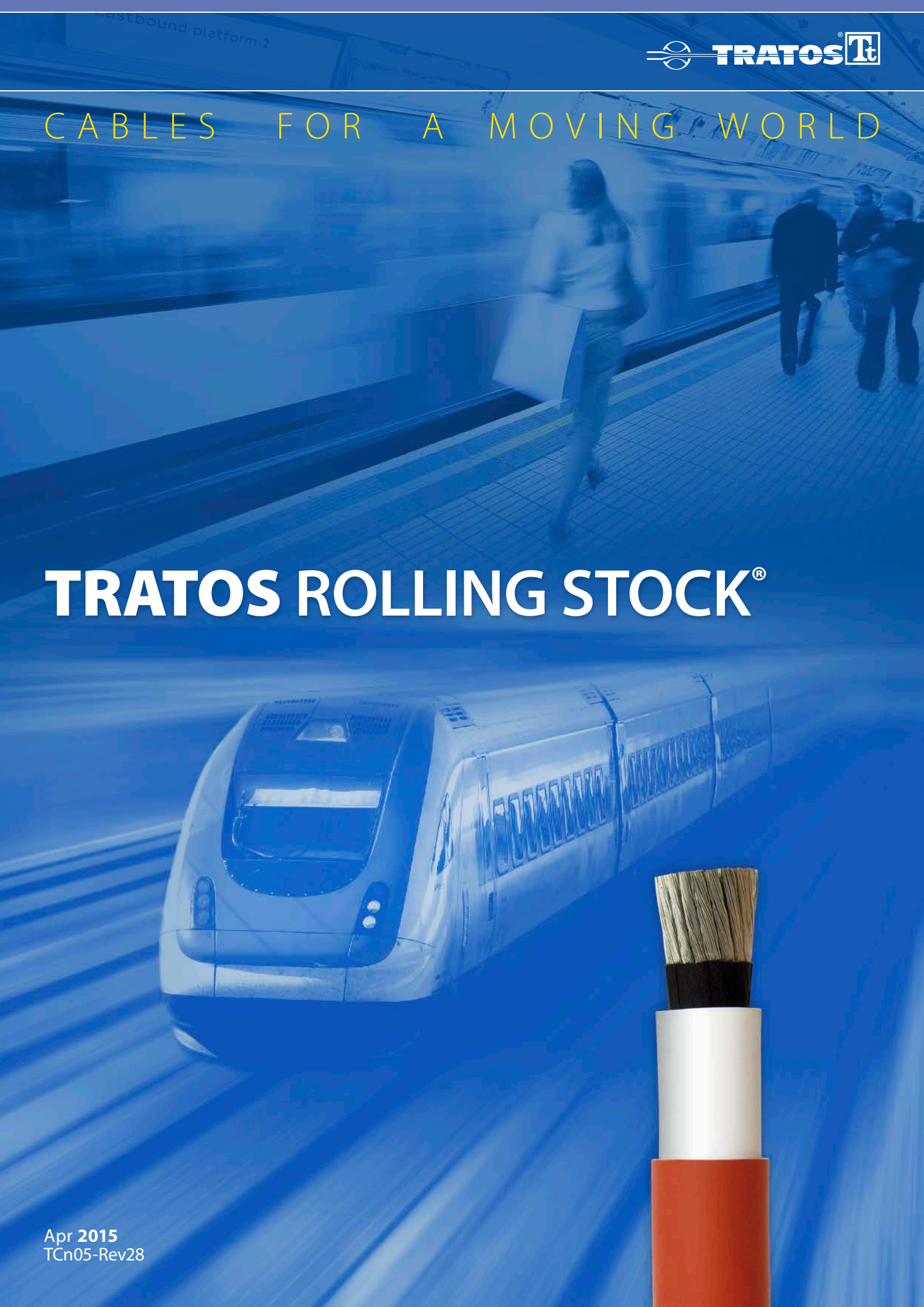
TRATOS®

CABLES FOR A MOVING WORLD

TRATOS ROLLING STOCK®



Apr **2015**
TCn05-Rev28


Eastbound platform 2

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TRATOS ROLLING STOCK®

STANDARD WALL POWER AND CONTROL CABLES

According to EN 50264

MEDIUM WALL POWER AND CONTROL CABLES

According to EN 50264

HIGH TEMPERATURE POWER CABLES

According to EN 50382

STANDARDS AND QUALITY SYSTEM

APPLICABLE STANDARDS

EN 50264-1: Railway applications – Railway rolling stock power and control cables having special fire performance Part 1 – General requirements

EN 50264-2-1: Railway applications – Railway rolling stock power and control cable having special fire performance – Cables with cross-linked elastomeric insulation – Part 2-1 - Single core cables

EN 50264-2-2: Railway applications – Railway rolling stock power and control cables having special fire performance – Part 2 - Cables with cross-linked elastomeric insulation – Part 2-2 - Multicore cables

EN 50264-3-1: Railway applications – Railway rolling stock power and control cables having special fire performance – Cables with cross-linked elastomeric insulation and reduced dimensions – Part 3-1 - Single core cables

EN 50264-3-2: Railway applications – Railway rolling stock power and control cables having special fire performance – Part 3 - Cables with cross-linked elastomeric insulation with reduced dimensions – Part 3-2 - Multicore cables

EN 50305: Railway applications - Railway rolling stock cables having special fire performance - Test methods

EN 50306: Railway applications - Railway rolling stock cables having special fire performance - Thin wall –
Part 1: General requirements
Part 2: Single core cables
Part 3: Single core and multicore cables (pairs, triples and quads) screened and thin wall sheathed
Part 4: Multicore and multipair cables standard wall sheathed

EN 50343: Railway applications - Rolling stock - Rules for installation of cabling

EN 50355: Railway applications - Railway rolling stock cables having special fire performance – Thin wall and standard wall - Guide to use

EN 50382: Railway applications – High temperature power cables for railway rolling stock and having special fire performance.
Part 1: General requirements
Part 2: Single core, silicone rubber insulated cables for 120 °C and 150 °C

BS 6853: Code of practice for fire precautions in the design and construction of passenger carrying trains

LUL 1-085: Fire safety performance of materials

EN 45545-1: Railway applications. Fire protection on railway vehicles. General.

TECHNICAL INFORMATION

The present catalogue illustrates a large familly of special fire performance cables used in railway rolling stock according to CELELEC European Standards.

Depending on the cable use and the railway environment (underground, city ...), the special fire performances (values of toxicity, smoke emission density, fire propagation) the hazard levels are defined in EN 45545-1.

CELELEC railway cables are designed to meet the following requirements:
2 levels of low temperature: -25°C and -40° C resistant
2 levels of fluids resistance: oil resistant, or extra oil and fuel resistant
3 levels of hazard: HL1, HL2-HL3, HL4

The cable monitoring are then identified by letters for all CENELEC European Standards		HL1	HL2 or HL3	HL4
Low temperature, oil resistant	(-25° C, IRM 902)	A	B	C
Extra low temperature, oil resistant	(-40° C, IRM 902)	D	E	F
Low temperature, extra oil and fuel resistant	(-25° C, IRM 902, IRM 903)	G	H	J
Extra low temperature, extra oil and fuel resistant	(-40° C, IRM 902, IRM 903)	K	L	M
Extra low temperature, no oil or fuel resistant	(-40° C)	O	O	O

EN 50264

Railway rolling stock power and control cables having special fire performance
Flexible conductors; +90°/105° C core temperature; 300/500 V - 0,6/1 kV - 1,8/3 kV - 3,6/6 kV

EN 50264-1:	General requirements
EN50264-2 = **EN50264-2-1**:	Single core cables TRATOS RS SW
EN50264-3 = **EN50264-2-2**:	Multi-core cables TRATOS RS SW - MW

EN50264-3-1:	Single core cable with reduced dimensions TRATOS RS MW
EN50264-3-2:	Multi-core cables with reduced dimensions TRATOS RS MW - MW

EN 50382

High Temperature power cables for railway rolling stock having special fire performances
Flexible conductors; +120° C or +150° C core temperature; 1,8/3 kV - 3,6/6 kV

EN 50382-1:	General requirements
EN 50382-2:	Single core, silicone rubber insulated cables for +120° C and +150° C

STANDARDS AND QUALITY SYSTEM

QUALITY SYSTEM

Tratos aim to work closely with customers to find better, more environmentally friendly solutions to their challenges.
We are committed to our vision and strategy to serve all our internal and external customers by providing high quality services and products. Tratos is an established industry leader in the design, manufacture and supply of cables and products and to maintain this leading position we are committed at every level to providing our customers with quality services and products at a competitive price. As a commercial enterprise we are aware of the importance of satisfying our customers and of the financial impact of which nonconformities may have on our profitability. For these reasons we are committed to complying with all customer requirements and specifications both legal and statutory requirements. Our Quality Management System has been audited and approved by two independent, Internationally recognized and accepted authorities: BSI and AENOR-IQNET (E), in accordance to BS EN ISO 9001:2015 covering the production, purchasing of raw materials design and final test including various document types. The Tratos Quality Management system is under frequent regular surveillance by inspectors working for the Certification Autorities.

ENVIRONMENTAL SYSTEM

Our Environmental Management System has been audited and approved by two independent, Internationally recognized and accepted authorities:
BSI and AENOR-IQNET (E), in accordance to BS EN ISO 14001:2015 covering the production, purchasing of raw materials design and final test including various document types. The Tratos Quality Management system is under frequent regular surveillance by inspectors working for the Certification Autorities.

ENERGY MANAGEMENT SYSTEMS

By complying with the BS EN ISO 50001:2018 Tratos follows a systematic approach in achieving continual improvement of energy performance and the Energy Management Systems (EnMS).
The BS EN ISO 50001:2018 is a standard issued by the International Standard Organization (ISO) which outlines the requirements for establishing, implementing, maintaining and improving an energy management system (EnMS).

CIRCULAR ECONOMY

The EU Eco-Management and Audit Scheme (EMAS) is a premium management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance. EMAS is open to every type of organisation eager to improve its environmental performance. It spans all economic and service sectors and is applicable worldwide.

AWARDS

Tratos cables are made with award winning Tratos-JBA® compound. Tratos UK Ltd has won a **Queen's Award for Enterprise - Innovation** for its technologically advanced Tratos-JBA® compound.

STANDARDS AND QUALITY SYSTEM

HEALTY & SAFETY SYSTEM

Oince its decision to create a board post dedicated to furthering best practice for Health and Safety, international cable manufacturer Tratos is celebrating receipt of ISO 45001.
ISO 45001 sets out the minimum requirements for occupational health and safety management best practice and helps companies achieve the maximum return for employees, operations and customers.

REACH, WEEE & ROHS

REACH COMPLIANT

Tratos is fully compliant with the **REACH**. This is a European Union regulation concerning the **Registration, Evaluation, Authorisation and restriction of Chemicals**. It came into force on 1st June 2007 and replaced a number of European Directives and Regulations with a single system. REACH applies to substances manufactured or imported into the EU in quantities of 1 tonne or more per year. Generally, it applies to all individual chemical substances on their own, in preparations or in articles . To summarise, REACH makes the cable industry directly responsible for assessing and managing the risks posed by chemicals and providing safety information to their users.

REACH COMPLIANT

Tratos fully subscribes to The **Waste Electrical and Electronic Equipment Directive (WEEE Directive)**, introduced into UK law in January 2007 by the Waste Electronic and Electrical Equipment Regulations 2006. The WEEE Directive aims to reduce the amount of electrical and electronic equipment being produced and to encourage everyone to reuse, recycle and recover it. The WEEE Directive also aims to improve the environmental performance of businesses that manufacture, supply, use, recycle and recover electrical and electronic equipment. TRATOS has enlisted the services of the UK's leading producer compliance scheme, Valpak, whom manage our recycling obligations and also ensure our compliance to the WEEE Regulations and the Waste Batteries and Accumulators Regulations.

REACH COMPLIANT

Tratos is fully compliant with the **Restriction of Hazardous Substances (RoHS) Regulations**. These Regulations implement EU Directive 2011/65/EU which bans the placing on the EU market of new electrical and electronic equipment containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants. Tratos fully understands the requirements of the RoHS Directive and ensures that our products, and their components, comply.

CORPORATE SOCIAL RESPONSABILITY

Tratos adoptes a Code of Ethics which adheres to the United Nations Global Compact on human rights, labour standards, protection of the environment and anti corruption measures.
Under this self regulatory code, Tratos will carry out initiatives in the environmental and social fields with special reference to environmental policies and social policies regarding child labour, compulsory labour, health and security, freedom of association and the right to collective bargaining, discrimination, disciplinary procedures, working hours and wages.

OUR MEMBERSHIPS IN THE RAILWAYS INDUSTRY

Rail Forum MIDLANDS

VENDOR APPROVALS

RISQS QUALIFIED

STANDARD WALL POWER AND CONTROL CABLES

TRATOS RS UU-SW

0,6/1 or 1,8/3 kV - unscreened insulated single core

Special fire performance, low smoke emmision, corrosivity and toxitity

Lighting circuits powered by batteries, control and monitoring circuits, auxiliary and electric heating circuits, power circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

Conductor
- flexible tinned annealed copper wires
- class 5 according to BS EN 60228

Insulation
- LSZH elastomeric compound according to EN 50264-1
- (EI 101 to EI 104)
- Black (other colours if required)

STANDARDS

- **EN 50264 - 2 - 1**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content

Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+90° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+90° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS SW - 0,6/1 kV - unscreened insulated single core

Nominal Cross-sectional Area	Conductor Diameter d (1)	Mean thickness of insulation	Overall diameter D		Resistance of conductor at 20 °C max.	Insulation resistance at 20 °C min.	Insulation resistance at 90 °C min.
			min	max			
mm²	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,0	1,25	0,8	2,8	3,2	20	65	0,65
1,5	1,5	0,8	3,0	3,5	13,7	55	0,55
2,5	1,95	0,8	3,4	3,9	8,21	50	0,5
4,0	2,5	0,8	3,9	4,6	5,09	40	0,4
6,0	3,0	0,9	4,6	5,4	3,39	35	0,35
10	3,9	1,1	5,8	6,8	1,95	30	0,3
16	5,0	1,1	7,2	8,5	1,24	30	0,3
25	6,4	1,3	8,6	10,0	0,795	30	0,3
35	7,7	1,3	10,2	11,5	0,565	25	0,25
50	9,2	1,5	11,6	13,5	0,393	25	0,25
70	11,0	1,5	13,3	15,5	0,277	20	0,2
95	12,5	1,6	14,9	17,4	0,210	20	0,2
120	14,2	1,6	16,5	19,3	0,164	20	0,2
150	15,8	1,9	18,5	21,7	0,132	15	0,15
185	17,5	1,9	20,1	23,6	0,108	15	0,15
240	20,1	2,1	22,9	26,8	0,0817	15	0,15
300	22,5	2,2	25,4	29,7	0,0654	10	0,1
400	25,8	2,3	28,7	33,6	0,0495	10	0,1

TRATOS RS SW - 1,8/3 kV - unscreened insulated single core

Nominal Cross-sectional Area	Conductor Diameter d	Mean thickness of insulation	Overall diameter D		Resistance of conductor at 20 °C max.	Insulation resistance at 20 °C min.	Insulation resistance at 90 °C min.
			min	max			
mm²	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,5	1,5	2,5	6,2	7,3	13,70	120	1,2
2,5	1,95	2,5	6,6	7,8	8,21	100	1,0
4	2,5	2,5	7,1	8,4	5,09	90	0,9
6	3,0	2,5	7,6	8,9	3,39	80	0,8
10	3,9	2,5	8,4	9,9	1,95	65	0,65
16	5,0	2,5	9,5	11,1	1,24	55	0,55
25	6,4	2,5	10,8	12,7	0,795	45	0,45
35	7,7	2,5	12,0	14,1	0,565	40	0,4
50	9,2	2,5	13,4	15,7	0,393	35	0,35
70	11,0	2,5	15,1	17,7	0,277	30	0,3
95	12,5	2,7	16,9	19,8	0,210	30	0,3
120	14,2	2,7	18,5	21,7	0,164	25	0,25
150	15,8	2,7	20,0	23,4	0,132	20	0,2
185	17,5	2,7	21,6	25,3	0,1080	20	0,2
240	20,1	2,7	24,1	28,2	0,0817	20	0,2
300	22,5	2,7	26,3	30,8	0,0654	15	0,15
400	25,8	2,9	29,8	34,9	0,0495	15	0,15

(1) for information,indicative only

STANDARD WALL POWER AND CONTROL CABLES

TRATOS RS US-SW

1,8/3 or 3,6/6 kV - sheathed single core

Special fire performance, low smoke emmision, corrosivity and toxitity

Medium Voltage auxiliary circuits, power circuits, Medium Voltage heating circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

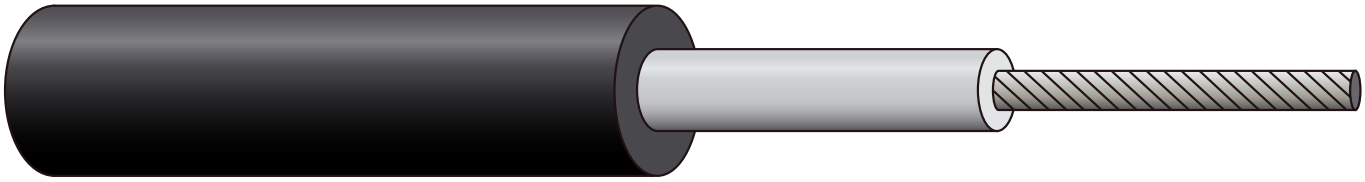
Conductor
- flexible tinned annealed copper wires
- class 5 according to BS EN 60228

Insulation
- LSZH elastomeric compound according to EN 50264-1
- (EI 101 to EI 104)

Outer sheath
- LSZH elastomeric compound according to EN 50264-1
- (EM 101 to EM 104)
- Black (other colours if required)

STANDARDS

- **EN 50264 - 2 - 1**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content



Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+90° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+90° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS SW - 1,8/3 - sheathed single core

Nominal cross-sectional area	Conductor Diameter d (1)	Mean thickness of insulation	Mean thickness of sheath	Overall Diameter D		Resistance of conductor at 20 °C	Insulation resistance at 20 °C	Insulation resistance at 90 °C
				min.	max.			
mm²	mm	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,5	1,5	1,3	1,4	6,7	7,8	13,70	960	9,6
2,5	1,95	1,3	1,4	7,1	8,3	8,21	850	8,5
4	2,5	1,3	1,4	7,6	8,9	5,09	750	7,5
6	3,0	1,3	1,4	8,1	9,5	3,39	670	6,7
10	3,9	2,2	1,4	10,6	12,4	1,95	550	5,5
16	5,0	2,2	1,4	11,7	13,6	1,24	450	4,5
25	6,4	2,2	1,4	13,0	15,2	0,795	390	3,9
35	7,7	2,2	1,4	14,2	16,5	0,565	350	3,5
50	9,2	2,2	1,4	15,6	18,3	0,393	300	3
70	11,0	2,2	1,5	17,5	20,5	0,277	260	2,6
95	12,5	2,4	1,6	19,6	22,3	0,210	250	2,5
120	14,2	2,4	1,6	21,1	24,6	0,164	220	2,2
150	15,8	2,4	1,7	22,7	26,6	0,132	210	2,1
185	17,5	2,4	1,7	24,0	28,1	0,1080	200	2
240	20,1	2,4	1,8	27,0	31,6	0,0817	180	1,8
300	22,5	2,4	1,9	29,4	34,4	0,0654	170	1,7
400	25,8	2,6	2,0	32,7	38,3	0,0495	150	1,5

TRATOS RS SW - 3,6/6 kV - sheathed single core

Nominal cross-sectional area	Conductor Diameter d (1)	Mean thickness of insulation	Mean thickness of sheath	Overall Diameter D		Resistance of conductor at 20 °C	Insulation resistance at 20 °C	Insulation resistance at 90 °C
				min.	max.			
mm²	mm	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
2,5	1,95	3,0	1,4	10,5	12,3	8,21	1300	13
4	2,5	3,0	1,4	11,0	12,9	5,09	1150	11,5
6	3,0	3,0	1,4	11,5	13,4	3,39	1050	10,5
10	3,9	3,0	1,4	12,3	14,4	1,95	850	8,5
16	5,0	3,0	1,4	13,3	15,6	1,24	710	7,1
25	6,4	3,0	1,4	14,7	17,2	0,795	630	6,3
35	7,7	3,0	1,4	15,9	18,6	0,565	550	5,5
50	9,2	3,0	1,5	17,5	20,5	0,393	500	5
70	11,0	3,0	1,5	19,2	22,4	0,277	430	4,3
95	12,5	3,0	1,6	20,8	24,3	0,210	400	4
120	14,2	3,1	1,7	22,7	26,6	0,164	360	3,6
150	15,8	3,1	1,7	24,2	28,4	0,132	340	3,4
185	17,5	3,2	1,8	26,2	30,7	0,108	330	3,3
240	20,1	3,4	1,9	29,2	34,2	0,0817	300	3
300	22,5	3,4	1,9	31,5	36,9	0,0654	250	2,5
400	25,8	3,4	2,0	34,8	40,7	0,0495	230	2,3

(1) for information,indicative only

STANDARD WALL POWER AND CONTROL CABLES

TRATOS RS US-SW

300/500 V or 0,6/1 kV - unscreened multicore

Special fire performance, low smoke emmision, corrosivity and toxitity

Inboard safety circuits, lighting circuits, auxiliary and electric heating circuits, control and monitoring circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

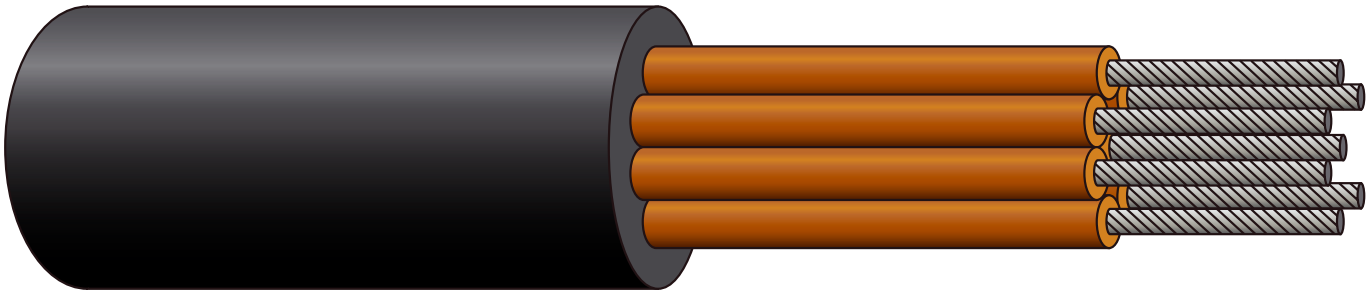
Conductor
- flexible tinned annealed copper wires
- class 5 according to BS EN 60228

Insulation
- LSZH elastomeric compound according to EN 50264-1
- (EI 101 to EI 105)

Outer sheath
- LSZH elastomeric compound according to EN 50264-1
- (EM 101 to EM 104)
- Black (other colours if required)

STANDARDS

- **EN 50264 - 2 - 2**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content



Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+90° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+90° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS SW - 300/500 V - unscreened multicore

Number and nominal Cross-sectional area [2]	Conductor Diameter d [1]	Mean thickness of insulation	Core diameter		Mean thickness of sheath	Overall Diameter D		Conductor resistance at 20 °C	Insulation resistance at 20 °C EI 105	Insulation resistance at 20 °C EI 101 – EI 104
			min.	max.		min.	max.			
mm²	mm	mm	mm		mm	mm		Ω/km	MΩ/km	MΩ/km
2x1	1,2	0,6	2,4	2,8	1,4	7,2	8,5	20,0	140	70
4x1	1,25	0,6	2,4	2,8	1,4	8,2	9,6	20,0	140	70
7x1	1,25	0,6	2,4	2,8	1,4	9,6	11,2	20,0	140	70
9x1	1,25	0,6	2,4	2,8	1,4	11,5	13,4	20,0	140	70
12x1	1,25	0,6	2,4	2,8	1,4	12,3	14,4	20,0	140	70
19x1	1,25	0,6	2,4	2,8	1,4	14,5	16,6	20,0	140	70
24x1	1,25	0,6	2,4	2,8	1,5	16,7	19,6	20,0	140	70
32x1	1,25	0,6	2,4	2,8	1,6	18,5	21,7	20,0	140	70
37x1	1,25	0,6	2,4	2,8	1,6	19,2	22,4	20,0	140	70
40x1	1,25	0,6	2,4	2,8	1,6	19,9	23,3	20,0	140	70
4x1,5	1,5	0,7	2,8	3,3	1,4	9,2	10,8	13,7	120	60
7x1,5	1,5	0,7	2,8	3,3	1,4	10,9	12,8	13,7	120	60
9x1,5	1,5	0,7	2,8	3,3	1,4	13,1	15,3	13,7	120	60
12x1,5	1,5	0,7	2,8	3,3	1,4	14,0	16,4	13,7	120	60
19x1,5	1,5	0,7	2,8	3,3	1,5	16,5	19,4	13,7	120	60
24x1,5	1,5	0,7	2,8	3,3	1,6	19,5	22,8	13,7	120	60
32x1,5	1,5	0,7	2,8	3,3	1,7	21,5	25,2	13,7	120	60
37x1,5	1,5	0,7	2,8	3,3	1,7	22,4	26,2	13,7	120	60
4x2,5	1,95	0,8	3,4	4,0	1,4	10,7	12,5	8,21	90	45
7x2,5	1,95	0,8	3,4	4,0	1,4	12,7	14,9	8,21	90	45
9x2,5	1,95	0,8	3,4	4,0	1,5	15,6	18,3	8,21	90	45
12x2,5	1,95	0,8	3,4	4,0	1,5	16,7	19,6	8,21	90	45
19x2,5	1,95	0,8	3,4	4,0	1,6	19,7	23,1	8,21	90	45
24x2,5	1,95	0,8	3,4	4,0	1,8	23,5	27,5	8,21	90	45

(1) for information,indicative only

(2) earth conductor (green/yellow) can be included upon request

TRATOS RS SW - 0,6/1 kV - unscreened two cores

Number and nominal Cross-sectional area (2) mm²	Conductor Diameter d (1) mm	Minimum Average Insulation Thickness mm	Minimum Core Diameter acc.to EN mm	Maximum Core Diameter acc.to EN mm	Minimum Average Insulation Sheath mm	Overall Diameter D Minimum acc.to EN mm	Overall Diameter D Maximum acc.to EN mm	Weight kg/km	Conductor Resistance at +20° C max. Ω/km	Insulation Resistance at +90° C min. MΩ/km	Insulation Resistance at +90° C min. MΩ/km
1,5	1,5	0,8	3,0	3,5	1,4	8,5	9,9	142	13,7	150	75
2,5	1,95	0,8	3,4	3,9	1,4	9,3	10,9	177	8,21	130	65
4	2,5	0,8	3,9	4,6	1,4	10,3	12,1	229	5,09	110	55
6	3,0	0,9	4,6	5,4	1,4	11,8	13,9	301	3,39	90	45
10	3,9	1,1	5,8	6,8	1,4	14,3	16,7	481	1,95	85	45
16	5,0	1,1	7,2	8,5	1,5	16,5	19,4	628	1,24	70	35
25	6,4	1,3	8,6	10,0	1,6	20,1	23,5	923	0,795	65	35
35	7,7	1,3	10,2	11,5	1,7	22,7	26,6	1204	0,565	60	30
50	9,2	1,5	11,6	13,5	1,9	26,7	31,2	1669	0,393	55	30

TRATOS RS SW - 0,6/1 kV - unscreened three cores

Number and nominal Cross-sectional area (2) mm²	Conductor Diameter d (1) mm	Minimum Average Insulation Thickness mm	Minimum Core Diameter acc.to EN mm	Maximum Core Diameter acc.to EN mm	Minimum Average Insulation Sheath mm	Overall Diameter D Minimum acc.to EN mm	Overall Diameter D Maximum acc.to EN mm	Weight kg/km	Conductor Resistance at +20° C max. Ω/km	Insulation Resistance at +90° C min. MΩ/km	Insulation Resistance at +90° C min. MΩ/km
1,5	1,5	0,8	3,0	3,5	1,4	8,9	10,5	163	13,7	150	75
2,5	1,95	0,8	3,4	3,9	1,4	9,9	11,6	208	8,21	130	65
4	2,5	0,8	3,9	4,6	1,4	11,0	12,9	273	5,09	110	55
6	3,0	0,9	4,6	5,4	1,4	12,5	14,6	364	3,39	90	45
10	3,9	1,1	5,8	6,8	1,5	15,3	17,9	601	1,95	85	45
16	5,0	1,1	7,2	8,5	1,6	17,8	20,8	793	1,24	70	35
25	6,4	1,3	8,6	10,0	1,7	21,6	25,3	1165	0,795	65	35
35	7,7	1,3	10,2	11,5	1,8	24,4	28,6	1530	0,565	60	30
50	9,2	1,5	11,6	13,5	1,9	28,2	33,3	2117	0,393	55	30

TRATOS RS SW - 0,6/1 kV - unscreened four cores

Number and nominal Cross-sectional area (2) mm²	Conductor Diameter d (1) mm	Minimum Average Insulation Thickness mm	Minimum Core Diameter acc.to EN mm	Maximum Core Diameter acc.to EN mm	Minimum Average Insulation Sheath mm	Overall Diameter D Minimum acc.to EN mm	Overall Diameter D Maximum acc.to EN mm	Weight kg/km	Conductor Resistance at +20° C max. Ω/km	Insulation Resistance at +90° C min. MΩ/km	Insulation Resistance at +90° C min. MΩ/km
1,5	1,5	0,8	3,0	3,5	1,4	9,7	11,3	194	13,7	150	75
2,5	1,95	0,8	3,4	3,9	1,4	10,7	12,5	250	8,21	130	65
4	2,5	0,8	3,9	4,6	1,4	11,9	14,0	331	5,09	110	55
6	3,0	0,9	4,6	5,4	1,4	13,7	16,1	445	3,39	90	45
10	3,9	1,1	5,8	6,8	1,5	16,9	19,8	741	1,95	85	45
16	5,0	1,1	7,2	8,5	1,6	19,6	22,9	983	1,24	70	35
25	6,4	1,3	8,6	10,0	1,8	24,1	28,2	1462	0,795	65	35
3x35+25	7,7/6,4	1,3/1,3	10,2/8,6	11,5/10,0	1,9	28,5	34,2	1608	0,565/0,795	60	30
3x50+25	9,2/6,4	1,5/1,3	11,6/8,6	13,5/10,0	2,0	33,4	40,0	2229	0,393/0,795	55	30

(1) for information,indicative only

(2) earth conductor (green/yellow) can be included upon request

STANDARD WALL POWER AND CONTROL CABLES

TRATOS RS SS-SW

300/500 V or 0,6/1 kV - screened multicore

Special fire performance, low smoke emmision, corrosivity and toxitity

Inboard safety circuits, control and monitoring circuits, lighting circuits, auxiliary and electric heating circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

Conductor
- flexible tinned annealed copper wires
- class 5 according to BS EN 60228

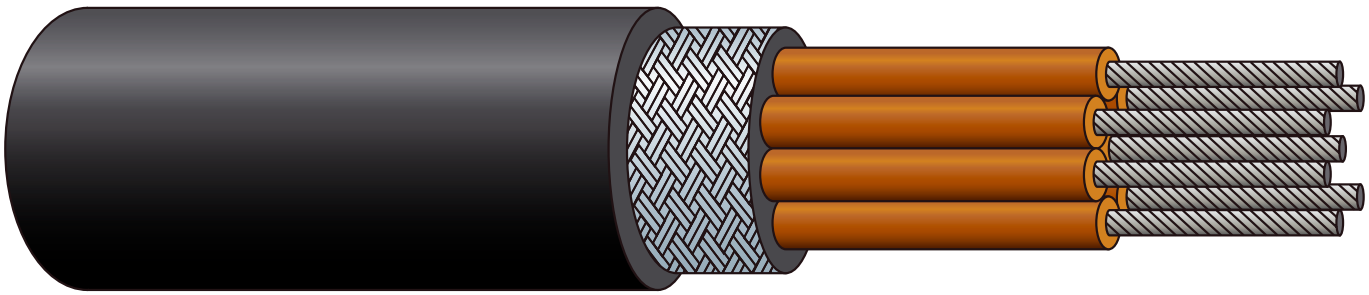
Insulation
- LSZH elastomeric compound according to EN 50264-1
- (EI 101 to EI 105)

Overal screen
- tinned annealed copper wires with required diameter

Outer sheath
- LSZH elastomeric compound according to EN 50264-1
- (EM 101 to EM 104)
- Black (other colours if required)

STANDARDS

- **EN 50264 - 2 - 2**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content



Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+90° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+90° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**r = 10D**	Minimum bending radius for installed cables

TRATOS RS SW - 300/500 V - screened multicore

Number and nominal Cross-sectional area [2]	Conductor Diameter d [1]	Mean thickness of insulation	Core diameter		Wire diameter of screen	Mean thickness of sheath	Overall diameter D		Resistance of conductor at 20 °C	Insulation resistance at 20 °C EI 105	Insulation resistance at 20 °C EI 101 - EI 104
			min.	max.			min.	max.			
mm²	mm	mm	mm		mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
2x1	1,25	0,6	2,4	2,8	0,16	1,4	8,1	9,5	20,0	140	70
4x1	1,25	0,6	2,4	2,8	0,16	1,4	9,0	10,6	20,0	140	70
7x1	1,25	0,6	2,4	2,8	0,16	1,4	10,4	12,2	20,0	140	70
9x1	1,25	0,6	2,4	2,8	0,21	1,4	12,5	14,6	20,0	140	70
12x1	1,25	0,6	2,4	2,8	0,21	1,4	13,3	15,6	20,0	140	70
19x1	1,25	0,6	2,4	2,8	0,26	1,5	15,7	18,4	20,0	140	70
x1	1,25	0,6	2,4	2,8	0,26	1,6	18,1	21,2	20,0	140	70
32x1	1,25	0,6	2,4	2,8	0,26	1,6	19,7	23,1	20,0	140	70
37x1	1,25	0,6	2,4	2,8	0,26	1,7	20,7	24,2	20,0	140	70
40x1	1,25	0,6	2,4	2,8	0,26	1,7	21,4	25,1	20,0	140	70
4x1,5	1,5	0,7	2,8	3,3	0,16	1,4	10,1	11,8	13,7	120	60
7x1,5	1,5	0,7	2,8	3,3	0,21	1,4	11,9	14,0	13,7	120	60
9x1,5	1,5	0,7	2,8	3,3	0,21	1,4	14,1	16,5	13,7	120	60
12x1,5	1,5	0,7	2,8	3,3	0,21	1,8	15,8	18,5	13,7	120	60
19x1,5	1,5	0,7	2,8	3,3	0,26	1,5	17,8	20,8	13,7	120	60
24x1,5	1,5	0,7	2,8	3,3	0,26	1,6	20,7	24,2	13,7	120	60
32x1,5	1,5	0,7	2,8	3,3	0,26	1,7	22,7	26,6	13,7	120	60
37x1,5	1,5	0,7	2,8	3,3	0,26	1,7	23,6	27,6	13,7	120	60
4x2,5	1,95	0,8	3,4	4,0	0,21	1,4	11,8	13,9	8,21	90	45
7x2,5	1,95	0,8	3,4	4,0	0,21	1,4	13,7	16,1	8,21	90	45
9x2,5	1,95	0,8	3,4	4,0	0,26	1,5	16,8	19,7	8,21	90	45
12x2,5	1,95	0,8	3,4	4,0	0,26	1,5	18,0	21,1	8,21	90	45
19x2,5	1,95	0,8	3,4	4,0	0,26	1,6	21,1	24,6	8,21	90	45
24x2,5	1,95	0,8	3,4	4,0	0,26	1,8	24,7	28,9	8,21	90	45

(1) for information,indicative only

(2) earth conductor (green/yellow) can be included upon request

TRATOS RS SW - 0,6/1 kV - screened two cores

Number and nominal Cross-sectional area [2]	Conductor Diameter d [1]	Mean thickness of insulation	Core diameter		Wire diameter of screen	Mean thickness of sheath	Overall diameter D		Resistance of conductor at 20 °C	Insulation resistance at 20 °C EI 105	Insulation resistance at 20 °C EI 101 - EI 104
			min.	max.			min.	max.			
mm²	mm	mm	mm		mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,5	1,5	0,8	3,0	3,5	0,16	1,4	9,3	10,9	13,7	150	75
2,5	1,95	0,8	3,4	3,9	0,16	1,4	10,2	11,9	8,21	130	65
4	2,5	0,8	3,9	4,6	0,21	1,4	11,5	13,4	5,09	110	55
6	3,0	0,9	4,6	5,4	0,21	1,4	12,9	15,1	3,39	90	45
10	3,9	1,1	5,8	6,8	0,21	1,5	15,5	18,2	1,95	85	45
16	5,0	1,1	7,2	8,5	0,26	1,5	17,9	20,9	1,24	70	35
25	6,4	1,3	8,6	10,0	0,26	1,7	21,6	25,3	0,795	65	35
35	7,7	1,3	10,2	11,5	0,31	1,8	24,4	28,6	0,565	60	30
50	9,2	1,5	11,6	13,5	0,31	1,9	28,2	33,0	0,393	55	30

TRATOS RS SW - 0,6/1 kV - screened three cores

Number and nominal Cross-sectional area [2]	Conductor Diameter d [1]	Mean thickness of insulation	Core diameter		Wire diameter of screen	Mean thickness of sheath	Overall diameter D		Resistance of conductor at 20 °C	Insulation resistance at 20 °C EI 105	Insulation resistance at 20 °C EI 101 - EI 104
			min.	max.			min.	max.			
mm²	mm	mm	mm		mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,5	1,5	0,8	3,0	3,5	0,16	1,4	9,8	11,4	13,7	150	75
2,5	1,95	0,8	3,4	3,9	0,16	1,4	10,7	12,5	8,21	130	65
4	2,5	0,8	3,9	4,6	0,21	1,4	12,0	14,1	5,09	110	55
6	3,0	0,9	4,6	5,4	0,21	1,4	13,6	16,0	3,39	90	45
10	3,9	1,1	5,8	6,8	0,26	1,5	16,7	19,6	1,95	85	45
16	5,0	1,1	7,2	8,5	0,26	1,6	19,1	22,3	1,24	70	35
25	6,4	1,3	8,6	10,0	0,26	1,7	22,9	26,8	0,795	65	35
35	7,7	1,3	10,2	11,5	0,31	1,8	26,0	30,5,	0,565	60	30
50	9,2	1,5	11,6	13,5	0,31	2,0	30,3	35,4	0,393	55	30

TRATOS RS SW - 0,6/1 kV - screened four cores

Number and nominal Cross-sectional area [2]	Conductor Diameter d [1]	Mean thickness of insulation	Core diameter		Wire diameter of screen	Mean thickness of sheath	Overall diameter D		Resistance of conductor at 20 °C	Insulation resistance at 20 °C EI 105	Insulation resistance at 20 °C EI 101 - EI 104
			min.	max.			min.	max.			
mm²	mm	mm	mm		mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,5	1,5	0,8	3,0	3,5	0,16	1,4	10,5	12,3	13,7	150	75
2,5	1,95	0,8	3,4	3,9	0,21	1,4	11,8	13,9	8,21	130	65
4	2,5	0,8	3,9	4,6	0,21	1,4	13,1	15,3	5,09	110	55
6	3,0	0,9	4,6	5,4	0,21	1,4	14,9	17,4	3,39	90	45
10	3,9	1,1	5,8	6,8	0,26	1,6	18,4	21,6	1,95	85	45
16	5,0	1,1	7,2	8,5	0,26	1,7	21,1	24,6	1,24	70	35
25	6,4	1,3	8,6	10,0	0,31	1,8	25,6	29,9	0,795	65	35
3x35+25	7,7/6,4	1,3/1,3	10,2/8,6	11,5/10,0	0,31	1,9	30,0	35,1	0,565/0,795	60	30
3x50+25	9,2/6,4	1,5/1,3	11,6/8,6	13,5/10,0	0,31	2,1	34,9	40,8	0,393/0,795	55	30

(1) for information,indicative only

(2) earth conductor (green/yellow) can be included upon request


Eastbound platform 2

MEDIUM WALL POWER AND CONTROL CABLES

TRATOS RS UU-MW

0,6/1 or 1,8/3 kV - unscreened insulated single core with reduced dimensions

Special fire performance, low smoke emmision, corrosivity and toxitity

Lighting circuits powered by batteries, control and monitoring circuits, auxiliary and electric heating circuits, power circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

Conductor

- flexible tinned annealed copper wires
- class 5 according to BS EN 60228

Insulation

- LSZH elastomeric compound according to EN 50264-1
- (EI 101 to EI 104)

STANDARDS

- **EN 50264 - 3 - 1**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content

Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+90° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+90° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS MW - 0,6/1 kV - unscreened insulated single core with reduced dimensions

Nominal Cross-sectional Area	Conductor Diameter d (1)	Nominal thickness of insulation	Overall diameter D		Resistance of conductor at 20 °C max.	Insulation resistance at 20 °C min.	Insulation resistance at 90 °C min.
			min	max			
mm²	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,0	1,25	0,6	2,4	2,8	20	11,4	0,114
1,5	1,5	0,7	2,8	3,3	13,7	11,0	0,110
2,5	1,95	0,7	3,2	3,8	8,21	9,1	0,091
4	2,5	0,7	3,8	4,4	5,09	7,5	0,075
6	3,0	0,7	4,2	5,0	3,39	6,5	0,065
10	3,9	0,7	5,1	5,9	1,95	5,2	0,052
16	5,0	0,7	6,1	7,2	1,24	4,2	0,042
25	6,4	0,9	7,8	9,1	0,795	4,1	0,041
35	7,7	0,9	9,0	10,6	0,565	3,5	0,035
50	9,2	1,0	10,6	12,4	0,393	3,3	0,033
70	11,0	1,1	12,5	14,6	0,277	3,0	0,030
95	12,5	1,1	13,9	16,3	0,210	2,7	0,027
120	14,2	1,2	15,7	18,4	0,164	2,7	0,027
150	15,8	1,4	17,6	20,6	0,132	2,7	0,027
185	17,5	1,6	19,6	22,9	0,108	2,6	0,026
240	20,1	1,7	22,2	26,0	0,0817	2,6	0,026
300	22,5	1,8	24,6	28,8	0,0654	2,4	0,024
400	25,8	2,0	28,1	32,9	0,0495	2,4	0,024

TRATOS RS MW - 1,8/3 kV - unscreened insulated single core with reduced dimensions

Nominal Cross-sectional Area	Conductor Diameter d (1)	Nominal thickness of insulation	Overall diameter		Resistance of conductor at 20 °C max.	Insulation resistance at 20 °C min.	Insulation resistance at 90 °C min.
			min	max			
mm²	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,5	1,5	2,0	5,3	6,2	13,7	21,0	0,210
2,5	1,95	2,0	5,7	6,7	8,21	18,0	0,180
4	2,5	2,0	6,2	7,3	5,09	15,5	0,155
6	3,0	2,0	6,7	7,8	3,39	13,7	0,137
10	3,9	2,0	7,5	8,8	1,95	11,5	0,115
16	5,0	2,0	8,6	10,0	1,24	9,5	0,095
25	6,4	2,0	9,9	11,6	0,795	7,9	0,079
35	7,7	2,0	11,1	13,0	0,565	6,8	0,068
50	9,2	2,0	12,5	14,6	0,393	5,9	0,059
70	11,0	2,0	14,2	16,6	0,277	5,0	0,050
95	12,5	2,2	16,0	18,7	0,210	4,5	0,045
120	14,2	2,2	17,6	20,6	0,164	4,0	0,040
150	15,8	2,2	19,1	22,3	0,132	3,7	0,037
185	17,5	2,4	20,9	24,4	0,108	3,4	0,034
240	20,1	2,4	24.3	27,5	0,0817	3,0	0,030
300	22,5	2,4	25,6	30,1	0,0654	2,7	0,027
400	25,8	2,6	29,2	34,2	0,0495	2,4	0,024

(1) for information,indicative only

MEDIUM WALL POWER AND CONTROL CABLES

TRATOS RS US-MW

1,8/3 or 3,6/6 kV - sheathed single core with reduced dimensions

Special fire performance, low smoke emmision, corrosivity and toxitity

Medium Voltage auxiliary circuits, power circuits, Medium Voltage heating circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

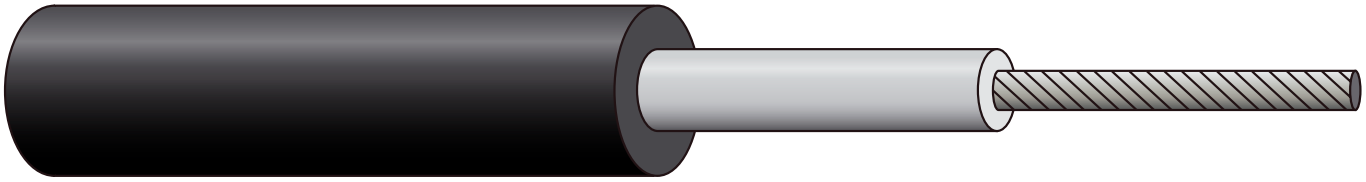
Conductor
- flexible tinned annealed copper wires
- class 5 according to BS EN 60228
- screen (only for 3,6/6 kV) conductive tape or extruded conductive layer

Insulation
- LSZH elastomeric compound according to EN 50264-1
- (EI 106 to EI 109)

Outer sheath
- LSZH elastomeric compound according to EN 50264-1
- (EM 101 to EM 104)
- Black (other colours if required)

STANDARDS

- **EN 50264 - 3 - 1**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content



Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+90° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+90° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS MW - 1,8/3 - sheathed single core with reduced dimensions

Nominal Cross-sectional Area	Conductor Diameter d (1)	Nominal thickness of insulation	Nominal thickness of sheath	Overall diameter D		Resistance of conductor at 20 °C max.	Insulation resistance at 20 °C min.	Insulation resistance at 90 °C min.
				min	max			
mm²	mm	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
1,5	1,5	1,3	0,8	5,7	6,7	13,7	21,8	0,218
2,5	1,95	1,3	0,8	6,0	7,0	8,21	18,8	0,188
4	2,5	1,3	0,8	6,5	7,6	5,09	16,2	0,162
6	3,0	1,3	0,8	7,0	8,1	3,39	14,4	0,144
10	3,9	1,5	0,8	8,2	9,6	1,95	12,8	0,128
16	5,0	1,5	0,8	9,2	10,8	1,24	10,7	0,107
25	6,4	1,8	1,0	11,5	13,4	0,795	10,3	0,103
35	7,7	1,8	1,0	12,7	14,9	0,565	8,9	0,089
50	9,2	1,8	1,0	14,1	16,5	0,393	7,8	0,078
70	11,0	1,8	1,0	15,8	18,5	0,277	6,7	0,067
95	12,5	2,2	1,0	18,0	21,0	0,210	6,5	0,065
120	14,2	2,2	1,0	19,6	22,9	0,164	6,1	0,061
150	15,8	2,2	1,2	21,4	25,1	0,132	5,8	0,058
185	17,5	2,4	1,2	23,4	27,4	0,108	5,6	0,056
240	20,1	2,4	1,2	25,9	30,3	0,0817	5,0	0,050
300	22,5	2,4	1,2	28,1	32,9	0,0654	4,5	0,045
400	25,8	2,6	1,4	32,0	37,4	0,0495	4,4	0,044

TRATOS RS MW - 3,6/6 kV - sheathed single core with reduced dimensions

Nominal Cross-sectional Area	Conductor Diameter d (1)	Nominal thickness of insulation	Nominal thickness of sheath	Overall diameter D		Resistance of conductor at 20 °C max.	Insulation resistance at 20 °C min.	Insulation resistance at 90 °C min.
				min	max			
mm²	mm	mm	mm	mm	mm	Ω/km	MΩ/km	MΩ/km
2,5	1,95	2,6	0,8	8,6	10,1	8,21	24,6	0,246
4	2,5	2,6	0,8	9,1	10,7	5,09	21,6	0,216
6	3,0	2,6	0,8	9,6	11,2	3,39	19,5	0,195
10	3,9	2,6	0,8	10,4	12,2	1,95	16,7	0,167
16	5,0	2,6	0,8	11,5	13,4	1,24	14,2	0,142
25	6,4	2,9	1,0	13,7	16,1	0,795	13,1	0,131
35	7,7	2,9	1,0	14,9	17,5	0,565	11,6	0,116
50	9,2	2,9	1,0	16,4	19,1	0,393	10,2	0,102
70	11,0	2,9	1,0	18,0	21,1	0,277	8,9	0,089
95	12,5	2,9	1,0	19,5	22,8	0,210	8,0	0,080
120	14,2	2,9	1,2	21,4	25,1	0,164	7,5	0,075
150	15,8	2,9	1,2	22,9	26,8	0,132	6,9	0,069
185	17,5	3,2	1,2	25,1	29,4	0,108	6,7	0,067
240	20,1	3,4	1,4	28,3	33,1	0,0817	6,4	0,064
300	22,5	3,4	1,4	30,6	35,8	0,0654	5,9	0,059
400	25,8	3,4	1,4	33,7	39,4	0,0495	5,2	0,052

(1) for information,indicative only

MEDIUM WALL POWER AND CONTROL CABLES

TRATOS RS US-MW

0,6/1 kV - screened multicore

Special fire performance, low smoke emmision, corrosivity and toxitity

Inboard safety circuits, control and monitoring circuits, lighting circuits, auxiliary and electric heating circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

Conductor
- flexible tinned annealed copper wires
- class 5 according to BS EN 60228

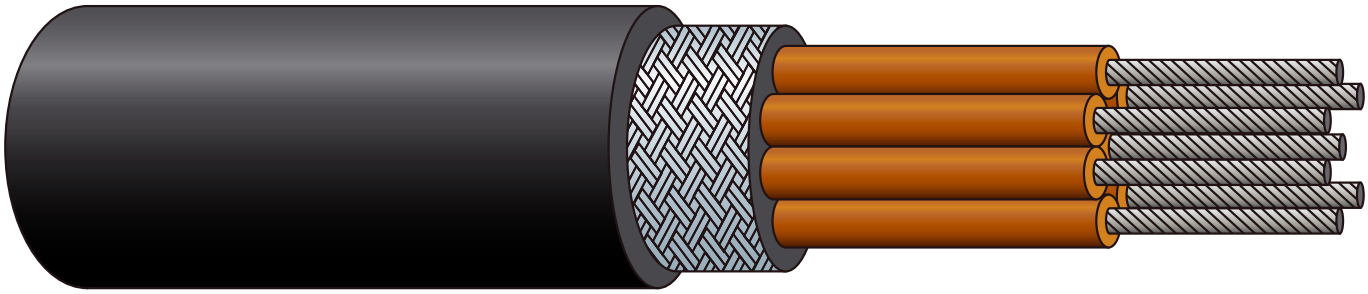
Insulation
- LSZH elastomeric compound according to EN 50264-1
- (EI 101 to EI 105)

Overal screen
- tinned annealed copper wires with required diameter

Outer sheath
- LSZH elastomeric compound according to EN 50264-1
- (EM 101 to EM 104)
- Black (other colours if required)

STANDARDS

- **EN 50264 - 2 - 1**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content



Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+90° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+90° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**r = 10D**	Minimum bending radius for installed cables

TRATOS RS MW - 0,6/1 kV - screened two cores

Number and nominal Cross-sectional area (2) mm²	Conductor Diameter d (1) mm	Minimum Average Insulation Thickness mm	Minimum Core Diameter acc.to EN mm	Maximum Core Diameter acc.to EN mm	Minimum Screen Wire Diameter mm	Minimum Average Sheath Thickness mm	Overall Diameter D Minimum acc.to EN mm	Overall Diameter D Maximum acc.to EN mm	Weight kg/km	Conductor Resistance at +20° C max. Ω/km	Insulation Resistance at +90° C min. MΩ/km	Insulation Resistance at +90° C min. MΩ/km
1,5	1,5	0,7	2,8	3,3	0,16	0,70	7,9	9,9	90	13,7	21,0	10,5
2,5	1,95	0,7	3,2	3,8	0,16	0,70	8,7	10,7	115	8,21	17,2	8,6
4	2,5	0,7	3,8	4,4	0,21	0,80	10,2	12,7	170	5,09	14,2	7,1
6	3,0	0,7	4,2	5,0	0,21	0,80	10,9	13,6	210	3,39	12,2	6,1
10	3,9	0,7	5,1	5,9	0,21	1,00	13,4	16,6	320	1,95	9,8	4,9
16	5,0	0,7	6,1	7,2	0,26	1,00	16,0	19,8	465	1,24	7,9	3,9
25	6,4	0,9	7,8	9,1	0,26	1,20	19,8	24,6	690	0,795	7,3	3,6
35	7,7	0,9	9,0	10,6	0,31	1,40	22,8	27,9	935	0,565	6,7	3,3
50	9,2	1,0	10,6	12,4	0,31	1,40	26,4	32,3	1260	0,393	6,3	3,1

TRATOS RS MW - 0,6/1 kV - screened three cores

Number and nominal Cross-sectional area (2) mm²	Conductor Diameter d (1) mm	Minimum Average Insulation Thickness mm	Minimum Core Diameter acc.to EN mm	Maximum Core Diameter acc.to EN mm	Minimum Screen Wire Diameter mm	Minimum Average Sheath Thickness mm	Overall Diameter D Minimum acc.to EN mm	Overall Diameter D Maximum acc.to EN mm	Weight kg/km	Conductor Resistance at +20° C max. Ω/km	Insulation Resistance at +90° C min. MΩ/km	Insulation Resistance at +90° C min. MΩ/km
1,5	1,5	0,7	2,8	3,3	0,16	0,70	8,4	10,4	120	13,7	21,0	10,5
2,5	1,95	0,7	3,2	3,8	0,16	0,70	9,2	11,4	160	8,21	17,2	8,6
4	2,5	0,7	3,8	4,4	0,21	0,80	10,8	13,3	230	5,09	14,2	7,1
6	3,0	0,7	4,2	5,0	0,21	0,80	11,6	14,3	295	3,39	12,2	6,1
10	3,9	0,7	5,1	5,9	0,26	1,00	14,4	18,0	498	1,95	9,8	4,9
16	5,0	0,7	6,1	7,2	0,26	1,20	17,4	21,3	675	1,24	7,9	3,9
25	6,4	0,9	7,8	9,1	0,26	1,20	21,3	26,1	971	0,795	7,3	3,6
35	7,7	0,9	9,0	10,6	0,31	1,40	24,5	29,8	1323	0,565	6,7	3,3
50	9,2	1,0	10,6	12,4	0,31	1,60	28,3	34,6	1823	0,393	6,3	3,1

TRATOS RS MW - 0,6/1 kV - screened four cores

Number and nominal Cross-sectional area (2) mm²	Conductor Diameter d (1) mm	Minimum Average Insulation Thickness mm	Minimum Core Diameter acc.to EN mm	Maximum Core Diameter acc.to EN mm	Minimum Screen Wire Diameter mm	Minimum Average Sheath Thickness mm	Overall Diameter D Minimum acc.to EN mm	Overall Diameter D Maximum acc.to EN mm	Weight kg/km	Conductor Resistance at +20° C max. Ω/km	Insulation Resistance at +90° C min. MΩ/km	Insulation Resistance at +90° C min. MΩ/km
1,5	1,5	0,7	2,8	3,3	0,16	0,70	9,1	11,3	149	13,7	21,0	10,5
2,5	1,95	0,7	3,2	3,8	0,21	0,80	10,4	12,9	216	8,21	17,2	8,6
4	2,5	0,7	3,8	4,4	0,21	0,80	11,8	14,5	292	5,09	14,2	7,1
6	3,0	0,7	4,2	5,0	0,21	1,00	13,1	16,1	396	3,39	12,2	6,1
10	3,9	0,7	5,1	5,9	0,26	1,00	15,9	19,5	640	1,95	9,8	4,9
16	5,0	0,7	6,1	7,2	0,26	1,20	19,3	23,6	860	1,24	7,9	3,9
25	6,4	0,9	7,8	9,1	0,31	1,40	24,0	29,3	1290	0,795	7,3	3,6
3x35+25	7,7/6,4	0,9/0,9	9,0/7,8	10,6/9,1	0,31	1,40	26,9	32,9	1908	0,565/0,795	6,7	3,3
3x50+25	9,2/6,4	1,0/0,9	10,6/7,8	12,4/9,1	0,31	1,60	31,5	38,2	2560	0,393/0,795	6,3	3,1

(1) for information,indicative only

(2) earth conductor (green/yellow) can be included upon request

HIGH TEMPERATURE POWER CABLES

TRATOS RS UU-HT

1,8/3 or 3,6/6 kV - single core

Special fire performance, low smoke emmision, corrosivity and toxitity

Traction and power circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

Conductor

- flexible tinned annealed copper wires
- (palin copper only for 150° C core temperature)
- class 5 according to BS EN 60228

Insulation

- silicon rubber according to EN 50382-1 (EI 111)

STANDARDS

- **EN 50382**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content

Working Specifications:		
Fluid resistance	**Good**	Insulation resistant to chemicals (oil resisting)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+120/+150° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+120° C; +150° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS HT - 1,8/3 kV - single core

Nominal Cross-sectional Area mm²	Conductor Diameter D (1) mm	Nominal Insulation Thickness mm	Minimum Overall Diameter D (2) acc.to EN mm	Maximum Overall Diameter D (2) acc.to EN mm	Nominal Cable Weight (kg/km)	Maximum DC Resistance at +20° C Tinned Conductor (Ω/km)	Maximum DC Resistance at +20° C Plain Conductor (Ω/km)	Minimum Insulation Resistance at +20° C min. (MΩ/km)	Minimum Insulation Resistance at +150° C min. (3) (MΩ/km)
1,5	1,5	2,5	6,3	7,3	53	13,7	13,3	970	1,90
2,5	1,95	2,5	6,7	7,8	65	8,21	7,98	840	1,60
4	2,5	2,5	7,2	8,4	83	5,09	4,95	720	1,40
6	3,0	2,5	7,7	9,0	104	3,39	3,30	650	1,30
10	3,9	2,5	8,5	10,0	159	1,95	1,91	540	1,00
16	5,0	2,5	9,6	11,2	209	1,24	1,21	460	0,90
25	6,4	2,5	10,9	12,7	289	0,795	0,780	380	0,70
35	7,7	2,5	12,1	14,1	384	0,565	0,554	330	0,60
50	9,2	2,5	13,5	15,8	518	0,393	0,386	290	0,50
70	11,0	2,5	15,2	17,8	716	0,277	0,272	250	0,50
95	12,5	2,7	17,0	19,9	926	0,210	0,206	230	0,40
120	14,2	2,7	18,6	21,7	1143	0,164	0,161	210	0,40
150	15,8	2,7	20,1	23,5	1426	0,132	0,129	190	0,30
185	17,5	2,7	21,7	25,4	1722	0,108	0,106	170	0,30
240	20,1	2,7	24,1	28,2	2270	0,0817	0,0801	150	0,30
300	22,5	2,7	26,4	30,9	2746	0,0654	0,0641	140	0,20
400	25,8	2,9	29,9	34,9	3725	0,0495	0,0486	130	0,20

TRATOS RS HT - 3,6/6 kV - single core

Nominal Cross-sectional Area mm²	Conductor Diameter D (1) mm	Nominal Insulation Thickness mm	Minimum Overall Diameter D (2) acc.to EN mm	Maximum Overall Diameter D (2) acc.to EN mm	Nominal Cable Weight (kg/km)	Maximum DC Resistance at +20° C Tinned Conductor (Ω/km)	Maximum DC Resistance at +20° C Plain Conductor (Ω/km)	Minimum Insulation Resistance at +20° C min. (MΩ/km)	Minimum Insulation Resistance at +150° C min. (3) (MΩ/km)
2,5	1,95	3,0	7,6	8,9	80	8,21	7,98	920	1,80
4	2,5	3,0	8,1	9,5	99	5,09	4,95	800	1,60
6	3,0	3,0	9,0	10,6	122	3,39	3,30	750	1,50
10	3,9	3,0	9,5	11,1	177	1,95	1,91	610	1,20
16	5,0	3,0	10,5	12,3	230	1,24	1,21	520	1,00
25	6,4	3,0	11,8	13,8	313	0,795	0,780	430	0,80
35	7,7	3,0	13,0	15,2	409	0,565	0,554	380	0,70
50	9,2	3,0	14,4	16,9	546	0,393	0,386	330	0,60
70	11,0	3,0	16,1	18,9	735	0,277	0,272	280	0,50
95	12,5	3,0	17,5	20,5	941	0,210	0,206	260	0,50
120	14,2	3,1	19,3	22,6	1172	0,164	0,161	240	0,40
150	15,8	3,1	20,8	24,4	1458	0,132	0,129	220	0,40
185	17,5	3,2	22,6	26,5	1759	0,108	0,106	200	0,40
240	20,1	3,4	25,4	29,8	2340	0,0817	0,0801	190	0,30
300	22,5	3,4	27,7	32,4	2822	0,0654	0,0641	170	0,30
400	25,8	3,4	30,8	36,0	3797	0,0495	0,0486	150	0,30

(1) for information,indicative only

(2) diameter (D) without braid. For braided cables increase diameter by 0,8 mm

(3) for cables rated 120° C: $IR_{120°C} \geq 0{,}01$ IR 20° C

HIGH TEMPERATURE POWER CABLES

TRATOS RS US-HT

1,8/3 or 3,6/6 kV - sheathed single core

Special fire performance, low smoke emmision, corrosivity and toxitity

Traction and power circuits.

FEATURES AND PERFORMANCES

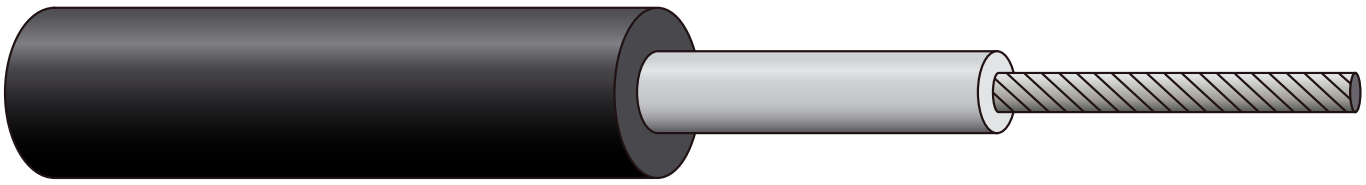
CONSTRUCTION

Conductor
- flexible tinned annealed copper wires
- (plain copper only for 150° C core temperature)
- class 5 according to BS EN 60228

Insulation
- silicon rubber according to EN 50382-1 (EI 112)

Outer sheath
- LSZH elastomeric compound according to EN 50382-1
- (EM 105, EM 106 or EM 107)
- Black (other colours if required)

STANDARDS
- **EN 50382**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content



Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+120/+150° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+120° C; +150° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS HT - 1,8/3 kV - single core

Nominal Cross-sectional Area mm²	Conductor Diameter D (1) mm	Minimum Average Insulation thickness mm	Minimum Average Sheath thickness mm	Minimum Overall Diameter D acc.to EN mm	Maximum Overall Diameter D acc.to EN mm	Nominal Cable Weight (kg/km)	Maximum DC Resistance at +20° C tinned conductor (Ω/km)	Maximum DC Resistance at +20° C tinned conductor (Ω/km)	Minimum Insulation Resistance at +20° C min. (MΩ/km)	Minimum Insulation Resistance at +150° C min. (2) (MΩ/km)
1,5	1,5	1,3	1,4	6,8	7,9	66	13,7	13,3	670	1,30
2,5	1,95	1,3	1,4	7,2	8,4	81	8,21	7,98	570	1,10
4	2,5	1,3	1,4	7,7	9,0	100	5,09	4,95	480	0,90
6	3,0	1,3	1,4	8,2	9,6	122	3,39	3,30	420	0,80
10	3,9	1,5	1,4	9,4	11,0	187	1,95	1,91	380	0,70
16	5,0	1,5	1,4	10,5	12,2	240	1,24	1,21	310	0,60
25	6,4	1,8	1,4	12,3	14,4	341	0,795	0,780	300	0,60
35	7,7	1,8	1,4	13,6	15,9	442	0,565	0,554	250	0,50
50	9,2	1,8	1,4	15,0	17,5	581	0,393	0,386	220	0,40
70	11,0	1,8	1,5	16,8	19,7	781	0,277	0,272	200	0,40
95	12,5	2,2	1,5	19,0	22,2	1022	0,210	0,206	190	0,40
120	14,2	2,2	1,6	20,8	24,3	1266	0,164	0,161	180	0,30
150	15,8	2,2	1,6	22,3	26,1	1559	0,132	0,129	160	0,30
185	17,5	2,4	1,7	24,5	28,6	1889	0,108	0,106	160	0,30
240	20,1	2,4	1,8	27,1	31,7	2483	0,0817	0,0801	140	0,20
300	22,5	2,4	1,9	29,5	34,6	2991	0,0654	0,0641	120	0,20
400	25,8	2,6	2,0	33,2	38,9	4015	0,0495	0,0486	120	0,20

TRATOS RS HT - 3,6/6 kV - single core

Nominal Cross-sectional Area mm²	Conductor Diameter D (1) mm	Minimum Average Insulation thickness mm	Minimum Average Sheath thickness mm	Minimum Overall Diameter D acc.to EN mm	Maximum Overall Diameter D acc.to EN mm	Nominal Cable Weight (kg/km)	Maximum DC Resistance at +20° C tinned conductor (Ω/km)	Maximum DC Resistance at +20° C tinned conductor (Ω/km)	Minimum Insulation Resistance at +20° C min. (MΩ/km)	Minimum Insulation Resistance at +150° C min. (2) (MΩ/km)
2,5	1,95	2,6	1,4	9,9	11,6	129	8,21	7,98	870	1,70
4	2,5	2,6	1,4	10,4	12,2	153	5,09	4,95	750	1,50
6	3,0	2,6	1,4	10,9	12,8	178	3,39	3,30	670	1,30
10	3,9	2,6	1,4	11,8	13,8	240	1,95	1,91	570	1,10
16	5,0	2,6	1,4	12,8	15,0	296	1,24	1,21	480	0,90
25	6,4	2,9	1,4	14,7	17,2	405	0,795	0,780	430	0,80
35	7,7	2,9	1,4	15,9	18,6	510	0,565	0,554	380	0,70
50	9,2	2,9	1,5	17,5	20,5	663	0,393	0,386	330	0,60
70	11,0	2,9	1,5	19,2	22,4	872	0,277	0,272	280	0,50
95	12,5	2,9	1,6	20,8	24,3	1099	0,210	0,206	250	0,50
120	14,2	2,9	1,6	22,4	26,2	1329	0,164	0,161	230	0,40
150	15,8	2,9	1,7	24,1	28,2	1637	0,132	0,129	210	0,40
185	17,5	3,2	1,8	26,4	30,9	1985	0,108	0,106	210	0,40
240	20,1	3,4	1,9	29,4	34,4	2616	0,0817	0,0801	190	0,30
300	22,5	3,4	1,9	31,7	37,1	3117	0,0654	0,0641	170	0,30
400	25,8	3,4	2,0	35,0	40,9	4148	0,0495	0,0486	150	0,30

(1) for information,indicative only

(2) for cables rated 120° C: IR 120° C !0,01 IR 20° C

HIGH TEMPERATURE POWER CABLES

TRATOS RS HT (EF)

3,6/6 kV - single core with extra flexible conductor

Special fire performance, low smoke emmision, corrosivity and toxitity

Traction and power circuits, inter coaches power circuits.

FEATURES AND PERFORMANCES

CONSTRUCTION

Conductor

- extra flexible tinned annealed copper wires
- (plain copper only for 150° C core temperature)
- class 6 according to BS EN 60228

Insulation

- silicon rubber according to EN 50382-1 (EI 111)

STANDARDS

- **EN 50382**
- **EN 50305**
- **EN 50355**
- **IEC 60332-1-2** Flame propagation
- **IEC 60332-3-22** Vertical flame spread
- **IEC 61034** Smoke emission density
- **IEC 60754** Halogen acid gas content

Working Specifications:		
Fluid resistance	**Good**	Outer sheath resistance to chemicals (oil, extra oil and fuel resistance)
Mechanical stress	**Good**	Cable mechanical resistance to mechanical stress
Temperature	**-25 C/-40° C** **+120/+150° C**	Permissible minimum ambient temperature in operation and maximum conductor temperature in normal operation (+120° C; +150° C) Compound resistance at low temperature (-25° C; -40° C)
Bending radius	**D < 12 mm: r = 3D** **D > 12 mm: r = 4D**	Minimum bending radius for installed cables

TRATOS RS HT - 3,6/6 kV - single core with extra flexible conductor

Nominal Cross-sectional Area mm²	Conductor Diameter D (1) mm	Insulation Average Thickness mm	Minimum Overall Diameter D (2) acc.to EN mm	Maximum Overall Diameter D (2) acc.to EN mm	Nominal Cable Weight (kg/km)	Maximum DC Resistance at +20° C Tinned Conductor (Ω/km)	Maximum DC Resistance at +20° C Plain Conductor (Ω/km)	Minimum Insulation Resistance at +20° C min. (MΩ/km)	Minimum Insulation Resistance at +150° C min. (3) (MΩ/km)
50	9,2	3,0	15,2	17,8	562	0,393	0,386	340	0,70
70	11,0	3,0	16,9	19,8	765	0,277	0,272	300	0,60
95	12,5	3,0	18,3	21,4	973	0,210	0,206	270	0,55
120	14,2	3,1	20,1	23,5	1196	0,164	0,161	250	0,50
150	15,8	3,1	21,6	25,3	1479	0,132	0,129	220	0,45
185	17,5	3,2	23,4	27,4	1800	0,108	0,106	210	0,40

(1) for information,indicative only

(2) diameter (D) without braid. For braided cables increase diameter by 0,8 mm

(3) for cables rated 120° C: $IR_{120°}$ C ≥0,01 IR 20° C

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