

PROTOLON (ST) / PROTOLON (ST)...../3E Medium-Voltage Flexible Cables for Use in Water



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Selection and dimensioning criteria

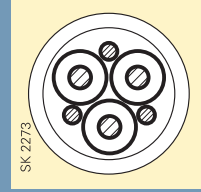
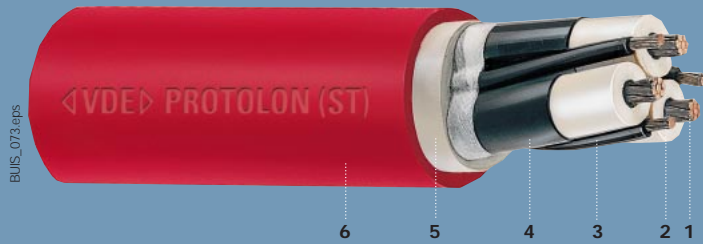
Refer to Section 4 for further details



	Type	PROTOLON (ST)	PROTOLON (ST) .../3E	Page	4/2
	Type designation	NTSCGEWÖU	NTSCGEWÖU	Page	4/3
	Approvals/standards	DIN VDE 0250, Part 813 MSHA P-189-4	DIN VDE 0250, Part 813 MSHA P-189-4	Page	4/4
	Application (refer also to DIN VDE 0298, Part 3)	Power supply cable for use in water, e.g. for connection to dredgers, floating docks, pumps, etc., in applications where high mechanical stresses are to be expected. Also suitable for use in sewage, salt water and brackish water at water depths of up to 500 m.		Page	4/6
Electrical parameters	Rated voltage	$U_0/U = 1.8/3$ kV to 18/30 kV	$U_0/U = 1.8/3$ kV to 18/30 kV	Pages to	4/14
	Maximum permissible operating voltage in AC systems	$U_0/U = 2.1/3.6$ kV to 20.8/36 kV	$U_0/U = 2.1/3.6$ kV to 20.8/36 kV		4/17
	Maximum permissible operating voltage in DC systems	$U_0/U = 2.7/5.4$ kV to 27/54 kV	$U_0/U = 2.7/5.4$ kV to 27/54 kV		
	AC test voltage	6 kV to 43 kV according to DIN VDE 0250, Part 813	6 kV to 43 kV according to DIN VDE 0250, Part 813		
	Current-carrying capacity	According to DIN VDE 0298, Part 4	According to DIN VDE 0298, Part 4		
Thermal parameters	Ambient temperature			Pages to	4/18
	• Fully flexible operation	- 25 °C to + 60 °C	- 25 °C to + 60 °C		4/19
	• Fixed installation	- 40 °C to + 80 °C	- 40 °C to + 80 °C		
	Maximum permissible water temperature	+ 40 °C	+ 40 °C		
	Maximum permissible operating temperature of the conductor	90 °C	90 °C		
Short-circuit temperature of the conductor	200 °C	200 °C			
Mechanical parameters	Tensile load	Up to 15 N/mm ²	Up to 15 N/mm ²	Page	4/20
	Torsional stresses	± 100 °/m	± 25 °/m	Page	4/21
	Minimum bending radii	According to DIN VDE 0298, Part 3	According to DIN VDE 0298, Part 3	Page	4/22
Chemical parameters	Resistance to oil	Given to DIN VDE 0473 Part 811-2-1, Para. 10	Given to DIN VDE 0473 Part 811-2-1, Para. 10	Page	4/28
	Behaviour in case of fire	Given to DIN VDE 0482 Part 811-2-1, Para. 10	Given to DIN VDE 0482 Part 811-2-1, Para. 10		
	Water compatibility	Given to HD 22.16	Given to HD 22.16		
	Weather resistance	Unrestricted use outdoors and indoors, resistant to UV and ozone	Unrestricted use outdoors and indoors, resistant to UV and ozone		
Note on installation	Termination with sealing ends	Suitable material sets for self-assembly		Page	3/13
		Termination at the manufacturer's works		Page	3/15

PROTOLON (ST) / PROTOLON (ST)...../3E Medium-Voltage Flexible Cables for Use in Water

- 1 Conductor
- 2 Insulation
- 3 Protective-earth conductor
- 4 Outer semiconductive layer
- 5 Inner sheath
- 6 Outer sheath



Design features	Refer to Section 4 for further details →		
Type	PROTOLON (ST)	PROTOLON (ST) ... /3E	Page 4/2
Conductor (refer also to DIN VDE 0295)	Electrolytic copper, tinned, finely stranded, Class 5	Electrolytic copper, tinned, finely stranded, Class 5	Page 4/29
Insulation (refer also to DIN VDE 0207, Part 20)	Basic material EPR, compound type: 3GI3	Basic material EPR, compound type: 3GI3	Page 4/32
Arrangement of protective-earth conductor	With protective-earth conductor split into three in the outer interstices	Individual concentric protective-earth conductors distributed over the insulation of the three main cores	
Electrical field control	Inner and outer semiconductive layer of semiconductive rubber	Inner and outer semiconductive layer of semiconductive rubber and individual concentric metallic protective-earth conductor	Page 4/36
Core identification	Natural colouring with black semiconductive rubber	Natural colouring with black semiconductive rubber	
Core arrangement	Three main conductors laid-up with protective-earth conductor split into three in the outer interstices	Three main conductors laid-up	Page 4/37
Inner sheath (refer also to DIN VDE 0207, Part 21)	EPR inner sheath with special characteristics with respect to water proofing and prevention of formation of water bubbles. Compound type: GM1b	EPR inner sheath with special characteristics with respect to water proofing and prevention of formation of water bubbles. Compound type: GM1b	Page 4/32
Outer sheath (refer also to DIN VDE 0207, Part 21)	Outer sheath, basic material CM, particularly water-proof, compound type: 5GM3, colour red	Outer sheath, basic material CM, particularly water-proof, compound type: 5GM3, colour red	Page 4/32
Marking	(Year of manufacture) (serial number) <VDE> PROTOLON (ST) NTSCGEWÖU (number of cores) x (cross-section) (rated voltage)	(Year of manufacture) (serial number) <VDE> PROTOLON (ST) NTSCGEWÖU (number of cores) x (cross-section) (rated voltage)	Page 4/40

Selection data

Number of cores and nominal cross-section mm ²	Conductor diameter Max. value mm	Overall diameter of cable (guidance value)		Conductor resistance at 20 °C Ω/km	Inductance per unit length mH/km	Operating capacitance per unit length μF/km	Current-carrying capacity at 30 °C A	Permissible short-circuit current (1s) kA	Approx. net weight for 1000 m kg	Maximum permissible tensile force N
		Min. value mm	Max. value mm							

1.8/3 kV NTSCGEWÖU

3 x 25 + 3 x 25/3	6.9	38.6	41.6	0.795	0.33	0.41	131	3.05	2480	1125
3 x 35 + 3 x 25/3	8.3	42.5	45.5	0.565	0.31	0.46	162	4.27	3090	1575
3 x 50 + 3 x 25/3	9.7	46.0	49.0	0.393	0.29	0.53	202	6.10	3750	2250
3 x 70 + 3 x 35/3	11.2	49.2	52.2	0.277	0.28	0.59	250	8.54	4620	3150
3 x 95 + 3 x 50/3	13.2	57.2	61.2	0.210	0.28	0.65	301	11.59	6200	4275
3 x 120 + 3 x 70/3	14.9	60.9	64.9	0.164	0.27	0.72	352	14.64	7390	5400
3 x 150 + 3 x 70/3	16.6	66.3	70.3	0.132	0.27	0.78	404	18.30	8830	6750
3 x 185 + 3 x 95/3	18.0	69.4	73.4	0.108	0.26	0.84	461	22.57	10170	8325

3.6/6 kV NTSCGEWÖU

3 x 25 + 3 x 25/3	6.9	44.7	47.7	0.795	0.36	0.34	131	3.05	3120	1125
3 x 35 + 3 x 25/3	8.3	47.3	50.3	0.565	0.34	0.38	162	4.27	3600	1575
3 x 50 + 3 x 25/3	9.7	52.2	56.2	0.393	0.32	0.44	202	6.10	4560	2250
3 x 70 + 3 x 35/3	11.2	55.5	59.5	0.277	0.31	0.48	250	8.54	5470	3150
3 x 95 + 3 x 50/3	13.2	59.8	63.8	0.210	0.29	0.54	301	11.59	6570	4275
3 x 120 + 3 x 70/3	14.9	65.3	69.3	0.164	0.28	0.59	352	14.64	8090	5400
3 x 150 + 3 x 70/3	16.6	68.9	72.9	0.132	0.28	0.64	404	18.30	9250	6750
3 x 185 + 3 x 95/3	18.0	72.0	76.0	0.108	0.27	0.69	461	22.57	10600	8325

6/10 kV NTSCGEWÖU

3 x 25 + 3 x 25/3	6.9	46.4	49.4	0.795	0.37	0.31	131	3.05	3320	1125
3 x 35 + 3 x 25/3	8.3	49.0	52.0	0.565	0.35	0.35	162	4.27	3810	1575
3 x 50 + 3 x 25/3	9.7	54.0	58.0	0.393	0.33	0.39	202	6.10	4780	2250
3 x 70 + 3 x 35/3	11.2	57.2	61.2	0.277	0.31	0.43	250	8.54	5700	3150
3 x 95 + 3 x 50/3	13.2	61.5	65.5	0.210	0.30	0.49	301	11.59	6830	4275
3 x 120 + 3 x 70/3	14.9	67.0	71.0	0.164	0.29	0.53	352	14.64	8360	5400
3 x 150 + 3 x 70/3	16.6	70.7	74.7	0.132	0.28	0.58	404	18.30	9530	6750
3 x 185 + 3 x 95/3	18.0	73.7	77.7	0.108	0.28	0.62	461	22.57	10890	8325

8.7/15 kV NTSCGEWÖU

3 x 25 + 3 x 25/3	6.9	52.7	56.7	0.795	0.39	0.25	139	3.05	4050	1125
3 x 35 + 3 x 25/3	8.3	55.3	59.3	0.565	0.37	0.28	172	4.27	4650	1575
3 x 50 + 3 x 25/3	9.7	58.7	62.7	0.393	0.35	0.31	215	6.10	5390	2250
3 x 70 + 3 x 35/3	11.2	63.8	67.8	0.277	0.33	0.34	265	8.54	6740	3150
3 x 95 + 3 x 50/3	13.2	68.1	72.1	0.210	0.32	0.39	319	11.59	7870	4275
3 x 120 + 3 x 70/3	14.9	71.7	75.7	0.164	0.31	0.42	371	14.64	9150	5400
3 x 150 + 3 x 70/3	16.6	77.2	81.2	0.132	0.30	0.46	428	18.30	10770	6750
3 x 185 + 3 x 95/3	18.0	80.2	84.2	0.108	0.29	0.48	488	22.57	12310	8325

12/20 kV NTSCGEWÖU

3 x 25 + 3 x 25/3	6.9	57.0	61.0	0.795	0.41	0.22	139	3.05	4690	1125
3 x 35 + 3 x 25/3	8.3	59.6	63.6	0.565	0.39	0.24	172	4.27	5260	1575
3 x 50 + 3 x 25/3	9.7	64.8	68.8	0.393	0.37	0.27	215	6.10	6380	2250
3 x 70 + 3 x 35/3	11.2	68.1	72.1	0.277	0.35	0.30	265	8.54	7370	3150
3 x 95 + 3 x 50/3	13.2	72.4	76.4	0.210	0.33	0.33	319	11.59	8600	4275
3 x 120 + 3 x 70/3	14.9	77.9	81.9	0.164	0.32	0.36	371	14.64	10290	5400
3 x 150 + 3 x 70/3	16.6	81.5	85.5	0.132	0.31	0.39	428	18.30	11560	6750
3 x 185 + 3 x 95/3	18.0	84.3	89.3	0.108	0.30	0.41	488	22.57	13000	8325

PROTOLON (ST) Medium-Voltage Flexible Cables for Use in Water

Selection data

Number of cores and nominal cross-section mm ²	Conductor diameter Max. value mm	Overall diameter of cable (guidance value)		Conductor resistance at 20 °C Ω/km	Inductance per unit length mH/km	Operating capacitance per unit length μF/km	Current-carrying capacity at 30 °C A	Permissible short-circuit current (1s) kA	Approx. net weight for 1000 m kg	Maximum permissible tensile force N
		Min. value mm	Max. value mm							

14/25 kV NTSCGEWÖU

3 x 25 + 3 x 25/3	6.9	64.4	68.4	0.795	0.43	0.19	139	3.05	5860	1125
3 x 35 + 3 x 25/3	8.3	67.0	71.0	0.565	0.41	0.21	172	4.27	8390	1575
3 x 50 + 3 x 25/3	9.7	70.4	74.4	0.393	0.39	0.23	215	6.10	7220	2250
3 x 70 + 3 x 35/3	11.2	73.7	77.7	0.277	0.37	0.25	265	8.54	8720	3150
3 x 95 + 3 x 50/3	13.2	79.8	83.8	0.210	0.35	0.28	319	11.59	9950	4275
3 x 120 + 3 x 70/3	14.9	83.5	87.5	0.164	0.34	0.30	371	14.64	11380	5400
3 x 150 + 3 x 70/3	16.6	88.7	93.7	0.132	0.33	0.33	428	18.30	13120	6750
3 x 185 + 3 x 95/3	18.0	91.8	96.8	0.108	0.32	0.35	488	22.57	14770	8325

18/30 kV NTSCGEWÖU

3 x 25 + 3 x 25/3	6.9	69.6	73.6	0.795	0.45	0.17	139	3.05	7010	1125
3 x 35 + 3 x 25/3	8.3	72.2	76.2	0.565	0.43	0.19	172	4.27	7440	1575
3 x 50 + 3 x 25/3	9.7	77.4	81.4	0.393	0.41	0.21	215	6.10	8590	2250
3 x 70 + 3 x 35/3	11.2	80.7	84.7	0.277	0.39	0.23	265	8.54	9670	3150
3 x 95 + 3 x 50/3	13.2	84.8	89.8	0.210	0.37	0.25	319	11.59	11010	4275
3 x 120 + 3 x 70/3	14.9	90.2	95.2	0.164	0.35	0.27	371	14.64	12890	5400
3 x 150 + 3 x 70/3	16.6	93.9	98.9	0.132	0.34	0.29	428	18.30	14260	6750
3 x 185 + 3 x 95/3	18.0	96.8	102.0	0.108	0.33	0.31	488	22.57	15780	8325

Selection data

Number of cores and nominal cross-section mm ²	Conductor diameter Max. value mm	Overall diameter of cable (guidance value)		Conductor resistance at 20 °C Ω/km	Inductance per unit length mH/km	Operating capacitance per unit length μF/km	Current-carrying capacity at 30 °C A	Permissible short-circuit current (1s) kA	Approx. net weight for 1000 m kg	Maximum permissible tensile force N
		Min. value mm	Max. value mm							

1.8/3 kV NTSCGEWÖU

3 x 25 + 3 x 16/3E	6.9	41.3	44.3	0.795	0.33	0.41	131	3.05	1180	1125
3 x 35 + 3 x 16/3E	8.1	43.9	46.9	0.565	0.31	0.46	162	4.27	1650	1575
3 x 50 + 3 x 25/3E	9.7	47.8	50.8	0.393	0.29	0.53	202	6.10	2310	2250
3 x 70 + 3 x 35/3E	11.2	52.5	56.5	0.277	0.28	0.59	250	8.54	3220	3150
3 x 95 + 3 x 50/3E	13.2	59.4	63.4	0.210	0.28	0.65	301	11.59	4335	4275
3 x 120 + 3 x 70/3E	14.9	65.5	69.5	0.164	0.27	0.72	352	14.64	5480	5400
3 x 150 + 3 x 70/3E	16.6	69.2	73.2	0.132	0.27	0.78	404	18.30	6800	6750
3 x 185 + 3 x 95/3E	18.0	72.2	76.2	0.108	0.26	0.84	461	22.57	8375	8325

3.6/6 kV NTSCGEWÖU

3 x 25 + 3 x 16/3E	6.9	46.0	49.0	0.795	0.36	0.34	131	3.05	3160	1125
3 x 35 + 3 x 16/3E	8.1	48.6	51.6	0.565	0.34	0.38	162	4.27	3640	1575
3 x 50 + 3 x 25/3E	9.7	54.0	58.0	0.393	0.32	0.43	202	6.10	4600	2250
3 x 70 + 3 x 35/3E	11.2	57.2	61.2	0.277	0.31	0.48	250	8.54	5510	3150
3 x 95 + 3 x 50/3E	13.2	63.8	67.8	0.210	0.29	0.54	301	11.59	6610	4275
3 x 120 + 3 x 70/3E	14.9	68.1	72.1	0.164	0.28	0.59	352	14.64	8130	5400
3 x 150 + 3 x 70/3E	16.6	71.8	75.8	0.132	0.28	0.64	404	18.30	9290	6750
3 x 185 + 3 x 95/3E	18.0	76.6	80.6	0.108	0.27	0.69	461	22.57	10840	8325

6/10 kV NTSCGEWÖU

3 x 25 + 3 x 16/3E	6.9	47.8	50.8	0.795	0.37	0.31	131	3.05	3360	1125
3 x 35 + 3 x 16/3E	8.1	51.9	55.9	0.565	0.35	0.34	162	4.27	3850	1575
3 x 50 + 3 x 25/3E	9.7	55.5	59.5	0.393	0.33	0.39	202	6.10	4820	2250
3 x 70 + 3 x 35/3E	11.2	59.0	63.0	0.277	0.31	0.43	250	8.54	5740	3150
3 x 95 + 3 x 50/3E	13.2	65.5	69.5	0.210	0.30	0.48	301	11.59	6870	4275
3 x 120 + 3 x 70/3E	14.9	69.8	73.8	0.164	0.29	0.53	352	14.64	8400	5400
3 x 150 + 3 x 70/3E	16.6	73.5	77.5	0.132	0.28	0.58	404	18.30	9570	6750
3 x 185 + 3 x 95/3E	18.0	78.3	82.3	0.108	0.28	0.61	461	22.57	10930	8325

8.7/15 kV NTSCGEWÖU

3 x 25 + 3 x 16/3E	6.9	54.0	58.0	0.795	0.39	0.25	139	3.05	4090	1125
3 x 35 + 3 x 16/3E	8.1	56.6	60.6	0.565	0.37	0.28	172	4.27	4690	1575
3 x 50 + 3 x 25/3E	9.7	60.3	64.3	0.393	0.35	0.31	215	6.10	5430	2250
3 x 70 + 3 x 35/3E	11.2	65.5	69.5	0.277	0.33	0.34	265	8.54	6780	3150
3 x 95 + 3 x 50/3E	13.2	70.3	74.3	0.210	0.32	0.39	319	11.59	7910	4275
3 x 120 + 3 x 70/3E	14.9	76.4	80.4	0.164	0.31	0.42	371	14.64	9190	5400
3 x 150 + 3 x 70/3E	16.6	80.1	84.1	0.132	0.30	0.46	428	18.30	10810	6750
3 x 185 + 3 x 95/3E	18.0	83.1	87.1	0.108	0.29	0.48	488	22.57	12350	8325

12/20 kV NTSCGEWÖU

3 x 25 + 3 x 16/3E ¹⁾	6.9	58.3	62.3	0.795	0.41	0.22	139	3.05	4730	1125
3 x 35 + 3 x 16/3E	8.1	60.9	64.9	0.565	0.39	0.24	172	4.27	5300	1575
3 x 50 + 3 x 25/3E	9.7	66.4	70.4	0.393	0.37	0.27	215	6.10	6420	2250
3 x 70 + 3 x 35/3E	11.2	69.8	73.8	0.277	0.35	0.30	265	8.54	7410	3150
3 x 95 + 3 x 50/3E	13.2	76.4	80.4	0.210	0.33	0.33	319	11.59	8640	4275
3 x 120 + 3 x 70/3E	14.9	80.7	84.7	0.164	0.32	0.36	371	14.64	10330	5400
3 x 150 + 3 x 70/3E	16.6	84.2	89.2	0.132	0.31	0.39	428	18.30	11600	6750
3 x 185 + 3 x 95/3E	18.0	89.0	94.0	0.108	0.30	0.41	488	22.57	13040	8325

1) Design available from stock.

PROTOLON (ST) ... /3E, with Copper Core Shield Medium-Voltage Flexible Cables for Use in Water

Selection data

Number of cores and nominal cross-section mm ²	Conductor diameter Max. value mm	Overall diameter of cable (guidance value)		Conductor resistance at 20 °C Ω/km	Inductance per unit length mH/km	Operating capacitance per unit length μF/km	Current-carrying capacity at 30 °C A	Permissible short-circuit current (1s) kA	Approx. net weight for 1000 m kg	Maximum permissible tensile force N
		Min. value mm	Max. value mm							

14/25 kV NTSCGEWÖU

3 x 25 + 3 x 16/3E	6.9	65.7	69.7	0.795	0.43	0.19	139	3.05	5900	1125
3 x 35 + 3 x 16/3E	8.1	68.3	72.3	0.565	0.41	0.21	172	4.27	8430	1575
3 x 50 + 3 x 25/3E	9.7	72.0	76.0	0.393	0.39	0.23	215	6.10	7260	2250
3 x 70 + 3 x 35/3E	11.2	77.2	81.2	0.277	0.37	0.25	265	8.54	8760	3150
3 x 95 + 3 x 50/3E	13.2	82.0	86.0	0.210	0.35	0.28	319	11.59	9990	4275
3 x 120 + 3 x 70/3E	14.9	87.9	92.9	0.164	0.34	0.30	371	14.64	11420	5400
3 x 150 + 3 x 70/3E	16.6	91.6	96.6	0.132	0.33	0.33	428	18.30	13160	6750
3 x 185 + 3 x 95/3E	18.0	94.6	99.6	0.108	0.32	0.35	488	22.57	14810	8325

18/30 kV NTSCGEWÖU

3 x 25 + 3 x 16/3E	6.9	70.9	74.9	0.795	0.45	0.17	139	3.05	7050	1125
3 x 35 + 3 x 16/3E	8.1	73.5	77.5	0.565	0.43	0.19	172	4.27	7490	1575
3 x 50 + 3 x 25/3E	9.7	79.0	83.0	0.393	0.41	0.21	215	6.10	8630	2250
3 x 70 + 3 x 35/3E	11.2	82.4	86.4	0.277	0.39	0.23	265	8.54	9710	3150
3 x 95 + 3 x 50/3E	13.2	88.8	93.8	0.210	0.37	0.25	319	11.59	11050	4275
3 x 120 + 3 x 70/3E	14.9	93.1	98.1	0.164	0.35	0.27	371	14.64	12930	5400
3 x 150 + 3 x 70/3E	16.6	96.8	101.8	0.132	0.34	0.29	428	18.30	14300	6750
3 x 185 + 3 x 95/3E	18.0	101.6	106.6	0.108	0.33	0.31	488	22.57	15820	8325

