

\*\* See page 9

Type	Denomination (mm <sup>2</sup> )	Part no.	Nominal current capacity at 30°C (Amp)**	Outer diameter (mm)	Weight (kg/m)	Bending radius (cm)	Fig. no.
	3x95 + 2G50/2 + S(2x0.5)	94 19 87	298	47 - 50	4.50	47	2
	3x120 + 2G70/2 + S(2x0.5)	94 19 88	346	54 - 56	5.70	54	2
7 core	7G2.5 + 2x1.5	94 20 82*	32	20 - 22	0.60	20	
	7G4 + 2x1.5	94 20 80*	42	22 - 24	0.84	22	
	7G6 + S(2x0.5)	94 19 80	54	24 - 26	0,85	24	
<b>Flygt SUBCAB® screened with control cores</b>							
4 core	S3x1,5 + 3x1,5/3 + S(2x0.5)	94 19 89	23	16 - 17	0,5	16	3
	S3x2,5 + 3x2,5/3 + S(4x0.5)	94 19 90	32	18 - 20	0,45	18	4
	S3x6 + 3x6/3 + S(4x0.5)	94 19 91	54	20 - 22	0,55	20	4
	S3x10 + 3x10/3 + S(4x0.5)	94 19 92	75	24 - 26	0.95	24	4
	S3x16 + 3x16/3 + S(4x0.5)	94 19 93	100	24 - 26	1.10	24	4
	S3x25 + 3x16/3 + S(4x0.5)	94 19 94	127	29 - 31	1.40	29	4
	S3x35 + 3x16/3 + S(4x0.5)	94 19 95	157	32 - 34	2.00	32	4
	S3x50 + 3x25/3 + S(4x0.5)	94 19 96	192	38 - 40	3.00	38	4
	S3x70 + 3x35/3 + 2S(2x0.5)	94 19 97	246	42 - 44	3.50	42	5
	S3x95 + 3x50/3 + 2S(2x0.5)	94 19 98	298	44 - 47	4.60	44	5
	S3x120 + 3x70/3 + 2S(2x0.5)	94 19 99	346	50 - 52	5.50	50	5
	S6x95 + 95 + S(4x0.5)	94 20 00	475	57 - 60	7.60	57	
<b>Flygt SUBCAB® control cables</b>							
Control	2x1.5	94 20 76*	-	10 - 11	0.14	10	
	7x1.5	94 19 22*	-	15 - 17	0.38	15	
	12x1.5	94 19 20*	-	18 - 21	0.53	18	
	24x1.5	94 19 21*	-	24 - 29	0.90	24	
<b>Flygt SUBCAB® screened control cables</b>							
Control	S 12x1.5	94 08 94*	-	29 - 31	0.78	29	
	S 24x1.5	94 08 95*	-	33 - 37	1.59	33	

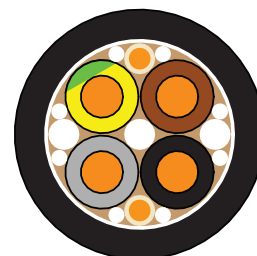
\* EPR

\*\* See page 9

# General properties for Flygt supplementing cables

## Flygt HCR cable

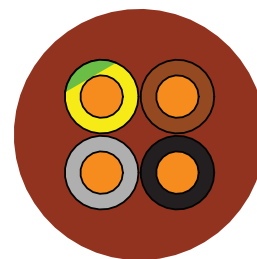
The HCR (Heat and Chemical Resistant) cable is designed for use in severe conditions. It is made of very high quality materials (FEP and ETFE) and is resistant to chemicals and solvents, high temperature and mechanical stress, that often cause rapid deterioration of other cables. A HCR cable should be used in hot liquid applications where temperatures exceed 90°C and high chemical resistance is required.



**Fig. 7**  
Flygt HCR cable

## Silicone cable

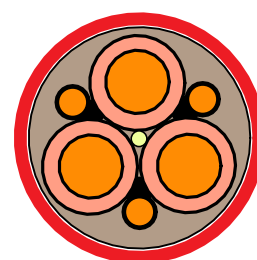
The silicone cable can be used instead of a HCR cable in hot liquid applications where the ambient temperature exceeds 90°C and where the demands for mechanical wear resistance is limited. This is a flexible cable with a wide temperature range. The water absorption rate is very low and the material is halogen free. An application where a silicone cable can be used is hot water without special requirements for chemical resistance. Compared to HCR and SUBCAB® the silicone cable has limited mechanical properties such as resistance to abrasion and lower tensile strength, therefore it is recommendable to use some protection around the cable if it is exposed to mechanical wear.



**Fig. 8**  
Silicone cable

## Medium voltage pump cable ≤15 kV

The medium voltage cable, (N)TSCGEWUEUS, is a heavy duty cable suitable for use with Flygt medium voltage products. Especially for high and extreme mechanical stress, e.g. torsional stress and high reeling speed. Only authorized Xylem personnel may connect these cables to products because of the semi-conductive layers over the insulation. The ground core must be marked with a green/yellow shrink tube when assembling the cable to the product.



**Fig. 9**  
Medium voltage pump cable

Feature	Flygt HCR cable	Silicone cable	Medium voltage cable
Max. sheath and insulation temperature	90 °C and 155 °C	145 °C and 180 °C	70 °C and 90 °C
Min. operating temperature	-40°C for fixed installations -25°C for flexible installations (bending radius ≥10 x outer cable diameter)	-40°C for fixed installations -25°C for flexible installations (bending radius ≥10 x outer cable diameter)	-40°C for fixed installations -25°C for flexible installations (bending radius ≥10 x outer cable diameter)
Outer sheathing material	black fluorethylene propylene FEP	red-brown silicone rubber sheath SI	red PCP compound
Conductor insulation material	black fluorethylene propylene FEP	red-brown silicone rubber SI	Ethylene-propylene rubber (EPDM)
Control wires insulation material	ethylenetetrafluorethylene ETFE		
Conductor material	copper strands	copper strands	copper strands
Rated voltage	450/750 V	300/500 V	8700/15 000 V
More information	Flygt standard document M1997.47.0015	Flygt standard document M1997.47.0014	Flygt standard documents M1947.0005 and A3440.00

## Flygt supplementing cable assortment

Type	Denomination (mm <sup>2</sup> )	Part no.	Nominal current capacity at 30°C (Amp)**	Outer diameter (mm)	Weight (kg/m)	Bending radius (cm)	Fig. no.
<b>HCR Heat &amp; chemical resistant cable SO7E6E5-F</b>							
4 core	4G16 + 2x1.5	94 20 96	125	19.5-21.5	1.03	19	7
	4G25 + 2x1.5	94 20 97	170	26.5-27.5	1.58	26	7
7 core	7x2.5	94 20 91	28	11.0-11.8	0.33	11	
	7x6	94 20 94	50	16.2-17.2	0.80	16	
<b>Silicone cable SI-SL-BIHFSIH-J</b>							
4 core	4G2.5	94 19 75	26	10.5-11.5	0.19	10	8
	4G10	94 19 78	61	17.9-19.7	0.71	17	8
7 core	7G2.5	94 19 79	26	11.2-12.4	0.27	11	
<b>Medium voltage cable ≤15kV (N)TSCGEWEOUS</b>							
4 core	3X25 + 3X25/3	94 19 67	127	41-44	2.51	41	9
	3x50 + 3x25/3	94 19 65	192	46-49	3.47	46	9

\*\* See page 9



# Temperature correction

## Temperature correction factors for Flygt cables

The current capacities for Flygt cables are designed for duty at 30°C ambient temperature. If the ambient temperature exceeds 30°C, the maximum current rating the conductors can handle has to be taken into consideration. The current rating must be adjusted (lowered) according to the table.

Note that there are no reduction factors for the Flygt HCR cables and the Silicone cables up to 90°C, due to their insulation materials' resistance to high temperatures.

### Example

Select cable for a pump with a pump current of 33 A and an ambient temperature of 52°C:

- Select correction factor for 52°C in the table (0,76).
- Calculate "virtual" current  $33 / 0,76 = 44A$
- Choose 4 G 6 mm<sup>2</sup> at 52°C, rated 54A

Ambient temp. (°C)	Correction factor	Ambient temp (F)
21-25	1.04	70-77
26-30	1.00	79-86
31-35	0.96	88-95
36-40	0.91	97-104
41-45	0.87	106-113
46-50	0.82	115-122
51-55	0.76	124-131
56-60	0.71	133-140
61-70	0.58	142-158

According to IEC 60364-5-523 table 52-D1 and NEC table 310-16 (USA/Canada) in air.

# Maximum mechanical load

The maximum mechanical load on Flygt cables is 1.5 kg/mm<sup>2</sup> conductor area.

### Example

Flygt SUBCAB® 4 G 50 p/No. 94 19 85 can take a max. load of  $1.5 \times 4 \times 50 = 300$  kg. It weighs 2.6 kg/m, so the max. length that can hang vertically is  $300 / 2.6 = 115m$  cable.

# Bending radius

The minimum bending radius of Flygt cables is 10 x outer diameter.

# Flygt SUBCAB® standards and approvals

Flygt SUBCAB® cables comply with the following general standards:

Standard	Type
IEC 60245	Flexible cable in general
IEC 60228 class 5	Conductor
IEC 60811-1-1 CLAUSE 9	Oil resistant
IEC 60811-2-1 CLAUSE 10	Oil resistant
IEC 60332-1	Flame retardant
IEC 60332-2	Flame retardant
IEC 60364-5-523	Current
CSA C22.2 No.49-1992	Flexible cable in general
UL 1581	Flexible cable in general
CCC.GB5013/IEC60245	Flexible cable in general
EN 50525-2-21	Flexible cable in general
VDE 0207 part 20	Material
VDE 0250	Material
VDE 0282 part 810	Material
VDE 0472 part 803-A	Oil resistant
VDE 0472 part 804-B	Flame retardant
VDE 0295	Conductor
VDE 0298	Current
VDE 0472	Testing
HD 22.4	Flexible cable in general
EN 50525-2-21	Cables for submersible use
EN 50363-1:2005	Material

# Other cables standards and approvals

Cable type	Standard/Approval	Type
Flygt HCR	IEC 60287	Current rating
Flygt HCR	IEC 60332-3 Cat A	Flame retardant
Flygt HCR	SS 424 02 46	Conductor insulation material
Flygt HCR	NEMA WC 27500	Material
Silicone cable	VDE 0207	Current rating
Silicone cable	IEC 60332-1	Flame retardant
Medium voltage cable	DIN VDE 250	Material
Medium voltage cable	DIN VDE 298 part 4	Current rating
Medium voltage cable	DIN VDE 207	Insulation material

## Conversion table for mm<sup>2</sup> and AWG sizes

mm <sup>2</sup>	AWG	Actual mm <sup>2</sup> size for AWG
1.5	16	1.31
2.5	14	2.08
4	12	3.31
6	10	5.26
10	8	8.39
16	6	13.29
25	4	21.15
35	2	33.62
50	1	42.41

For more detailed calculations regarding transformation of SUBCAB mm<sup>2</sup> ampacity into AWG ampacity, please refer to NEC Article 310.15C for accurate formula.

## How to read the SUBCAB<sup>®</sup> denominations

### Examples:

#### **3x50 + 2G35/2 + S(2x0.5) means**

3x50      3 power cores, 50 mm<sup>2</sup> area each

2G35/2    2 earth cores, 35/2 mm<sup>2</sup> = 17.5 mm<sup>2</sup> area each, i.e. total earth area = 35 mm<sup>2</sup>

S(2x0.5)   1 screened (S) control element, 2 monitoring cores of 0.5 mm<sup>2</sup> area each

#### **S3x16 + 3x16/3 + S(4x0.5) means**

S3x16      Screened. 3 power cores, 16 mm<sup>2</sup> area each

3x16/3     3 earth cores, 16/3 mm<sup>2</sup> = 5.3 mm<sup>2</sup> area each, i.e. total earth area = 16 mm<sup>2</sup>

S(4x0.5)   1 screened (S) control element, 4 monitoring cores of 0.5 mm<sup>2</sup> area each

## About Flygt

Flygt, a Xylem brand, is synonymous with engineering excellence, reliability and closeness to customers. Flygt is a world leader in the design and manufacture of dry and submersible pumps, mixers and related intelligent controls systems. Under the Flygt banner, customers have access to a complete range of products, services and solutions for moving water and wastewater, as well as advanced monitoring and control equipment to optimize operations. Product development and manufacturing of Flygt products is based in Sweden. For more information about Flygt products, please visit [www.flygt.com](http://www.flygt.com)

## Xylem ['zīləm]

- 1) The tissue in plants that brings water upward from the roots
- 2) A leading global water technology company

We meet the world's water needs by creating innovative solutions that improve the way water is used, conserved, and re-used. We move, treat, analyze, and return water to the environment. In more than 150 countries, our loyal customers know us for our powerful combination of leading product brands and applications expertise.



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