Industrial Project Business Unit

Instrumentation Cables

CAMUNACAVI

LAPP GROUP

Welcome

CAMUNA CAVI S.R.L
Operation: Via General Treboldi 128
25048 EDOLO (BS) Italy
Tel. (+39) 0364 773411
Fax (+39) 0364 770120

Sales Office: Via Lavoratori Autobianchi 1
building 20
20832 DESIO (MB) Italy
Tel. (+39) 0364 773411

www.camunacavi.it
info@camunacavi.it

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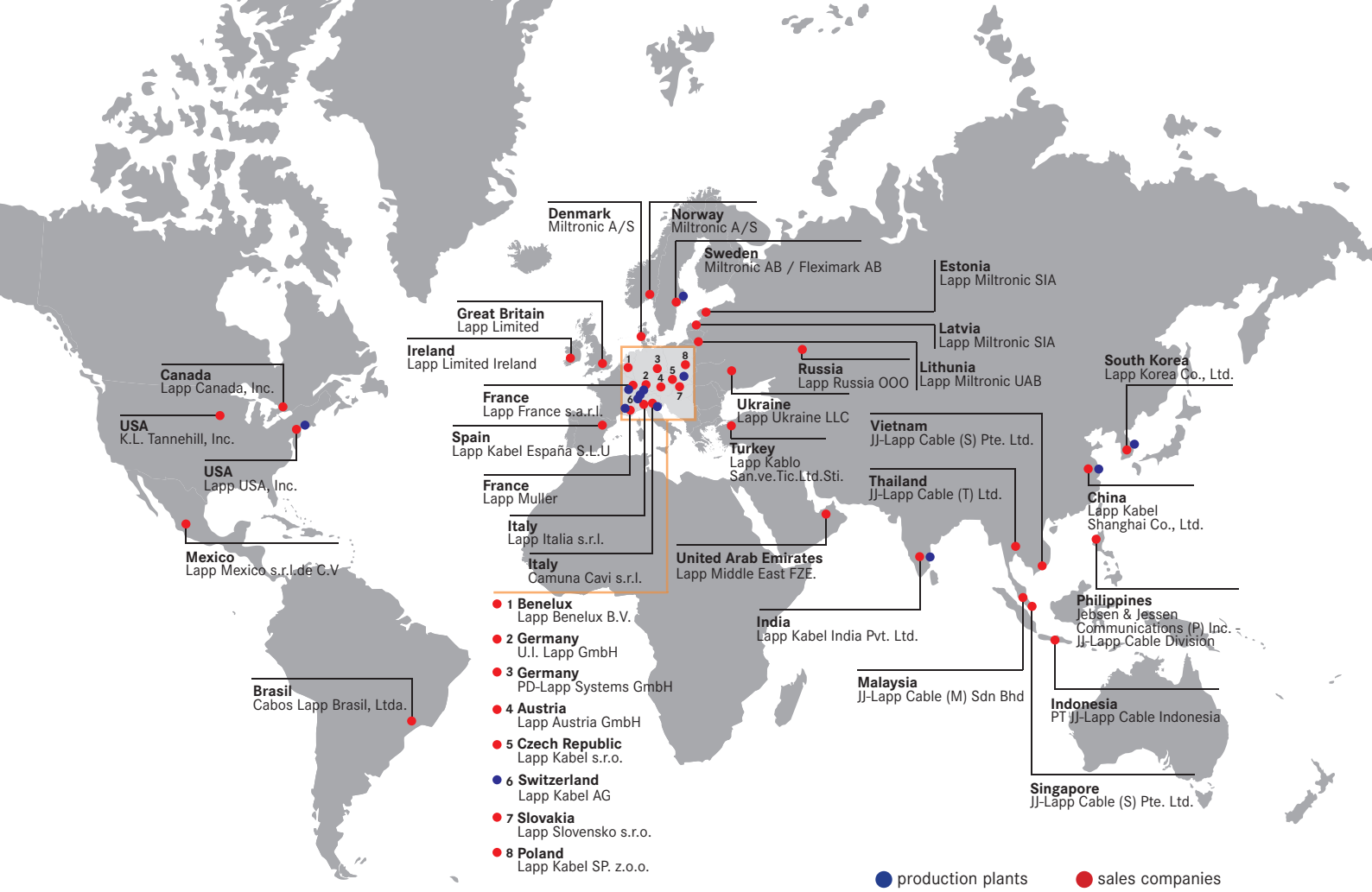


Camuna Cavi
all over the world

Camuna Cavi is an Italian Industrial Cable manufacturer, ISO 9001:2008 certified.

The company operates since 20 years on the international market and is a Lapp Group Company.

Lapp Group is a global supplier of cable technology well present worldwide with 41 own sales companies, 17 production plants and more than 100 partner companies.

Camuna Cavi is listed on the vendor lists of the major EPC, Operators and End-Users.

The Industrial Project Business Unit supplies products in full compliance with our customers' technical specifications to meet applications whenever durability, quality and reliability are mandatory.

The Lapp Group worldwide

Algeria
EURL CABELMAT
Cité Mimouni Lotissement 18
Villa N° 14 Bordj El Kifane
ALGER, 16411
Tel.: +213 2 1201039
Fax: +213 2 0388220
info@cablemat.net
www.cablemat.net

Argentina
NAKASE SRL
Calle 49 No. 5764
B1653AOX
Villa Ballester
1870 BUENOS AIRES
Tel.: +54 11 47684242122
Fax: +54 11 47684242111
gerencia@nakase.com
www.nakase.com.ar

Armenia
Integral Design ev Engineering
8 Tumanyan Street, suite 425 – 426
375002 YEREVAN
Tel.: +374 10 520188
Fax: +374 10 519188
info@ahbt.am
www.ahbt.am

Australia
DKSH Australia Pty Ltd.
14-17 Dansu Court Hallam
3803 VICTORIA
Tel.: +61 3 95546666
Fax: +61 3 95546677
info@dksh.com.au

Austria
Lapp Austria GmbH
Bremenstraße 8
4030 LINZ
Tel.: +43 732 781272444
Fax: +43 732 78127234
sales@lappaustria.at
www.lappaustria.at

Belarus
PNS „Professional Network Systems“
Temirjaseva Str. House 65 b off. 308
220035 MINSK
Tel.: +375 17 2908372
Fax: +375 17 2547828
info@pns.by
www.pns.by

Belgium – Luxembourg
Lapp Benelux B.V.
Van Dijklaan 16, 5581 WG WAALRE
Postbus 74, 5580 AB WAALRE
NL:
Tel.: +31 40 2285000
Fax: +31 40 2285010
Belux:
Tel.: +32 78 353060
Fax: +32 78 353065
info.lappbenelux@lappgroup.com
www.lappbenelux.com

Brazil
Cabos Lapp Brasil Ltda.
Av. Dr. Mauro Lindemberg
Monteiro, 628
Galpao18, Osasco
CEP 06278-010 SAO PAULO
Tel.: +55 11 21664166
Fax: +55 11 21664165
vendas@lappbrasil.com.br
www.lappbrasil.com.br

Bulgaria
V&V Isomatic Ltd.
128, Yanko Sakazov blvd.
1505 SOFIA
Tel.: +359 29 583111
Fax: +359 29 582270
v.v@techno-link.com
www.viv-isomatic.com

Canada
Lapp Canada
3505 Laird Road, Unit 10
L5L 5Y7 MISSISSAUGA, Ontario
Tel.: +905 8 205492
Fax: +905 8 206516
sales@lappcanada.com
www.lappcanada.com

Chile
Desimat Chile
Av. Puerto Vespucio 9670
Parque Industrial Puerto Santiago
Pudahuel, SANTIAGO
Tel.: +56 2 5851200
Fax: +56 2 7470153
importaciones@desimat.cl
www.desimat.cl

China
Lapp Kabel Shanghai Co., Ltd.
23A Zhaofeng Universe Building
1800 Zhongshan Road West
SHANGHAI 200235
Tel.: +86 21 64400833
Fax: +86 21 64400834
info@lappkabel.com.cn
www.lappkabel.com.cn

Costa Rica
Elvatrón, SA
De Rapifreno en La Uruca
400 metros Nte.
SAN JOSÉ
P.O. Box 8-3770 (1000)
Tel.: +506 2242-9955
Fax: +506 2520-0697
elvatron@elvatron.com
www.elvatron.com

Colombia
Transmisiones Ltda.
Carrera 69 B No. 21 A 48 Bodega
UE 28-9 Parque Industrial Salitre
BOGOTÁ, D.C.
Tel.: +57 1 4126898
Fax: +57 1 3153315221
info@transmisiones.de

Croatia
TIM KABEL
Savska cesta 103
10360 ZAGREB – Sesvete
Tel.: +385 1 5555900
Fax: +385 1 5555901
zagreb@tim-kabel.hr
www.tim-kabel.hr

Cyprus
MARIOS KARANTONIS LTD
6 Pentadactilou Street, 2682
P.O. Box 14509, 2690
PALEOMETOCHO, NICOSIA
info@karantonis.com.cy
www.karantonis.com.cy

Czech Republic
LAPP KABEL s.r.o.
Bartosova 315
765 02 OTROKOVICE
Tel.: +420 5 73501011
Fax: +420 5 73394650
info@lappgroup.cz
www.lappgroup.cz

Denmark
Miltronic
Korskildeeng 6
2670 GREVE
Tel.: +45 43 950000
Fax: +45 43 950009
info@miltronic.dk
www.miltronic.dk

Ecuador
ELSYSTEC S.A.
Electricidad Sistemas y Tecnologia
Vasco de Contreras y
Mañosca 35-251
QUITO
Tel.: +593 2 2455698
Fax: +593 2 2455698
info@elsystec.com.ec

El Salvador
INTEK EL SALVADOR S.A. de C.V.
Calle Gabriela Mistral No. 373
Entre Blvd.Los Héroes y 33 Ave. NTE,
C. A.
SAN SALVADOR
Tel.: +503 2260-8888
Fax: +503 2260-8855
inteksv@intek-ca.com
www.intek-ca.com

Estonia
Lapp Miltronic SIA Eesti Filiaal
Kastani pst 10
44307 RAKVERE
Tel.: +372 6 518970
Fax: +372 6 518971
orders@lappmiltronic.lv
www.lappmiltronic.ee

Finland
SKS Automaatio Oy
Martinkyläntie 50
P.O. Box 122
01721 VANTAA
Tel.: +358 2 076461
Fax: +358 2 07646820
automaatio@sks.fi
www.sks.fi

France
Lapp France s.a.r.l.
Technopôle Forbach-Sud BP 50084
57602 FORBACH CEDEX
Tel.: +33 387 841929
Fax: +33 387 841794
lappfrance@lappgroup.com
www.lappfrance.fr

LAPP MULLER SAS
Z.A. du Grand Pont
83310 GRIMAUD
Tel.: +33 494 566500
Fax: +33 494 43487
info@mullercables.com
www.mullercables.com

Georgia
INSTA Ltd.
8, Zakariadze str.
0177 TBILISI
Tel.: +995 32 202020
Fax: +995 32 202022
sales@insta.ge
www.insta.ge

Germany
U.I. Lapp GmbH
Schulze-Delitzsch-Straße 25
70565 STUTTGART
Tel.: +49 711 783801
Fax: +49 711 78382640
info@lappkabel.de
www.lappkabel.de

Lapp Systems GmbH
Oskar-Lapp-Str. 5
70565 STUTTGART
Tel.: +49 711 783804
Fax: +49 711 78383520
info@lappkabel.de
www.lappkabel.de

Ghana
PROCESS AND PLANT AUTOMATION Ltd.
No. 3 Becca Villa, behind Cal Bank
Baatsona, Spintex Road.
P.O. Box Sr 95
ACCRA
Tel.: +233 3 02812680
ekua@automationghana.com
www.automationghana.com

Great Britain
Lapp Limited
Unit 3 Perivale Park
Horsenden Lane South
UB6 7RL GREENFORD MIDDLESEX
Tel.: +44 20 87587800
Fax: +44 20 87587880
sales@lapplimited.com
www.lappgroup.co.uk

Greece
Dimoulas Special Cables S.A.
100-102 Lenorman Str.
10444 ATHENS
Tel.: +30 21 05157610
Fax: +30 21 05157611
info@dimoulas.gr
www.dimoulas.gr

Guatemala
INTEK GUATEMALA, S.A.
Vía 5 y Ruta 3 4-35 Zona 4
C.P. 01004
GUATEMALA, GUA
Tel.: +502 2361-5977
Fax: +502 2334-4338
intekgt@intek-ca.com

Honduras
INTEK HONDURAS, S.A. DE C.V.
3ra. Ave. entre 10 y 11 calle
N.O., local #9, EDIFICIO SIKABUN,
Barrio Las Acacias
SAN PEDRO SULA
Tel.: +504 5 503116
Fax: +504 5 578016
intekhn@intek-ca.com

Hong Kong
Worldtex & Co.
Unit 11, 11/F, Tins Enterprises
Centre
777 Lai Chi Kok Rd.
CHEUNG SHA WAN
KOWLOON
Tel.: +85 22 7811860
Fax: +85 22 7814733
info@worldtex-co.com.hk

Hungary
Lapp Austria GmbH m. k. k. k.
Neumann János u.1
2040 BUDAÖRS
Tel.: +36 23501-250
Fax: +36 23501-259
sales@lappgroup.hu
www.lappgroup.hu

India
Lapp India Pvt. Ltd.
Plot No.98, J & K
Jigani Industrial Area, II Phase
BANGALORE SOUTH – 560 105
Tel.: +91 8110 304800
Fax: +91 80 27825479
info@lappindia.com
www.lappindia.com

Indonesia
PT. JJ-LAPP CABLE INDONESIA
Graha INTI FAUZI, 7th Floor
Jl. Buncit Raya No. 22
JAKARTA 12510
Tel.: +62 21 27537051
Fax: +62 21 27537052
sales_jjli@jjsea.com
www.jj-lappcable.com

Island
Johan Rönning Ltd.
Klettagardar 12
104 REYKJAVIK
Tel.: +354 5 200800
Fax: +354 5 200888
ronning@ronning.is
www.ronning.is

Israel
Arrow Control Cables Ltd.
7, Zavitan street
49950 NEHALIM
Tel.: +972 3 9074887
Fax: +972 3 9074889
info@arrowcables.com
www.arrowcables.com

Italy
LAPP ITALIA S.R.L.
Via Lavoratori Autobianchi 1
Building 20
20832 DESIO (MB)
Tel.: +39 362 4871
Fax: +39 362 487330-340
lappitalia@lappitalia.it
www.lappitalia.it

Camuna Cavi s.r.l.
Via Lavoratori Autobianchi 1
Building 20
20832 DESIO (MB)
Tel.: +39 364 773411
Fax: +39 364 770120
info@camunacavi.it
www.camunacavi.it
Production Site:
Via General Treboldi, 128
25048 EDOLO (BS)
Tel.: +39 364 773411
Fax: +39 364 770120
info@camunacavi.it
www.camunacavi.it

Japan
K.Mecs Co., Ltd.
Headquarters Yusen Iwamotocho
Bldg. 3F
2-3-3 Iwamotocho, Chiyodaku
101-0032 TOKYO
Tel.: +81 3 58255333
Fax: +81 3 58258550
info@kmecs.co.jp
www.kmecs.com

Kazakhstan
SAR
Sales Area Representative
Alexandr Zemlyanoy
Tel.: +77273 282346
Mob.:+7777 2877330
Alexandr.Zemlyanoy@lappgroup.kz

Korea
Lapp Korea LLC.
759-5, Kumeu-ri
JangAn-Myeon, HWASUNG CITY
KyungGi Province
South Korea 445-941
Tel.: +82 31 2501011
Fax: +82 31 2501019
jin.min@lappgroup.com
www.lappkorea.com

Latvia
LAPP MILTRONIC SIA
Ulbrokas 44a
RIGA, 1021
Tel.: +371 67 501900
Fax: +371 67 501909
pasutijumi@lappmiltronic.lv
www.lappmiltronic.lv

Libya
Al Jouda Co.
Al Fath – Street
Al Buraq – Building 3rd floor
BENGHAZI
Tel.: +218 91 7433363
ilsharee@yahoo.co.uk

Lithuania
LAPP Miltronic UAB
P. Vileisio 18N
10306 VILNIUS
Tel.: +370 5 2780390
Fax: +370 5 2780397
info@lappmiltronic.lt
www.lappmiltronic.lt

Macedonia
Siskon Dooel
Taskenska 4A
1000 SKOPJE
Tel.: +389 2 3062423
Fax: +389 2 3061250
siskon@mt.net.mk
www.siskon.com.mk

Malaysia
JJ-LAPP Cable (M) Sdn Bhd
16, Jalan 51A/225,
46100 PETALING JAYA SELANGOR
Tel.: +603 78 616288
Fax: +603 78 616299
sales_jjlm@jjsea.com
www.jj-lappcable.com

Malta
G & E Electronics Ltd.
Genics Bldgs.
Giov. Papaffy Str.
B'KARA BKR 4021
Tel.: +356 21 486816
Fax: +356 21 497103
info@gemalta.com
www.gemalta.com

Mexico
Lapp Mexico s de rl de C.V.
Metalurgia # 2730
Industrial El Alamo C.P.
44490 TLAQUEPAQUE, Jalisco
Tel.: +52 33 36660250
Fax: +52 33 36660075
ventas@lappmexico.com
www.lappmexico.com

Republic of Moldova
Licuri SRL
Bd. Moskova, 20
2045 MUN. CHISINAU
Tel.: +373 22 402536, 329436
Fax: +373 22 404777
office@licuri.md
www.licuri.md

Mongolia
MCS International Co. Ltd.
MCS Anun centera Khan-Uul
districta 3rd khoroo
ULAANBAATAR
Tel.: +976 11 346363
Fax: +976 11 346030
galbadrakh@mcs.mn
www.international.mcs.mn

Morocco
FIABEL Sarl MAROC
56 Résidence Najmat Bahmad
Bd Bahmad - Belvédère
CASABLANCA
Tel.: +212 22 4033-01, -02
Fax: +212 22 403303
stefiabel@menara.ma
www.fiabel.com

Netherlands
Lapp Benelux B.V.
Van Dijklaan 16,
5581 WG WAALRE
Postbus 74, 5580 AB WAALRE
Tel.: +31 40 2285000
Fax: +31 40 2285010
info.lappbenelux@lappgroup.com
www.lappbenelux.com

New Zealand
Engineering Computer Services Ltd.
530 Te Rapa Road
P.O. Box 20204
HAMILTON
Tel.: +64 7 8492211
Fax: +64 7 8492220
garry@lappgroup.co.nzw
www.lappgroup.co.nz

Nicaragua
EL-TEC
De la óptica Nicaraguense
3c al Este, 1/2 c al Sur
Residencial Bolonia, MANAGUA
Tel.: +505 2254-4913
info@el-tec.com
www.el-tec.com

Nigeria
Penz Williams Limited
Suite 7 Canaan Mall, Plot 2
Block 105 LEKKI
LAGOS
Tel.: +234 8 037448810
Fax: +234 8 4612169
info@penzwilliams.com
www.penzwilliams.com

Norway
Miltronic AS
Eikveien 11
3036 DRAMMEN
Tel.: +47 32 261300
Fax: +47 32 261398
info@miltronic.no
www.miltronic.no

Panamá
CONTEC PANAMA
Consultores Electrotécnicos S.A.
Vía Tocumen, Plaza Conquistador
Local # 33
PANAMÁ
Tel.: +507 2 335119
Fax: +507 2 336028
gerencia@consultorestecnicos.com
www.contecpanama.com

Peru
DESIMAT PERU
Av. Velasco Astete 2371
Surco LIMA
Tel.: +51 1 2752765
Fax: +51 1 2752776
ventas@desimat.com.pe
www.desimat.com.pe

Philippines
JJ-LAPP Cable (P) Inc
Unit 704, Total Corporate Center
1012 Triangle Drive
Bonifacio Global City
1634 TAGUIG CITY, MANILA
Tel.: +632 786 7566
Fax: +632 786 7544
sales_jjlp@jjsea.com
www.jj-lappcable.com

Poland
Lapp Kabel Sp. z o.o.
ul. Wrocławska 33 D
Długołęka, 55-095 MIRKÓW
Tel.: +48 71 3306300
Fax: +48 71 3306306
info@lapppolska.pl
www.lapppolska.pl

Portugal
Policabos S.A.
Av. Pedro Álvares Cabral
Lugar da Capa Rota
2710-144 SINTRA
Tel.: +351 21 9178640
Fax: +351 21 9178649
policabos@policabos.pt
www.policabos.pt

Rumania
COELCO TRADE
Autostrada Bucuresti-Pitesti, km 13,5
A1 ind. park Polo Occidente/Hala M
Judet ILFOF, 077096
Tel.: +40 213 1009-61, -62
Fax: +40 213 1009-59, -89
coelco@dnt.ro
www.coelco.ro

Russia
Lapp Russia OOO
Leninskaya St., 141
443041 SAMARA
Tel.: +7 846 3731717
Fax: +7 846 2760291
lapprussia@lappgroup.ru
www.lappgroup.ru

Serbia
Vesimpex d.o.o.
Petra Konjovića 12v
Poslovni centar-Rakovica, ulaz C
11090 BEOGRAD
Tel.: +381 11 3510-683
Fax: +381 11 3057-947
info@vesimpex.rs
www.vesimpex.rs

Singapore
JJ-LAPP Cable (S) Pte Ltd
No.9 Tuas South St 3
SINGAPORE 638017
Tel.: +65 6 5086200
Fax: +65 6 8631271
sales_jjls@jjsea.com
www.jj-lappcable.com

Slovakia
LAPP SLOVENSKO, s.r.o.
Piaristicka 2
949 24 NITRA
Tel.: +421 376 578095
Fax: +421 376 578096
info@lappgroup.sk
www.lappgroup.sk

Slovenia
FINEA TRADE d.o.o.
Limbuška cesta 2
2000 MARIBOR
Tel.: +386 2 4213555
Fax: +386 2 4213571
elektro@finea-trade.si
www.finea-trade.si

South Africa
Lapp Group Southern Africa
51 Brunton Circle
Founders View South
Modderfontein
1645 GAUTENG
Tel.: +27 11 2013200
Fax: +27 11 6095850
info@lappkabel.co.za
www.lappcable.co.za

Spain
Lapp Group España
Avda. de les Garrigues, 34 – 36, Nave 1
Parque Empresarial Mas Blau II
08820 EL PRAT DE LLOBREGAT
(Barcelona)
Tel.: +34 902 108 669
Fax: +34 934 796 272
info@lappgroup.es
www.lappgroup.es

Sweden
Miltronic AB
Kungshagsvägen 7
P.O. Box 1022
611 29 NYKÖPING
Tel.: +46 155 77700
Fax: +46 155 77701
info@miltronic.se
www.miltronic.se

Sales office Denmark
Korskildeeng 6
2670 GREVE
Tel.: +45 43 950000
Fax: +45 43 950009
info@miltronic.dk
www.miltronic.dk

Switzerland
EPIC®
Bachofen AG
Ackerstraße 42
8610 USTER
Tel.: +41 44 9441111
Fax: +41 44 9441233
info@bachofen.ch
www.bachofen.ch

Volland AG
Ifangstrasse 103
8153 RÜMLANG
Tel.: +41 44 8179797
Fax: +41 44 8179700
info@volland.ch
www.volland.ch

Taiwan
DKSH Taiwan Ltd.
10th Floor, No. 22, Lane 407
Tiding Blvd., Sec. 2
Neihu Technology Park
TAIPEI CITY 114-93
Tel.: +886 2 87527651
Fax: +886 2 87518688
paul.lin@dksh.com

Thailand
JJ-LAPP Cable (T) Ltd
23/110-117 Sorachai Building
25-29th FL
Soi Sukhumvit 63 (Ekamai),
Sukhumvit Road, Klongton Nua,
Wattana, BANGKOK 10110
Tel.: +66 27 878288
Fax: +66 27 878299
sales_jjlt@jjsea.com
www.jj-lappcable.com

Turkey
LAPP KABLO San.ve.Tic.Ltd.Şti.
Atatürk Bulvarı
Ayanoğlu İş Merkezi No: 1
34758 ATAŞEHIR – Istanbul
Tel.: +90 216 4565699
Fax: +90 216 45656-87, -89
info@lapp.com.tr
www.lapp.com.tr

Ukraine
Lapp Ukraine LLC
201 – 203, Kharkivske shose
02121 KIEV
Tel.: +38 044 495-6000
Fax: +38 044 490-7630
info@lappukraine.com
www.lappukraine.com

United Arab Emirates
LAPP Cables Middle East FZE
HQ Building A-502
DUBAI SILICON OASIS
P.O. Box 341223
Tel.: +971 4 8860744
Fax: +971 4 8860742
lappme@lappgroup.com
www.lappgroup.com

Uruguay
Reprinter LTDA.
Avda. Italia 6481
MONTEVIDEO
Tel.: +598 2600-7343
Fax: +598 2600-8658
reprinter@multi.com.uy
www.reprinter.com.uy

USA
Lapp USA, Inc.
29 Hanover Road
FLORHAM PARK, NJ 07932
Tel.: +1 973 6609700
Fax: +1 973 6609330
sales@lappusa.com
www.lappusa.com

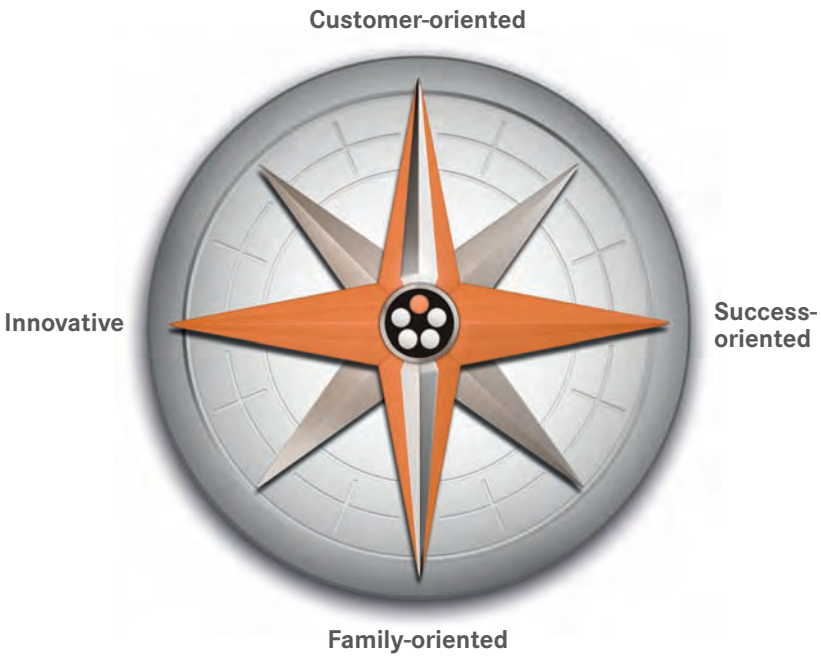
Lapp Tannehill, Inc.
8675 Eagle Creek Parkway Suite 900
SAVAGE, MN 55378
Tel.: +1 952 8816700
Fax: +1 952 8810743
sales@lapptannehill.com
www.lapptannehill.com

Uzbekistan
Elektro-Potential LLC
2b, G. Mavlyanov str. off. 311
100084 TASHKENT
Tel.: +99 898 3003821
Fax: +99 871 1249286
mz1958@yandex.ru

Venezuela
Somerinca C.A.
3era Transversal Dos Caminos
Quinta Corazon de Jesús
1070 CARACAS
Tel.: +58 212 2373003
Fax: +58 212 2399341
klocmoeller@cantv.net

Vietnam
Jebsen & Jessen Vietnam Co., Ltd
(JJ-Lapp Cable Division)
Sailing Tower, Unit 1206, 12 floor,
111A, Pasteur Street, District 1
HO CHI MINH CITY
Tel.: +848 35 203411
Fax: +848 38 272677
sales_jjlv@jjsea.com
www.jj-lappcable.com

Our guiding principles



Customer-oriented

We strive to make our customers successful in their markets. We work together reliably with our partners in a spirit of trust.

- We take each existing and potential customer serious and treat one another with respect
- We guarantee our customers worldwide security of supply through international manufacturing locations and local stocking of Lapp brand-name products
- We are there for our customers all over the world with our competent staff
- We find quick, flexible and simple solutions for our customers
- We provide our customers a competitive price-performance ratio
- We work together with our partners on a long-term basis and grow with them
- We complete our range of skills with strong partners
- We strengthen our global growth with an international network of partners

Success-oriented

Success orientation is important to us in order to secure our independence and our profitable growth.

- Our achievement-oriented organisation inspires customers and other stakeholders
- Our organisation is versatile and adapts to new challenges
- Our organisation has transparent structures which are aligned with our processes
- We encourage team-oriented decision making
- We remain conscious of our risks while driving our growth
- We are cost and result conscious
- We orient ourselves to mutually agreed targets and communicate these
- Our decisions are sustainable and long-term oriented

Family-oriented

Long-term orientation, warmth and the familiar atmosphere of our family-owned and operated company stand against coldness and anonymity.

- Our corporate culture is characterised by treating one another with respect
- We promote personal responsibility and initiative
- We communicate openly and transparently
- We work together toward our goal in a spirit of trust
- We reflect our thoughts and actions constructively
- We secure our future through actively training and developing our staff
- We respect human rights, values and standards in all cultures. We are committed to social responsibility
- The shareholders identify themselves with the company. Lapp remains a family-owned enterprise

Innovative

For us, innovation means future-oriented solutions for our customers.

- We continuously develop our products, system solutions and services
- We set standards with our brand-name products in terms of safety, quality and functionality
- We are always striving towards improvements in methods, processes and technologies
- We manufacture our innovative brand-name products in our own, flexible plants
- We pledge ourselves to ensure safety, the well-being of our employees, the protection of our environment and the conservation of resources when manufacturing our products

Know how

KNOW HOW and INNOVATION are our drivers to move from engineering to the cable.

Our LABORATORY CENTER executes tests during every step of the production process.

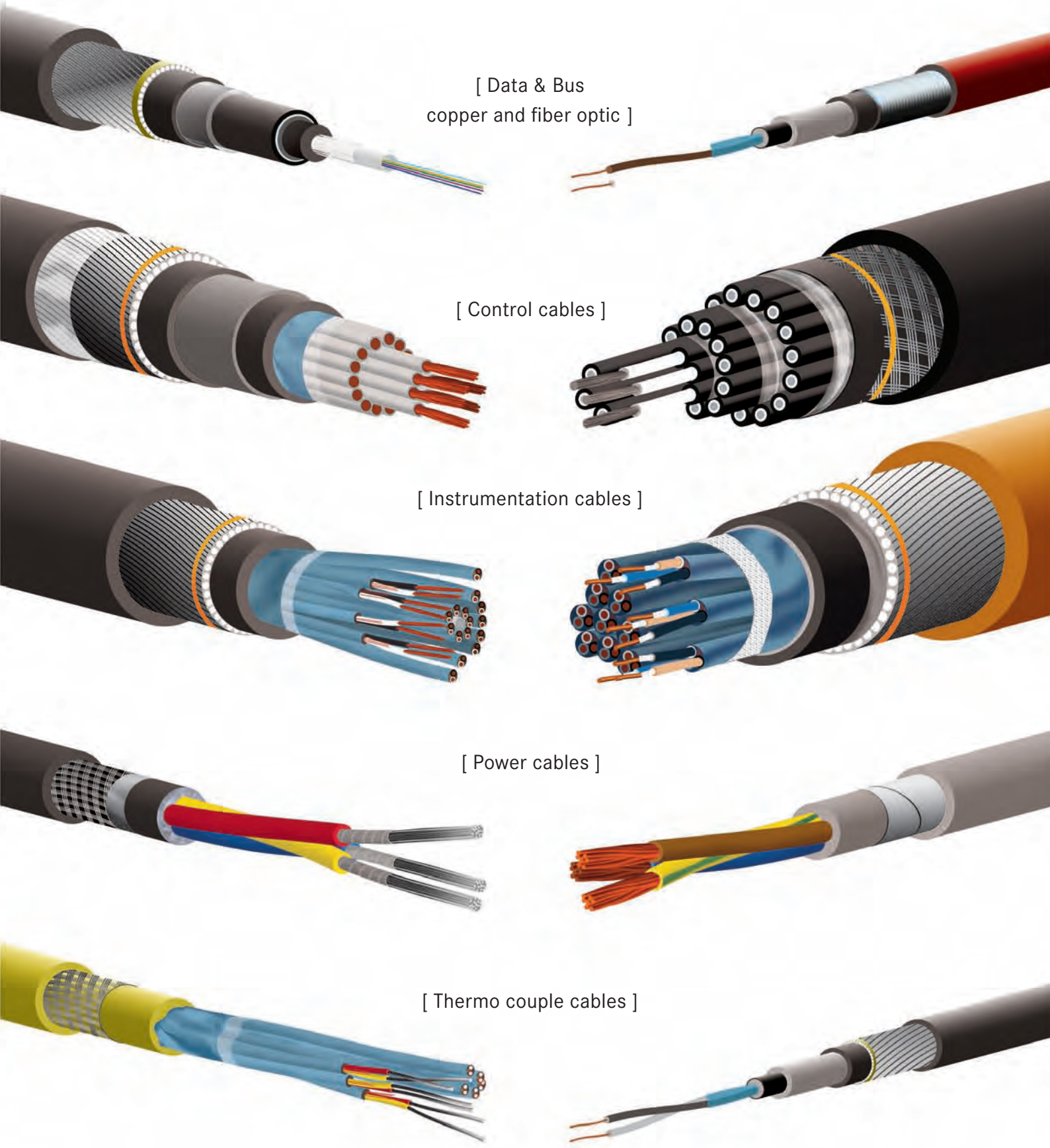
We develop cables with high RELIABILITY, QUALITY and DURABILITY.

CUSTOMERS and our TECHNICAL DEPARTMENT create solutions together to meet the project requirements.

We can design and manufacture the AL/HDPE/PA technology as alternative to the lead jacket cable.

We are able to manufacture tailor made cable in SHORT LENGTHS and also in very SHORT TIME.

The Lapp Group worldwide



[Data & Bus
copper and fiber optic]

[Control cables]

[Instrumentation cables]

[Power cables]

[Thermo couple cables]

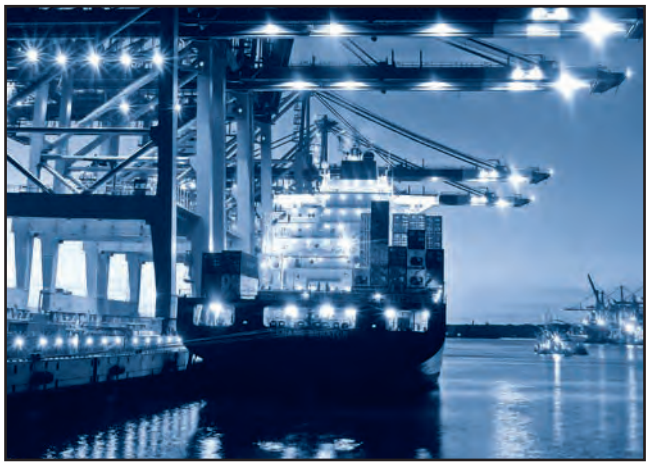
Most of our cables are designed and manufactured according to customer needs, they fulfill the technical specs of plants and applications. Our cables are devoted to measurement and control, to connect sensors and actuators and to be installed in dangerous areas such as intrinsically safe or explosion proof zones.

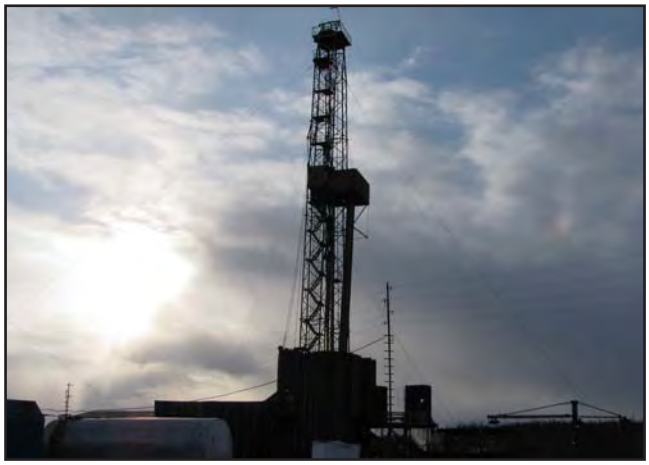
Application Fields





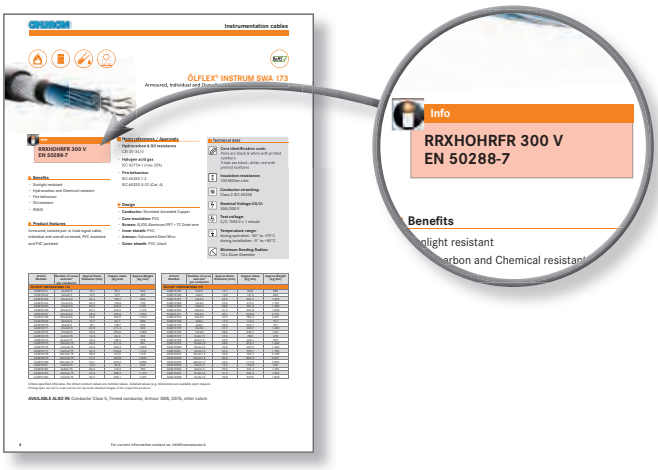

Camuna Cavi is listed on the vendor lists of the major EPC, Operators and End-Users.
The Industrial Project Business Unit supplies products in full compliance with our customers' technical specifications to meet applications whenever durability, quality and reliability are mandatory.



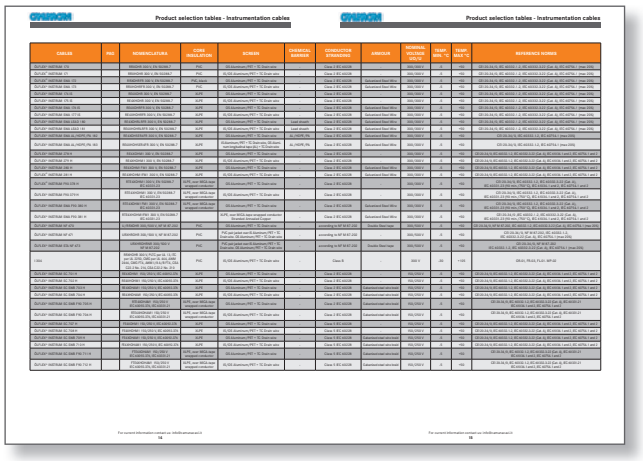


Finding everything easily – the new navigation

Cable's identification code



Product selection tables



Legend for pictograms

- FIRE BEHAVIOUR
- OIL RESISTANT
- HYDROCARBON AND CHEMICAL RESISTANT
- SUNLIGHT RESISTANT
- HALOGEN FREE
- LOW SMOKE
- DNV
- RINA
- BV
- LLOYD'S REGISTER
- RoHS

Legend for abbreviations

SWB:	**STEEL WIRE BRAID**
SWA:	**STEEL WIRE ARMOUR**
LEAD:	**LEAD SHEATH**
AL/HDPE/PA:	**MULTI LAYER SHEATH**
F90:	**FIRE RESISTANT 90 MINUTES**
NF:	**FRENCH NORM**
STA:	**STEEL TAPE ARMOUR**
H:	**HALOGEN FREE**
IS:	**INTRINSECALLY SAFE**
ST:	**ALUMINIUM FOIL SCREEN**
iST:	**INDIVIDUAL STATIC ALUMINIUM FOIL SCREEN**
oST:	**OVERALL STATIC ALUMINIUM FOIL SCREEN**
TT:	**THERMO COUPLE CONDUCTOR TYPE**
XLPO:	**CROSSLINKED POLYOLEFIN**
LSZH:	**LOW SMOKE ZERO HALOGEN**

How we help you:

- In part TT you can find information about the selection and handling of our products.
- In parts T1 to T30 detailed information is given and the relevant standards are referred to, such as: Assembly and cable laying guidelines, rating tables, colour codes and an overview about chemical resistance.

Cable's identification code
GEN to CEI-UNEL 35011

Conductors

U	Solid Conductor
R	Stranded conductor
F	Flexible Conductor
FF	Extra Flexible Conductor

Insulations

R	PVC
R2	PVC Type R2
R3	PVC 105°C
R7	PVC 90°C
E	Polyethylene
E4	Cross-linked Polyethylene (XLPE)
G4	Silicon Rubber
G7	Hich Module Ethylene Propylene Rubber (HEPR)
G10	Low Smoke Cross-Linked Polyolefin (XLPO)
T	Mica Glass Tape

Cable's shape

O	Round shape cable
D	Flat Cable
X	Cores twisted in pairs, triad, quad

Shields

C	Copper Concentric conductor
H	Aluminium Polyester Tape
H1	Copper tape or Copper wires shield
H2	Copper Braid Shield
H3	Double Copper Braid Shield
H5	Longitudinal Aluminium Tape

Armours

A	Steel Wire Braid
F	Steel Wires
N	Steel Tape
Z	Steel Stripes
L	Lead Jacket
H4	Longitudinal Corrugated Steel Tape

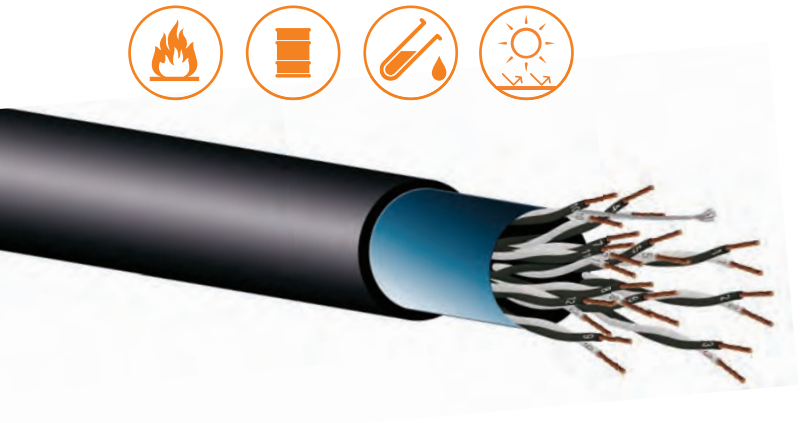
Jackets

R	PVC
R4	Polyamide (nylon)
E	Polyethylene
E4	Cross-linked Polyethylene (XLPE)
G	Cross-linked Elastomer
M1	Low Smoke Halogen Free Thermoplastic Material
M2	Low Smoke Halogen Free cross-linked Material
T	Textitle Braid
T1	Glass Type
T2	Special Textile
P	Polyutherane
Tpe	Termoplastic Elastomer

CONDUCTORS
INSULATIONS
CABLE'S SHAPE
SHIELDS
ARMOURS
JACKETS

CABLES	PAG	NOMENCLATURA	CORE INSULATION	SCREEN	CHEMICAL BARRIER
ÖLFLEX® INSTRUM 170		RRXOHR 300 V, EN 50288-7	PVC	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM 171		RRXHOHR 300 V, EN 50288-7	PVC	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SWA 172		RRXOHRFR 300 V, EN 50288-7	PVC, black	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SWA 173		RRXHOHRFR 300 V, EN 50288-7	PVC	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM 174 IS		RE4XOHR 300 V, EN 50288-7	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM 175 IS		RE4XHOHR 300 V, EN 50288-7	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SWA 176 IS		RE4XOHRFR 300 V, EN 50288-7	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SWA 177 IS		RE4XHOHRFR 300 V, EN 50288-7	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SWA LEAD 180		RE4XOHRLRFR 300 V, EN 50288-7	XLPE	OS Aluminum/PET + TC Drain wire	Lead sheath
ÖLFLEX® INSTRUM SWA LEAD 181		RE4XHOHRLRFR 300 V, EN 50288-7	XLPE	IS/OS Aluminum/PET + TC Drain wire	Lead sheath
ÖLFLEX® INSTRUM SWA AL/HDPE/PA 182		RE4XOH5ER4FR 300 V, EN 50288-7	XLPE	OS Aluminum/PET + TC Drain wire	AL/HDPE/PA
ÖLFLEX® INSTRUM SWA AL/HDPE/PA 183		RE4XHOH5ER4FR 300 V, EN 50288-7	XLPE	IS Aluminum/PET + TC Drain wire, OS Aluminum longitudinal tape (AL) + TC Drain wire	AL/HDPE/PA
ÖLFLEX® INSTRUM 278 H		RE4XOHM1 300 V, EN 50288-7	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM 279 H		RE4XHOHM1 300 V, EN 50288-7	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM 280 H		RE4XOHM1FM1 300 V, EN 50288-7	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM 281 H		RE4XHOHM1FM1 300 V, EN 50288-7	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM F90 378 H		RTE4XOHM1 300 V, EN 50288-7 IEC 60331-23	XLPE, over MICA-tape wrapped conductor	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM F90 379 H		RTE4XHOHM1 300 V, EN 50288-7 IEC 60331-23	XLPE, over MICA-tape wrapped conductor	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SWA F90 380 H		RTE4XOHM1FM1 300 V, EN 50288-7 IEC 60331-23	XLPE, over MICA-tape wrapped conductor	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SWA F90 381 H		RTE4XHOHM1FM1 300 V, EN 50288-7 IEC 60331-23		XLPE, over MICA-tape wrapped conductor Stranded Annealed Copper	-
ÖLFLEX® INSTRUM NF 670		U/RRXOHR 300/500 V, NF M 87-202	PVC	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM NF 671		URXHROHR 300/500 V, NF M 87-202	PVC	PVC pair jacket over IS Aluminum/PET + TC Drain wire. OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM STA NF 673		URXHROHRNR 300/500 V NF M 87-202	PVC	PVC pair jacket over IS Aluminum/PET + TC Drain wire. OS Aluminum/PET + TC Drain wire	-
I 304		RRXHOHR 300 V, PLTC per UL 13, ITC per UL 2250, CMG per UL 444, AWM 2464, CMG FT4, AWM I/II A/B FT4, CSA C22.2 No. 214, CSA C22.2 No. 210	PVC	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC 701 H		RE4XOHM1 150/250 V, IEC 60092-376	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC 702 H		RE4XHOHM1 150/250 V, IEC 60092-376	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB 703 H		RE4XOHAM1 150/250 V, IEC 60092-376	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB 704 H		RE4XHOHAM1 150/250 V, IEC 60092-376	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB F90 705 H		RTE4XOHAM1 150/250 V IEC 60092-376, IEC 60331-21	XLPE, over MICA-tape wrapped conductor	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB F90 706 H		RTE4XHOHAM1 150/250 V IEC 60092-376, IEC 60331-21	XLPE, over MICA-tape wrapped conductor	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC 707 H		FE4XOHM1 150/250 V, IEC 60092-376	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC 708 H		FE4XHOHM1 150/250 V, IEC 60092-376	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB 709 H		FE4XOHAM1 150/250 V, IEC 60092-376	XLPE	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB 710 H		FE4XHOHAM1 150/250 V, IEC 60092-376	XLPE	IS/OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB F90 711 H		FTE4XOHAM1 150/250 V IEC 60092-376, IEC 60331-21	XLPE, over MICA-tape wrapped conductor	OS Aluminum/PET + TC Drain wire	-
ÖLFLEX® INSTRUM SC SWB F90 712 H		FTE4XHOHAM1 150/250 V IEC 60092-376, IEC 60331-21	XLPE, over MICA-tape wrapped conductor	IS/OS Aluminum/PET + TC Drain wire	-

CONDUCTOR STRANDING	ARMOUR	NOMINAL VOLTAGE UO/U	TEMP. MIN. °C	TEMP. MAX °C	REFERENCE NORMS
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60754-1 (max 20%)
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60754-1 (max 20%)
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-23 (90 min./750°C), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	-	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-23 (90 min./750°C), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-23 (90 min./750°C), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized Steel Wire	300/300 V	-5	+50	CEI 20-34/0 ,IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-23 (90 min./750°C), IEC 61034-1 and 2, IEC 60754-1 and 2
according to NF M 87-202	Double Steel tape	300/500 V	-5	+50	CEI 20-34/0, NF M 87-202, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
according to NF M 87-202	-	300/500 V	-5	+50	CEI 20-34/0, NF M 87-202, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
according to NF M 87-202	Double Steel tape	300/500 V	-5	+50	CEI 20-34/0, NF M 87-202 IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60754-1 (max 20%)
Class B	-	300 V	-30	+105	OR-01, FR-03, FL-01. MP-02
Class 2 IEC 60228	-	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	-	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-21 IEC 61034-1 and 2, IEC 60754-1 and 2
Class 2 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-21 IEC 61034-1 and 2, IEC 60754-1 and 2
Class 5 IEC 60228	-	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 5 IEC 60228	-	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 5 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 5 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 61034-1 and 2, IEC 60754-1 and 2
Class 5 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-21 IEC 61034-1 and 2, IEC 60754-1 and 2
Class 5 IEC 60228	Galvanized steel wire braid	150/250 V	-5	+50	CEI 20-34/0, IEC 60332-1-2, IEC 60332-3-22 (Cat. A), IEC 60331-21 IEC 61034-1 and 2, IEC 60754-1 and 2



ÖLFLEX® INSTRUM 170

Overall screened instrumentation cable

Info

RRXOHR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** PVC
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
100 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

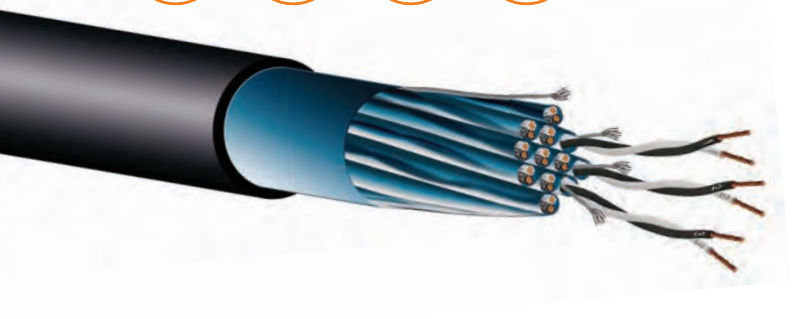
Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 170				
CAM10001	1x2x0,5	5,1	15,1	36
CAM10002	2x2x0,5	7,5	25,4	68
CAM10003	6x2x0,5	10,5	66,7	142
CAM10004	10x2x0,5	13,4	108,0	216
CAM10005	12x2x0,5	13,9	128,7	239
CAM10006	16x2x0,5	15,6	170,0	313
CAM10007	20x2x0,5	17,5	211,3	396
CAM10008	24x2x0,5	19,4	252,6	456
CAM10009	30x2x0,5	20,7	314,6	550
CAM10010	1x3x0,5	5,4	20,2	44
CAM10011	3x3x0,5	9,0	51,2	106
CAM10012	6x3x0,5	11,8	97,7	196
CAM10013	10x3x0,5	15,2	159,7	301
CAM10014	12x3x0,5	15,7	190,6	337
CAM10015	1x2x0,75	5,9	20,2	47
CAM10016	2x2x0,75	8,4	35,7	87
CAM10017	6x2x0,75	12,1	97,5	193
CAM10018	10x2x0,75	15,5	159,4	295
CAM10019	12x2x0,75	16,0	190,3	329
CAM10020	16x2x0,75	18,0	252,2	431
CAM10021	20x2x0,75	20,2	314,0	546
CAM10022	24x2x0,75	22,4	375,9	630
CAM10023	30x2x0,75	23,9	468,7	760
CAM10024	1x3x0,75	6,2	27,9	58
CAM10025	3x3x0,75	10,1	74,3	139
CAM10026	6x3x0,75	13,4	143,9	261
CAM10027	10x3x0,75	17,5	236,7	414
CAM10028	12x3x0,75	18,1	283,1	466

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 170				
CAM10029	1x2x1	6,4	25,6	55
CAM10030	2x2x1	9,4	46,5	109
CAM10031	6x2x1	13,2	130,1	238
CAM10032	10x2x1	17,2	213,6	375
CAM10033	12x2x1	17,8	255,4	419
CAM10034	16x2x1	19,7	338,9	540
CAM10035	20x2x1	22,2	422,5	684
CAM10036	24x2x1	24,8	506,0	804
CAM10037	30x2x1	26,5	631,4	972
CAM10038	1x3x1	6,7	36,1	69
CAM10039	3x3x1	11,0	98,7	170
CAM10040	6x3x1	14,9	192,7	333
CAM10041	10x3x1	19,2	318,0	518
CAM10042	12x3x1	20,1	380,7	595
CAM10043	1x2x1,5	7,2	36,5	71
CAM10044	2x2x1,5	10,8	68,2	145
CAM10045	6x2x1,5	15,5	195,1	336
CAM10046	10x2x1,5	20,2	322,1	529
CAM10047	12x2x1,5	20,9	385,5	594
CAM10048	16x2x1,5	23,4	512,5	782
CAM10049	20x2x1,5	26,3	639,4	989
CAM10050	24x2x1,5	29,4	766,3	1.161
CAM10051	30x2x1,5	31,4	956,7	1.404
CAM10052	1x3x1,5	7,6	52,3	92
CAM10053	3x3x1,5	13,0	147,5	240
CAM10054	6x3x1,5	17,5	290,3	472
CAM10055	10x3x1,5	22,6	480,7	738
CAM10056	12x3x1,5	23,6	575,9	850

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, other colors



ÖLFLEX® INSTRUM 171

Individual and overall screened instrumentation cable

Info

RRXHOHR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, individual and overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** PVC
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
100 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 171				
CAM10057	2x2x0,5	8,3	35,7	86
CAM10058	6x2x0,5	11,8	97,7	195
CAM10059	10x2x0,5	15,2	159,7	300
CAM10060	12x2x0,5	15,7	190,6	337
CAM10061	16x2x0,5	17,6	252,6	442
CAM10062	20x2x0,5	19,5	314,6	547
CAM10063	24x2x0,5	21,9	376,6	646
CAM10064	30x2x0,5	23,3	469,5	783
CAM10065	3x3x0,5	9,9	66,7	132
CAM10066	6x3x0,5	13,1	128,7	246
CAM10067	10x3x0,5	16,9	211,3	382
CAM10068	12x3x0,5	17,7	252,6	440
CAM10069	2x2x0,75	9,5	46,0	110
CAM10070	6x2x0,75	13,3	128,5	244
CAM10071	10x2x0,75	17,4	211,0	386
CAM10072	12x2x0,75	18,0	252,3	434
CAM10073	16x2x0,75	20,1	334,8	569
CAM10074	20x2x0,75	22,4	417,3	706
CAM10075	24x2x0,75	25,1	499,8	832
CAM10076	30x2x0,75	26,8	623,6	1.008
CAM10077	3x3x0,75	11,1	89,8	166
CAM10078	6x3x0,75	15,0	174,9	321
CAM10079	10x3x0,75	19,4	288,3	501
CAM10080	12x3x0,75	20,3	345,1	577

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 171				
CAM10081	2x2x1	10,3	56,8	130
CAM10082	6x2x1	14,8	161,0	299
CAM10083	10x2x1	19,0	265,3	462
CAM10084	12x2x1	19,7	317,4	520
CAM10085	16x2x1	22,1	421,6	684
CAM10086	20x2x1	24,8	525,8	864
CAM10087	24x2x1	27,8	630,0	1.017
CAM10088	30x2x1	29,6	786,3	1.233
CAM10089	3x3x1	12,4	114,2	205
CAM10090	6x3x1	16,4	223,7	389
CAM10091	10x3x1	21,5	369,7	619
CAM10092	12x3x1	22,2	442,7	702
CAM10093	2x2x1,5	12,0	78,5	173
CAM10094	6x2x1,5	17,2	226,1	403
CAM10095	10x2x1,5	22,2	373,7	625
CAM10096	12x2x1,5	23,2	447,5	716
CAM10097	16x2x1,5	26,0	595,1	940
CAM10098	20x2x1,5	29,2	742,7	1.186
CAM10099	24x2x1,5	32,7	890,3	1.394
CAM10100	30x2x1,5	34,8	1111,6	1.689
CAM10101	3x3x1,5	14,4	163,0	279
CAM10102	6x3x1,5	19,2	321,3	534
CAM10103	10x3x1,5	25,1	532,4	849
CAM10104	12x3x1,5	26,2	637,9	979

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor class 5, timed conductor, other colors

ÖLFLEX® INSTRUM SWA 172

Armoured, Overall screened instrumentation cable

Info

RRXOHRFR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured, twisted pair or triad signal cable, overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** PVC
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
100 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 172				
CAM10105	1x2x0,5	9,8	15,1	179
CAM10106	2x2x0,5	12,3	25,4	267
CAM10107	6x2x0,5	15,3	66,7	405
CAM10108	10x2x0,5	18,5	108,0	552
CAM10109	12x2x0,5	18,9	128,7	585
CAM10110	16x2x0,5	20,8	170,0	706
CAM10111	20x2x0,5	23,5	211,3	954
CAM10112	24x2x0,5	25,5	252,6	1.079
CAM10113	30x2x0,5	26,9	314,6	1.211
CAM10114	1x3x0,5	10,0	20,2	193
CAM10115	3x3x0,5	13,8	51,2	337
CAM10116	6x3x0,5	16,9	97,7	496
CAM10117	10x3x0,5	20,4	159,7	685
CAM10118	12x3x0,5	20,9	190,6	733
CAM10119	1x2x0,75	10,5	20,2	206
CAM10120	2x2x0,75	13,3	35,7	306
CAM10121	6x2x0,75	17,1	97,5	499
CAM10122	10x2x0,75	20,7	159,4	687
CAM10123	12x2x0,75	22,0	190,3	844
CAM10124	16x2x0,75	23,9	252,2	1.002
CAM10125	20x2x0,75	26,4	314,0	1.192
CAM10126	24x2x0,75	28,8	375,9	1.353
CAM10127	30x2x0,75	30,3	468,7	1.528
CAM10128	1x3x0,75	10,8	27,9	224
CAM10129	3x3x0,75	14,9	74,3	394
CAM10130	6x3x0,75	18,4	143,9	597
CAM10131	10x3x0,75	23,5	236,7	972
CAM10132	12x3x0,75	24,3	283,1	1.052

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 172				
CAM10133	1x2x1	11,0	25,6	224
CAM10134	2x2x1	14,2	46,5	349
CAM10135	6x2x1	18,2	130,1	569
CAM10136	10x2x1	23,2	213,6	925
CAM10137	12x2x1	23,8	255,4	985
CAM10138	16x2x1	25,9	338,9	1.174
CAM10139	20x2x1	28,6	422,5	1.403
CAM10140	24x2x1	31,2	506,0	1.599
CAM10141	30x2x1	33,9	631,4	2.012
CAM10142	1x3x1	11,3	36,1	246
CAM10143	3x3x1	15,9	98,7	446
CAM10144	6x3x1	20,0	192,7	701
CAM10145	10x3x1	25,4	318,0	1.137
CAM10146	12x3x1	26,3	380,7	1.239
CAM10147	1x2x1,5	11,8	36,5	258
CAM10148	2x2x1,5	15,6	68,2	415
CAM10149	6x2x1,5	20,7	195,1	727
CAM10150	10x2x1,5	26,4	322,1	1.176
CAM10151	12x2x1,5	27,1	385,5	1.260
CAM10152	16x2x1,5	29,8	512,5	1.535
CAM10153	20x2x1,5	33,7	639,4	2.022
CAM10154	24x2x1,5	36,9	766,3	2.320
CAM10155	30x2x1,5	38,9	956,7	2.634
CAM10156	1x3x1,5	12,5	52,3	294
CAM10157	3x3x1,5	18,0	147,5	566
CAM10158	6x3x1,5	23,5	290,3	1.029
CAM10159	10x3x1,5	29,0	480,7	1.467
CAM10160	12x3x1,5	30,0	575,9	1.608

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, Armour SWB, DSTA, other colors

ÖLFLEX® INSTRUM SWA 173

Armoured, Individual and Overall screened instrumentation cable

Info

RRXHOHRFR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured, twisted pair or triad signal cable, individual and overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** PVC
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
100 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

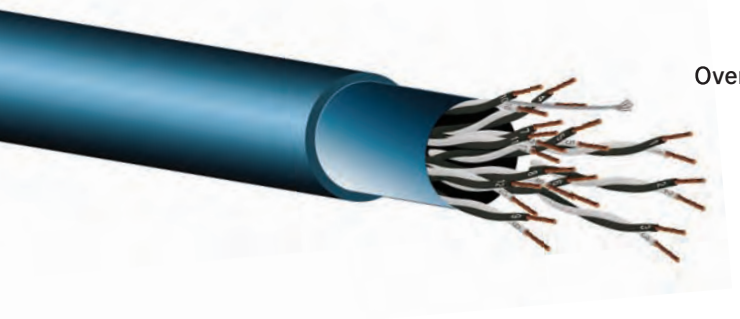
Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 173				
CAM10161	2x2x0,5	13,1	35,7	302
CAM10162	6x2x0,5	16,9	97,7	495
CAM10163	10x2x0,5	20,4	159,7	684
CAM10164	12x2x0,5	20,9	190,6	732
CAM10165	16x2x0,5	23,5	252,6	1.001
CAM10166	20x2x0,5	25,7	314,6	1.175
CAM10167	24x2x0,5	28,3	376,6	1.354
CAM10168	30x2x0,5	29,8	469,5	1.534
CAM10169	3x3x0,5	14,7	66,7	383
CAM10170	6x3x0,5	18,1	128,7	574
CAM10171	10x3x0,5	22,9	211,3	922
CAM10172	12x3x0,5	23,6	252,6	1.003
CAM10173	2x2x0,75	14,3	46,0	352
CAM10174	6x2x0,75	18,4	128,5	578
CAM10175	10x2x0,75	23,4	211,0	941
CAM10176	12x2x0,75	24,0	252,3	1.005
CAM10177	16x2x0,75	26,3	334,8	1.214
CAM10178	20x2x0,75	28,8	417,3	1.431
CAM10179	24x2x0,75	31,5	499,8	1.635
CAM10180	30x2x0,75	34,1	623,6	2.058
CAM10181	3x3x0,75	16,0	89,8	444
CAM10182	6x3x0,75	20,3	174,9	702
CAM10183	10x3x0,75	25,6	288,3	1.124
CAM10184	12x3x0,75	26,5	345,1	1.225

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 173				
CAM10185	2x2x1	15,1	56,8	389
CAM10186	6x2x1	19,8	161,0	664
CAM10187	10x2x1	25,2	265,3	1.075
CAM10188	12x2x1	25,9	317,4	1.152
CAM10189	16x2x1	28,5	421,6	1.399
CAM10190	20x2x1	31,2	525,8	1.659
CAM10191	24x2x1	35,1	630,0	2.101
CAM10192	30x2x1	37,2	786,3	2.401
CAM10193	3x3x1	17,4	114,2	517
CAM10194	6x3x1	22,4	223,7	917
CAM10195	10x3x1	27,7	369,7	1.303
CAM10196	12x3x1	28,6	442,7	1.421
CAM10197	2x2x1,5	17,0	78,5	478
CAM10198	6x2x1,5	23,2	226,1	953
CAM10199	10x2x1,5	28,6	373,7	1.344
CAM10200	12x2x1,5	29,6	447,5	1.463
CAM10201	16x2x1,5	32,6	595,1	1.785
CAM10202	20x2x1,5	36,8	742,7	2.340
CAM10203	24x2x1,5	40,4	890,3	2.691
CAM10204	30x2x1,5	42,6	1111,6	3.065
CAM10205	3x3x1,5	19,4	163,0	636
CAM10206	6x3x1,5	25,4	321,3	1.152
CAM10207	10x3x1,5	31,5	532,4	1.652
CAM10208	12x3x1,5	32,8	637,9	1.828

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, Armour SWB, DSTA, other colors



ÖLFLEX® INSTRUM 174 IS

Overall screened instrumentation cable for intrinsically safe circuits

Info

RE4XOHR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Outer sheath:** PVC, blue RAL 5015

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 174 IS				
CAM10209	1x2x0,5	5,1	15,1	34
CAM10210	2x2x0,5	7,5	25,4	65
CAM10211	6x2x0,5	10,5	66,7	132
CAM10212	10x2x0,5	13,4	108,0	199
CAM10213	12x2x0,5	13,9	128,7	219
CAM10214	16x2x0,5	15,6	170,0	286
CAM10215	20x2x0,5	17,5	211,3	363
CAM10216	24x2x0,5	19,4	252,6	416
CAM10217	30x2x0,5	20,7	314,6	500
CAM10218	1x3x0,5	5,4	20,2	41
CAM10219	3x3x0,5	9,0	51,2	99
CAM10220	6x3x0,5	11,8	97,7	181
CAM10221	10x3x0,5	15,2	159,7	276
CAM10222	12x3x0,5	15,7	190,6	307
CAM10223	1x2x0,75	5,9	20,2	45
CAM10224	2x2x0,75	8,4	35,7	83
CAM10225	6x2x0,75	12,1	97,5	180
CAM10226	10x2x0,75	15,5	159,4	274
CAM10227	12x2x0,75	16,0	190,3	303
CAM10228	16x2x0,75	18,0	252,2	396
CAM10229	20x2x0,75	20,2	314,0	502
CAM10230	24x2x0,75	22,4	375,9	578
CAM10231	30x2x0,75	23,9	468,7	695
CAM10232	1x3x0,75	6,2	27,9	55
CAM10233	3x3x0,75	10,1	74,3	129
CAM10234	6x3x0,75	13,4	143,9	242
CAM10235	10x3x0,75	17,5	236,7	381
CAM10236	12x3x0,75	18,1	283,1	427

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 174 IS				
CAM10237	1x2x1	6,4	25,6	52
CAM10238	2x2x1	9,4	46,5	104
CAM10239	6x2x1	13,2	130,1	223
CAM10240	10x2x1	17,2	213,6	349
CAM10241	12x2x1	17,8	255,4	388
CAM10242	16x2x1	19,7	338,9	499
CAM10243	20x2x1	22,2	422,5	633
CAM10244	24x2x1	24,8	506,0	742
CAM10245	30x2x1	26,5	631,4	894
CAM10246	1x3x1	6,7	36,1	65
CAM10247	3x3x1	11,0	98,7	159
CAM10248	6x3x1	14,9	192,7	309
CAM10249	10x3x1	19,2	318,0	479
CAM10250	12x3x1	20,1	380,7	549
CAM10251	1x2x1,5	7,2	36,5	67
CAM10252	2x2x1,5	10,8	68,2	138
CAM10253	6x2x1,5	15,5	195,1	315
CAM10254	10x2x1,5	20,2	322,1	494
CAM10255	12x2x1,5	20,9	385,5	552
CAM10256	16x2x1,5	23,4	512,5	725
CAM10257	20x2x1,5	26,3	639,4	919
CAM10258	24x2x1,5	29,4	766,3	1.076
CAM10259	30x2x1,5	31,4	956,7	1.299
CAM10260	1x3x1,5	7,6	52,3	87
CAM10261	3x3x1,5	13,0	147,5	224
CAM10262	6x3x1,5	17,5	290,3	440
CAM10263	10x3x1,5	22,6	480,7	685
CAM10264	12x3x1,5	23,6	575,9	786

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, other colors

ÖLFLEX® INSTRUM 175 IS

Individual and overall screened instrumentation cable for intrinsically safe circuits

Info

RE4XHOHR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, individual and overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Outer sheath:** PVC, blue RAL 5015

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

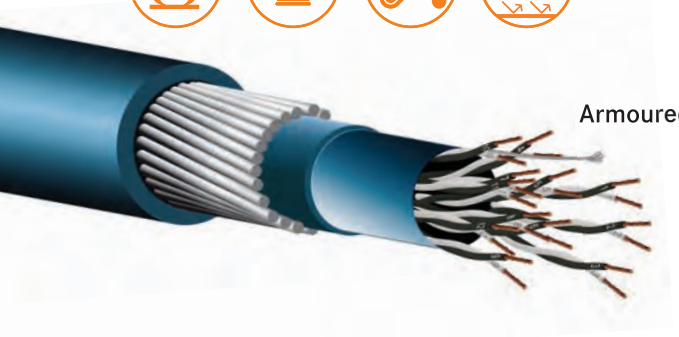
Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 175 IS				
CAM10265	2x2x0,5	8,3	35,7	83
CAM10266	6x2x0,5	11,8	97,7	185
CAM10267	10x2x0,5	15,2	159,7	284
CAM10268	12x2x0,5	15,7	190,6	317
CAM10269	16x2x0,5	17,6	252,6	415
CAM10270	20x2x0,5	19,5	314,6	514
CAM10271	24x2x0,5	21,9	376,6	606
CAM10272	30x2x0,5	23,3	469,5	732
CAM10273	3x3x0,5	9,9	66,7	124
CAM10274	6x3x0,5	13,1	128,7	230
CAM10275	10x3x0,5	16,9	211,3	357
CAM10276	12x3x0,5	17,7	252,6	410
CAM10277	2x2x0,75	9,5	46,0	106
CAM10278	6x2x0,75	13,3	128,5	231
CAM10279	10x2x0,75	17,4	211,0	365
CAM10280	12x2x0,75	18,0	252,3	408
CAM10281	16x2x0,75	20,1	334,8	534
CAM10282	20x2x0,75	22,4	417,3	663
CAM10283	24x2x0,75	25,1	499,8	780
CAM10284	30x2x0,75	26,8	623,6	943
CAM10285	3x3x0,75	11,1	89,8	156
CAM10286	6x3x0,75	15,0	174,9	302
CAM10287	10x3x0,75	19,4	288,3	468
CAM10288	12x3x0,75	20,3	345,1	538

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 175 IS				
CAM10289	2x2x1	10,3	56,8	124
CAM10290	6x2x1	14,8	161,0	283
CAM10291	10x2x1	19,0	265,3	436
CAM10292	12x2x1	19,7	317,4	489
CAM10293	16x2x1	22,1	421,6	643
CAM10294	20x2x1	24,8	525,8	812
CAM10295	24x2x1	27,8	630,0	955
CAM10296	30x2x1	29,6	786,3	1.155
CAM10297	3x3x1	12,4	114,2	193
CAM10298	6x3x1	16,4	223,7	366
CAM10299	10x3x1	21,5	369,7	580
CAM10300	12x3x1	22,2	442,7	656
CAM10301	2x2x1,5	12,0	78,5	166
CAM10302	6x2x1,5	17,2	226,1	382
CAM10303	10x2x1,5	22,2	373,7	589
CAM10304	12x2x1,5	23,2	447,5	673
CAM10305	16x2x1,5	26,0	595,1	884
CAM10306	20x2x1,5	29,2	742,7	1.116
CAM10307	24x2x1,5	32,7	890,3	1.310
CAM10308	30x2x1,5	34,8	1111,6	1.583
CAM10309	3x3x1,5	14,4	163,0	263
CAM10310	6x3x1,5	19,2	321,3	502
CAM10311	10x3x1,5	25,1	532,4	797
CAM10312	12x3x1,5	26,2	637,9	915

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, other colors



ÖLFLEX® INSTRUM SWA 176 IS

Armoured overall screened instrumentation cable for intrinsically safe circuits

Info

RE4XOHRFR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured twisted pair or triad signal cable, overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC, blue RAL 5015
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, blue RAL 5015

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

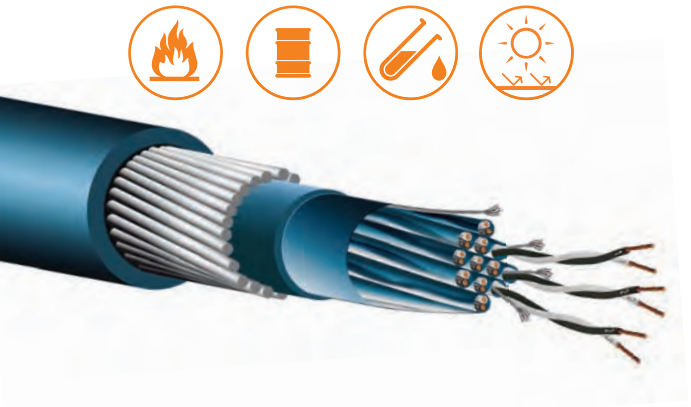
Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 176 IS				
CAM10313	1x2x0,5	9,8	15,1	177
CAM10314	2x2x0,5	12,3	25,4	264
CAM10315	6x2x0,5	15,3	66,7	395
CAM10316	10x2x0,5	18,5	108,0	535
CAM10317	12x2x0,5	18,9	128,7	565
CAM10318	16x2x0,5	20,8	170,0	679
CAM10319	20x2x0,5	23,5	211,3	921
CAM10320	24x2x0,5	25,5	252,6	1.039
CAM10321	30x2x0,5	26,9	314,6	1.161
CAM10322	1x3x0,5	10,0	20,2	190
CAM10323	3x3x0,5	13,8	51,2	330
CAM10324	6x3x0,5	16,9	97,7	481
CAM10325	10x3x0,5	20,4	159,7	660
CAM10326	12x3x0,5	20,9	190,6	703
CAM10327	1x2x0,75	10,5	20,2	204
CAM10328	2x2x0,75	13,3	35,7	302
CAM10329	6x2x0,75	17,1	97,5	486
CAM10330	10x2x0,75	20,7	159,4	665
CAM10331	12x2x0,75	22,0	190,3	818
CAM10332	16x2x0,75	23,9	252,2	967
CAM10333	20x2x0,75	26,4	314,0	1.149
CAM10334	24x2x0,75	28,8	375,9	1.300
CAM10335	30x2x0,75	30,3	468,7	1.463
CAM10336	1x3x0,75	10,8	27,9	221
CAM10337	3x3x0,75	14,9	74,3	385
CAM10338	6x3x0,75	18,4	143,9	577
CAM10339	10x3x0,75	23,5	236,7	939
CAM10340	12x3x0,75	24,3	283,1	1.013

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 176 IS				
CAM10341	1x2x1	11,0	25,6	222
CAM10342	2x2x1	14,2	46,5	344
CAM10343	6x2x1	18,2	130,1	554
CAM10344	10x2x1	23,2	213,6	899
CAM10345	12x2x1	23,8	255,4	954
CAM10346	16x2x1	25,9	338,9	1.132
CAM10347	20x2x1	28,6	422,5	1.351
CAM10348	24x2x1	31,2	506,0	1.537
CAM10349	30x2x1	33,9	631,4	1.934
CAM10350	1x3x1	11,3	36,1	242
CAM10351	3x3x1	15,9	98,7	435
CAM10352	6x3x1	20,0	192,7	678
CAM10353	10x3x1	25,4	318,0	1.098
CAM10354	12x3x1	26,3	380,7	1.193
CAM10355	1x2x1,5	11,8	36,5	255
CAM10356	2x2x1,5	15,6	68,2	408
CAM10357	6x2x1,5	20,7	195,1	706
CAM10358	10x2x1,5	26,4	322,1	1.141
CAM10359	12x2x1,5	27,1	385,5	1.218
CAM10360	16x2x1,5	29,8	512,5	1.478
CAM10361	20x2x1,5	33,7	639,4	1.951
CAM10362	24x2x1,5	36,9	766,3	2.236
CAM10363	30x2x1,5	38,9	956,7	2.529
CAM10364	1x3x1,5	12,5	52,3	289
CAM10365	3x3x1,5	18,0	147,5	550
CAM10366	6x3x1,5	23,5	290,3	998
CAM10367	10x3x1,5	29,0	480,7	1.414
CAM10368	12x3x1,5	30,0	575,9	1.544

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, Armour SWB, DSTA, other colors



ÖLFLEX® INSTRUM SWA 177 IS

Armoured individual and overall screened instrumentation cable for intrinsically safe circuits

Info

RE4XHOHRFR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured twisted pair or triad signal cable, individual and overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC, blue RAL 5015
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, blue RAL 5015

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 177 IS				
CAM10369	2x2x0,5	13,1	35,7	298
CAM10370	6x2x0,5	16,9	97,7	485
CAM10371	10x2x0,5	20,4	159,7	667
CAM10372	12x2x0,5	20,9	190,6	712
CAM10373	16x2x0,5	23,5	252,6	975
CAM10374	20x2x0,5	25,7	314,6	1.142
CAM10375	24x2x0,5	28,3	376,6	1.314
CAM10376	30x2x0,5	29,8	469,5	1.484
CAM10377	3x3x0,5	14,7	66,7	375
CAM10378	6x3x0,5	18,1	128,7	559
CAM10379	10x3x0,5	22,9	211,3	897
CAM10380	12x3x0,5	23,6	252,6	972
CAM10381	2x2x0,75	14,3	46,0	348
CAM10382	6x2x0,75	18,4	128,5	565
CAM10383	10x2x0,75	23,4	211,0	919
CAM10384	12x2x0,75	24,0	252,3	979
CAM10385	16x2x0,75	26,3	334,8	1.179
CAM10386	20x2x0,75	28,8	417,3	1.388
CAM10387	24x2x0,75	31,5	499,8	1.583
CAM10388	30x2x0,75	34,1	623,6	1.993
CAM10389	3x3x0,75	16,0	89,8	434
CAM10390	6x3x0,75	20,3	174,9	683
CAM10391	10x3x0,75	25,6	288,3	1.092
CAM10392	12x3x0,75	26,5	345,1	1.186

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 177 IS				
CAM10393	2x2x1	15,1	56,8	384
CAM10394	6x2x1	19,8	161,0	648
CAM10395	10x2x1	25,2	265,3	1.050
CAM10396	12x2x1	25,9	317,4	1.121
CAM10397	16x2x1	28,5	421,6	1.357
CAM10398	20x2x1	31,2	525,8	1.607
CAM10399	24x2x1	35,1	630,0	2.039
CAM10400	30x2x1	37,2	786,3	2.323
CAM10401	3x3x1	17,4	114,2	506
CAM10402	6x3x1	22,4	223,7	894
CAM10403	10x3x1	27,7	369,7	1.264
CAM10404	12x3x1	28,6	442,7	1.374
CAM10405	2x2x1,5	17,0	78,5	471
CAM10406	6x2x1,5	23,2	226,1	931
CAM10407	10x2x1,5	28,6	373,7	1.308
CAM10408	12x2x1,5	29,6	447,5	1.421
CAM10409	16x2x1,5	32,6	595,1	1.729
CAM10410	20x2x1,5	36,8	742,7	2.270
CAM10411	24x2x1,5	40,4	890,3	2.607
CAM10412	30x2x1,5	42,6	1111,6	2.959
CAM10413	3x3x1,5	19,4	163,0	620
CAM10414	6x3x1,5	25,4	321,3	1.121
CAM10415	10x3x1,5	31,5	532,4	1.599
CAM10416	12x3x1,5	32,8	637,9	1.765

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, Armour SWB, DSTA, other colors

ÖLFLEX® INSTRUM SWA LEAD 180

Armoured, Lead jacketed, Overall screened instrumentation cable

Info

RE4XOHRLRFR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant

Productf eatures

Armoured, lead jacketed, twisted pair or triad signal cable, overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC, black
- **Chemical Barrier:** Lead sheath
- **Inner sheath:** PVC, black
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
15 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA LEAD 180				
CAM10417	1x2x0,5	13,7	15,1	468
CAM10418	2x2x0,5	16,5	25,4	673
CAM10419	6x2x0,5	19,7	66,7	962
CAM10420	10x2x0,5	23,1	108,0	1.283
CAM10421	12x2x0,5	23,5	128,7	1.332
CAM10422	16x2x0,5	25,4	170,0	1.523
CAM10423	20x2x0,5	28,5	211,3	1.966
CAM10424	24x2x0,5	30,6	252,6	2.244
CAM10425	30x2x0,5	32,1	314,6	2.449
CAM10426	1x3x0,5	14,2	20,2	520
CAM10427	3x3x0,5	18,2	51,2	837
CAM10428	6x3x0,5	21,3	97,7	1.104
CAM10429	10x3x0,5	25,0	159,7	1.486
CAM10430	12x3x0,5	25,5	190,6	1.551
CAM10431	1x2x0,75	14,7	20,2	553
CAM10432	2x2x0,75	17,5	35,7	745
CAM10433	6x2x0,75	21,5	97,5	1.119
CAM10434	10x2x0,75	25,4	159,4	1.506
CAM10435	12x2x0,75	26,8	190,3	1.779
CAM10436	16x2x0,75	29,0	252,2	2.034
CAM10437	20x2x0,75	31,4	314,0	2.397
CAM10438	24x2x0,75	33,8	375,9	2.660
CAM10439	30x2x0,75	36,2	468,7	3.057
CAM10440	1x3x0,75	15,0	27,9	581
CAM10441	3x3x0,75	19,4	74,3	938
CAM10442	6x3x0,75	23,1	143,9	1.325
CAM10443	10x3x0,75	28,5	236,7	1.984
CAM10444	12x3x0,75	29,1	283,1	2.074

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA LEAD 180				
CAM10445	1x2x1	15,2	25,6	588
CAM10446	2x2x1	18,6	46,5	868
CAM10447	6x2x1	22,9	130,1	1.292
CAM10448	10x2x1	28,2	213,6	1.930
CAM10449	12x2x1	28,8	255,4	2.013
CAM10450	16x2x1	31,0	338,9	2.357
CAM10451	20x2x1	33,7	422,5	2.704
CAM10452	24x2x1	37,1	506,0	3.184
CAM10453	30x2x1	39,8	631,4	3.804
CAM10454	1x3x1	15,5	36,1	621
CAM10455	3x3x1	20,5	98,7	1.035
CAM10456	6x3x1	24,8	192,7	1.503
CAM10457	10x3x1	30,2	318,0	2.213
CAM10458	12x3x1	31,3	380,7	2.435
CAM10459	1x2x1,5	16,0	36,5	651
CAM10460	2x2x1,5	20,0	68,2	987
CAM10461	6x2x1,5	25,3	195,1	1.546
CAM10462	10x2x1,5	31,4	322,1	2.388
CAM10463	12x2x1,5	32,3	385,5	2.515
CAM10464	16x2x1,5	35,5	512,5	3.029
CAM10465	20x2x1,5	39,5	639,4	3.809
CAM10466	24x2x1,5	42,8	766,3	4.276
CAM10467	30x2x1,5	45,2	956,7	4.836
CAM10468	1x3x1,5	16,7	52,3	702
CAM10469	3x3x1,5	22,6	147,5	1.278
CAM10470	6x3x1,5	28,5	290,3	2.041
CAM10471	10x3x1,5	34,0	480,7	2.785
CAM10472	12x3x1,5	35,6	575,9	3.104

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, other colors, Armour DSTA

ÖLFLEX® INSTRUM SWA LEAD 181

Armoured, Lead jacketed,
Individual and Overall screened instrumentation cable

Info

RE4XHOHRLRFR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant

Productf eatures

Armoured, lead jacketed, twisted pair or triad signal cable, individual and overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC, black
- **Chemical Barrier:** Lead sheath
- **Inner sheath:** PVC, black
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
15 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA LEAD 181				
CAM10473	2x2x0,5	17,3	35,7	735
CAM10474	6x2x0,5	21,3	97,7	1.108
CAM10475	10x2x0,5	25,0	159,7	1.494
CAM10476	12x2x0,5	25,5	190,6	1.560
CAM10477	16x2x0,5	28,6	252,6	2.022
CAM10478	20x2x0,5	30,8	314,6	2.356
CAM10479	24x2x0,5	33,3	376,6	2.648
CAM10480	30x2x0,5	35,4	469,5	3.032
CAM10481	3x3x0,5	19,1	66,7	919
CAM10482	6x3x0,5	22,8	128,7	1.293
CAM10483	10x3x0,5	27,7	211,3	1.899
CAM10484	12x3x0,5	28,7	252,6	2.025
CAM10485	2x2x0,75	18,7	46,0	875
CAM10486	6x2x0,75	23,0	128,5	1.309
CAM10487	10x2x0,75	28,4	211,0	1.958
CAM10488	12x2x0,75	29,0	252,3	2.046
CAM10489	16x2x0,75	31,4	334,8	2.424
CAM10490	20x2x0,75	33,9	417,3	2.752
CAM10491	24x2x0,75	37,4	499,8	3.244
CAM10492	30x2x0,75	40,2	623,6	3.898
CAM10493	3x3x0,75	20,6	89,8	1.038
CAM10494	6x3x0,75	24,9	174,9	1.504
CAM10495	10x3x0,75	30,6	288,3	2.298
CAM10496	12x3x0,75	31,5	345,1	2.437

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA LEAD 181				
CAM10497	2x2x1	19,5	56,8	944
CAM10498	6x2x1	24,6	161,0	1.467
CAM10499	10x2x1	30,1	265,3	2.155
CAM10500	12x2x1	30,9	317,4	2.343
CAM10501	16x2x1	33,5	421,6	2.702
CAM10502	20x2x1	37,1	525,8	3.255
CAM10503	24x2x1	41,2	630,0	4.001
CAM10504	30x2x1	43,1	786,3	4.378
CAM10505	3x3x1	22,0	114,2	1.207
CAM10506	6x3x1	27,3	223,7	1.875
CAM10507	10x3x1	32,9	369,7	2.591
CAM10508	12x3x1	33,6	442,7	2.726
CAM10509	2x2x1,5	21,4	78,5	1.101
CAM10510	6x2x1,5	28,2	226,1	1.963
CAM10511	10x2x1,5	33,7	373,7	2.661
CAM10512	12x2x1,5	34,9	447,5	2.922
CAM10513	16x2x1,5	38,3	595,1	3.425
CAM10514	20x2x1,5	42,7	742,7	4.302
CAM10515	24x2x1,5	46,5	890,3	4.976
CAM10516	30x2x1,5	49,5	1111,6	5.685
CAM10517	3x3x1,5	24,3	163,0	1.423
CAM10518	6x3x1,5	30,2	321,3	2.235
CAM10519	10x3x1,5	37,4	532,4	3.260
CAM10520	12x3x1,5	38,5	637,9	3.471

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, other colors, Armour DSTA

ÖLFLEX® INSTRUM SWA AL/HDPE/PA 182

Armoured, AL/HDPE/PA jacketed, Overall screened instrumentation cable

Info

RE4XOH5ER4FR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured, AL/HDPE/PA jacketed, twisted pair or triad signal cable, overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum longitudinal tape (AL) + TC Drain wire
- **Chemical Barrier:** AL/HDPE/PA
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

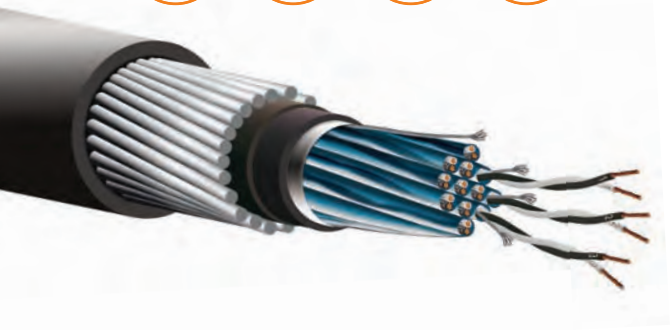
Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA AL/HDPE/PA 182				
CAM10521	1x2x0,5	11,6	15,1	229
CAM10522	2x2x0,5	13,9	25,4	313
CAM10523	6x2x0,5	16,9	66,7	447
CAM10524	10x2x0,5	19,8	108,0	581
CAM10525	12x2x0,5	20,5	128,7	621
CAM10526	16x2x0,5	22,9	170,0	844
CAM10527	20x2x0,5	25,1	211,3	986
CAM10528	24x2x0,5	26,9	252,6	1.094
CAM10529	30x2x0,5	28,5	314,6	1.227
CAM10530	1x3x0,5	11,8	20,2	242
CAM10531	3x3x0,5	15,2	51,2	372
CAM10532	6x3x0,5	18,2	97,7	526
CAM10533	10x3x0,5	21,8	159,7	706
CAM10534	12x3x0,5	23,0	190,6	868
CAM10535	1x2x0,75	12,3	20,2	256
CAM10536	2x2x0,75	14,8	35,7	352
CAM10537	6x2x0,75	18,5	97,5	531
CAM10538	10x2x0,75	22,9	159,4	829
CAM10539	12x2x0,75	23,4	190,3	873
CAM10540	16x2x0,75	25,5	252,2	1.033
CAM10541	20x2x0,75	27,8	314,0	1.202
CAM10542	24x2x0,75	30,1	375,9	1.355
CAM10543	30x2x0,75	31,7	468,7	1.514
CAM10544	1x3x0,75	12,6	27,9	273
CAM10545	3x3x0,75	16,5	74,3	436
CAM10546	6x3x0,75	19,8	143,9	623
CAM10547	10x3x0,75	25,1	236,7	1.005
CAM10548	12x3x0,75	25,7	283,1	1.068

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA AL/HDPE/PA 182				
CAM10549	1x2x1	12,8	25,6	274
CAM10550	2x2x1	15,6	46,5	387
CAM10551	6x2x1	19,6	130,1	600
CAM10552	10x2x1	24,8	213,6	964
CAM10553	12x2x1	25,4	255,4	1.020
CAM10554	16x2x1	27,3	338,9	1.188
CAM10555	20x2x1	30,0	422,5	1.406
CAM10556	24x2x1	32,8	506,0	1.604
CAM10557	30x2x1	35,3	631,4	1.990
CAM10558	1x3x1	13,1	36,1	296
CAM10559	3x3x1	17,5	98,7	488
CAM10560	6x3x1	21,5	192,7	734
CAM10561	10x3x1	26,8	318,0	1.153
CAM10562	12x3x1	27,7	380,7	1.245
CAM10563	1x2x1,5	13,6	36,5	309
CAM10564	2x2x1,5	17,2	68,2	461
CAM10565	6x2x1,5	22,8	195,1	870
CAM10566	10x2x1,5	27,8	322,1	1.193
CAM10567	12x2x1,5	28,7	385,5	1.285
CAM10568	16x2x1,5	31,2	512,5	1.529
CAM10569	20x2x1,5	35,0	639,4	2.008
CAM10570	24x2x1,5	38,3	766,3	2.288
CAM10571	30x2x1,5	40,3	956,7	2.578
CAM10572	1x3x1,5	14,1	52,3	338
CAM10573	3x3x1,5	19,4	147,5	596
CAM10574	6x3x1,5	25,1	290,3	1.063
CAM10575	10x3x1,5	30,4	480,7	1.469
CAM10576	12x3x1,5	31,4	575,9	1.595

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, other colors



ÖLFLEX® INSTRUM SWA AL/HDPE/PA 183

Armoured, AL/HDPE/PA jacketed,
Individual and Overall screened instrumentation cable

Info

RE4XHOH5ER4FR 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured, AL/HDPE/PA jacketed, twisted pair or triad signal cable, individual and overall screened, XLPE insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS Aluminum/PET + TC Drain wire, OS Aluminum longitudinal tape (AL) + TC Drain wire
- **Chemical Barrier:** AL/HDPE/PA
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** PVC, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

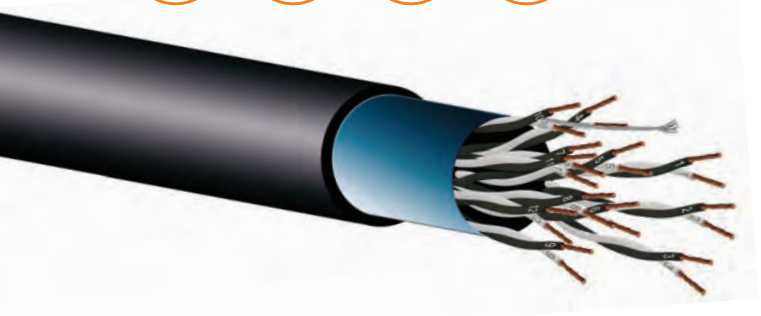
Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA AL/HDPE/PA 183				
CAM10577	2x2x0,5	14,7	35,7	349
CAM10578	6x2x0,5	18,2	97,7	530
CAM10579	10x2x0,5	21,8	159,7	714
CAM10580	12x2x0,5	23,0	190,6	878
CAM10581	16x2x0,5	25,1	252,6	1.040
CAM10582	20x2x0,5	27,1	314,6	1.197
CAM10583	24x2x0,5	29,6	376,6	1.368
CAM10584	30x2x0,5	31,1	469,5	1.535
CAM10585	3x3x0,5	16,3	66,7	426
CAM10586	6x3x0,5	19,5	128,7	605
CAM10587	10x3x0,5	24,5	211,3	964
CAM10588	12x3x0,5	25,2	252,6	1.038
CAM10589	2x2x0,75	15,7	46,0	391
CAM10590	6x2x0,75	19,7	128,5	611
CAM10591	10x2x0,75	25,0	211,0	984
CAM10592	12x2x0,75	25,5	252,3	1.045
CAM10593	16x2x0,75	27,7	334,8	1.232
CAM10594	20x2x0,75	30,2	417,3	1.442
CAM10595	24x2x0,75	33,1	499,8	1.650
CAM10596	30x2x0,75	35,5	623,6	2.049
CAM10597	3x3x0,75	17,6	89,8	487
CAM10598	6x3x0,75	21,7	174,9	729
CAM10599	10x3x0,75	27,0	288,3	1.147
CAM10600	12x3x0,75	27,8	345,1	1.239

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA AL/HDPE/PA 183				
CAM10601	2x2x1	16,7	56,8	436
CAM10602	6x2x1	21,4	161,0	704
CAM10603	10x2x1	26,6	265,3	1.105
CAM10604	12x2x1	27,3	317,4	1.177
CAM10605	16x2x1	29,9	421,6	1.411
CAM10606	20x2x1	32,8	525,8	1.674
CAM10607	24x2x1	36,7	630,0	2.113
CAM10608	30x2x1	38,6	786,3	2.376
CAM10609	3x3x1	18,8	114,2	551
CAM10610	6x3x1	23,8	223,7	949
CAM10611	10x3x1	29,3	369,7	1.331
CAM10612	12x3x1	30,0	442,7	1.428
CAM10613	2x2x1,5	18,4	78,5	515
CAM10614	6x2x1,5	24,8	226,1	996
CAM10615	10x2x1,5	30,0	373,7	1.363
CAM10616	12x2x1,5	31,0	447,5	1.472
CAM10617	16x2x1,5	34,7	595,1	1.962
CAM10618	20x2x1,5	38,2	742,7	2.323
CAM10619	24x2x1,5	41,8	890,3	2.654
CAM10620	30x2x1,5	44,2	1111,6	3.022
CAM10621	3x3x1,5	21,0	163,0	675
CAM10622	6x3x1,5	26,8	321,3	1.176
CAM10623	10x3x1,5	33,1	532,4	1.666
CAM10624	12x3x1,5	34,9	637,9	1.999

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, other colors



ÖLFLEX® INSTRUM 278 H

Overall screened instrumentation cable LSZH

Info

RE4XOHM1 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 278 H				
CAM10625	1x2x0,5	5,1	15,1	35
CAM10626	2x2x0,5	7,5	25,4	66
CAM10627	6x2x0,5	10,5	66,7	134
CAM10628	10x2x0,5	13,4	108,0	202
CAM10629	12x2x0,5	13,9	128,7	222
CAM10630	16x2x0,5	15,6	170,0	290
CAM10631	20x2x0,5	17,5	211,3	367
CAM10632	24x2x0,5	19,4	252,6	421
CAM10633	30x2x0,5	20,7	314,6	505
CAM10634	1x3x0,5	5,4	20,2	42
CAM10635	3x3x0,5	9,0	51,2	100
CAM10636	6x3x0,5	11,8	97,7	183
CAM10637	10x3x0,5	15,2	159,7	279
CAM10638	12x3x0,5	15,7	190,6	311
CAM10639	1x2x0,75	5,9	20,2	45
CAM10640	2x2x0,75	8,4	35,7	84
CAM10641	6x2x0,75	12,1	97,5	183
CAM10642	10x2x0,75	15,5	159,4	277
CAM10643	12x2x0,75	16,0	190,3	306
CAM10644	16x2x0,75	18,0	252,2	401
CAM10645	20x2x0,75	20,2	314,0	507
CAM10646	24x2x0,75	22,4	375,9	583
CAM10647	30x2x0,75	23,9	468,7	702
CAM10648	1x3x0,75	6,2	27,9	56
CAM10649	3x3x0,75	10,1	74,3	131
CAM10650	6x3x0,75	13,4	143,9	244
CAM10651	10x3x0,75	17,5	236,7	386
CAM10652	12x3x0,75	18,1	283,1	431

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 278 H				
CAM10653	1x2x1	6,4	25,6	53
CAM10654	2x2x1	9,4	46,5	106
CAM10655	6x2x1	13,2	130,1	225
CAM10656	10x2x1	17,2	213,6	353
CAM10657	12x2x1	17,8	255,4	392
CAM10658	16x2x1	19,7	338,9	503
CAM10659	20x2x1	22,2	422,5	638
CAM10660	24x2x1	24,8	506,0	749
CAM10661	30x2x1	26,5	631,4	902
CAM10662	1x3x1	6,7	36,1	66
CAM10663	3x3x1	11,0	98,7	161
CAM10664	6x3x1	14,9	192,7	313
CAM10665	10x3x1	19,2	318,0	484
CAM10666	12x3x1	20,1	380,7	554
CAM10667	1x2x1,5	7,2	36,5	69
CAM10668	2x2x1,5	10,8	68,2	140
CAM10669	6x2x1,5	15,5	195,1	318
CAM10670	10x2x1,5	20,2	322,1	499
CAM10671	12x2x1,5	20,9	385,5	557
CAM10672	16x2x1,5	23,4	512,5	732
CAM10673	20x2x1,5	26,3	639,4	927
CAM10674	24x2x1,5	29,4	766,3	1.086
CAM10675	30x2x1,5	31,4	956,7	1.309
CAM10676	1x3x1,5	7,6	52,3	88
CAM10677	3x3x1,5	13,0	147,5	227
CAM10678	6x3x1,5	17,5	290,3	444
CAM10679	10x3x1,5	22,6	480,7	691
CAM10680	12x3x1,5	23,6	575,9	793

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, other colors

ÖLFLEX® INSTRUM 279 H

Individual and overall screened instrumentation cable LSZH

Info

RE4XHOHM1 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, individual and overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

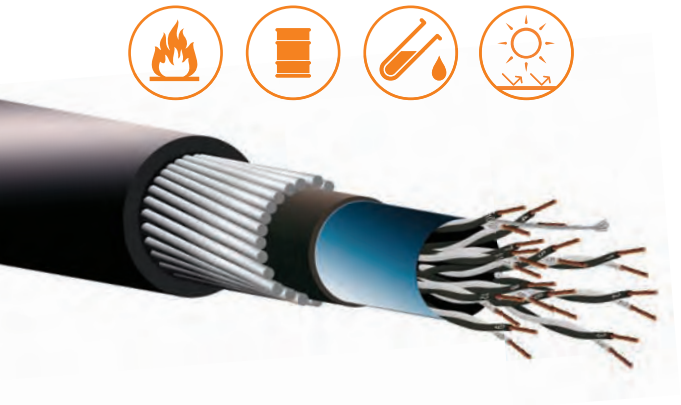
Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 279 H				
CAM10681	2x2x0,5	8,3	35,7	84
CAM10682	6x2x0,5	11,8	97,7	187
CAM10683	10x2x0,5	15,2	159,7	287
CAM10684	12x2x0,5	15,7	190,6	321
CAM10685	16x2x0,5	17,6	252,6	419
CAM10686	20x2x0,5	19,5	314,6	518
CAM10687	24x2x0,5	21,9	376,6	611
CAM10688	30x2x0,5	23,3	469,5	739
CAM10689	3x3x0,5	9,9	66,7	126
CAM10690	6x3x0,5	13,1	128,7	233
CAM10691	10x3x0,5	16,9	211,3	361
CAM10692	12x3x0,5	17,7	252,6	414
CAM10693	2x2x0,75	9,5	46,0	108
CAM10694	6x2x0,75	13,3	128,5	234
CAM10695	10x2x0,75	17,4	211,0	369
CAM10696	12x2x0,75	18,0	252,3	412
CAM10697	16x2x0,75	20,1	334,8	539
CAM10698	20x2x0,75	22,4	417,3	669
CAM10699	24x2x0,75	25,1	499,8	787
CAM10700	30x2x0,75	26,8	623,6	951
CAM10701	3x3x0,75	11,1	89,8	158
CAM10702	6x3x0,75	15,0	174,9	305
CAM10703	10x3x0,75	19,4	288,3	473
CAM10704	12x3x0,75	20,3	345,1	543

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM 279 H				
CAM10705	2x2x1	10,3	56,8	126
CAM10706	6x2x1	14,8	161,0	286
CAM10707	10x2x1	19,0	265,3	441
CAM10708	12x2x1	19,7	317,4	494
CAM10709	16x2x1	22,1	421,6	648
CAM10710	20x2x1	24,8	525,8	819
CAM10711	24x2x1	27,8	630,0	963
CAM10712	30x2x1	29,6	786,3	1.164
CAM10713	3x3x1	12,4	114,2	196
CAM10714	6x3x1	16,4	223,7	369
CAM10715	10x3x1	21,5	369,7	586
CAM10716	12x3x1	22,2	442,7	661
CAM10717	2x2x1,5	12,0	78,5	168
CAM10718	6x2x1,5	17,2	226,1	386
CAM10719	10x2x1,5	22,2	373,7	595
CAM10720	12x2x1,5	23,2	447,5	680
CAM10721	16x2x1,5	26,0	595,1	891
CAM10722	20x2x1,5	29,2	742,7	1.125
CAM10723	24x2x1,5	32,7	890,3	1.321
CAM10724	30x2x1,5	34,8	1111,6	1.596
CAM10725	3x3x1,5	14,4	163,0	266
CAM10726	6x3x1,5	19,2	321,3	507
CAM10727	10x3x1,5	25,1	532,4	804
CAM10728	12x3x1,5	26,2	637,9	923

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, other colors



ÖLFLEX® INSTRUM SWA 280 H

Armoured overall screened instrumentation cable LSZH

Info

RE4XOHM1FM1 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured twisted pair or triad signal cable, overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 280 H				
CAM10729	1x2x0,5	9,8	15,1	179
CAM10730	2x2x0,5	12,3	25,4	266
CAM10731	6x2x0,5	15,3	66,7	398
CAM10732	10x2x0,5	18,5	108,0	538
CAM10733	12x2x0,5	18,9	128,7	568
CAM10734	16x2x0,5	20,8	170,0	683
CAM10735	20x2x0,5	23,5	211,3	925
CAM10736	24x2x0,5	25,5	252,6	1.044
CAM10737	30x2x0,5	26,9	314,6	1.166
CAM10738	1x3x0,5	10,0	20,2	192
CAM10739	3x3x0,5	13,8	51,2	332
CAM10740	6x3x0,5	16,9	97,7	484
CAM10741	10x3x0,5	20,4	159,7	664
CAM10742	12x3x0,5	20,9	190,6	707
CAM10743	1x2x0,75	10,5	20,2	206
CAM10744	2x2x0,75	13,3	35,7	304
CAM10745	6x2x0,75	17,1	97,5	489
CAM10746	10x2x0,75	20,7	159,4	669
CAM10747	12x2x0,75	22,0	190,3	823
CAM10748	16x2x0,75	23,9	252,2	972
CAM10749	20x2x0,75	26,4	314,0	1.154
CAM10750	24x2x0,75	28,8	375,9	1.307
CAM10751	30x2x0,75	30,3	468,7	1.469
CAM10752	1x3x0,75	10,8	27,9	223
CAM10753	3x3x0,75	14,9	74,3	387
CAM10754	6x3x0,75	18,4	143,9	581
CAM10755	10x3x0,75	23,5	236,7	944
CAM10756	12x3x0,75	24,3	283,1	1.018

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 280 H				
CAM10757	1x2x1	11,0	25,6	224
CAM10758	2x2x1	14,2	46,5	346
CAM10759	6x2x1	18,2	130,1	557
CAM10760	10x2x1	23,2	213,6	903
CAM10761	12x2x1	23,8	255,4	958
CAM10762	16x2x1	25,9	338,9	1.138
CAM10763	20x2x1	28,6	422,5	1.357
CAM10764	24x2x1	31,2	506,0	1.543
CAM10765	30x2x1	33,9	631,4	1.941
CAM10766	1x3x1	11,3	36,1	244
CAM10767	3x3x1	15,9	98,7	437
CAM10768	6x3x1	20,0	192,7	682
CAM10769	10x3x1	25,4	318,0	1.103
CAM10770	12x3x1	26,3	380,7	1.198
CAM10771	1x2x1,5	11,8	36,5	257
CAM10772	2x2x1,5	15,6	68,2	411
CAM10773	6x2x1,5	20,7	195,1	710
CAM10774	10x2x1,5	26,4	322,1	1.146
CAM10775	12x2x1,5	27,1	385,5	1.223
CAM10776	16x2x1,5	29,8	512,5	1.484
CAM10777	20x2x1,5	33,7	639,4	1.959
CAM10778	24x2x1,5	36,9	766,3	2.244
CAM10779	30x2x1,5	38,9	956,7	2.537
CAM10780	1x3x1,5	12,5	52,3	291
CAM10781	3x3x1,5	18,0	147,5	553
CAM10782	6x3x1,5	23,5	290,3	1.002
CAM10783	10x3x1,5	29,0	480,7	1.420
CAM10784	12x3x1,5	30,0	575,9	1.550

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, Armour SWB, other colors

ÖLFLEX® INSTRUM SWA 281 H

Armoured individual and overall screened instrumentation cable LSZH

Info

RE4XHOHM1FM1 300 V
EN 50288-7

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured twisted pair or triad signal cable, individual and overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

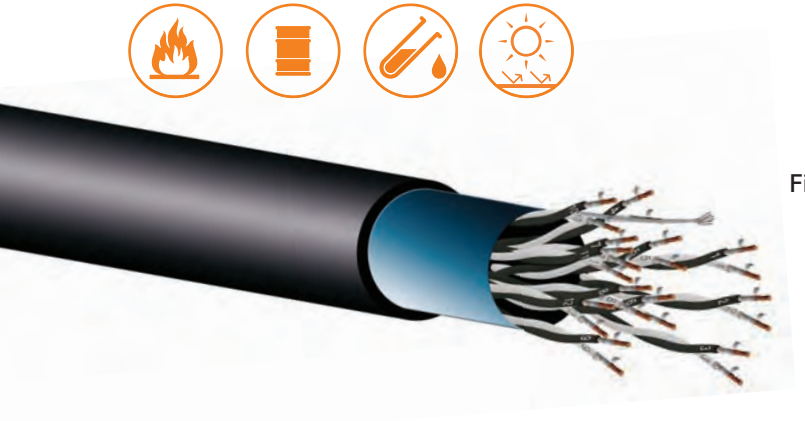
Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 281 H				
CAM10785	2x2x0,5	13,1	35,7	301
CAM10786	6x2x0,5	16,9	97,7	488
CAM10787	10x2x0,5	20,4	159,7	671
CAM10788	12x2x0,5	20,9	190,6	716
CAM10789	16x2x0,5	23,5	252,6	979
CAM10790	20x2x0,5	25,7	314,6	1.147
CAM10791	24x2x0,5	28,3	376,6	1.320
CAM10792	30x2x0,5	29,8	469,5	1.490
CAM10793	3x3x0,5	14,7	66,7	378
CAM10794	6x3x0,5	18,1	128,7	562
CAM10795	10x3x0,5	22,9	211,3	902
CAM10796	12x3x0,5	23,6	252,6	977
CAM10797	2x2x0,75	14,3	46,0	350
CAM10798	6x2x0,75	18,4	128,5	568
CAM10799	10x2x0,75	23,4	211,0	923
CAM10800	12x2x0,75	24,0	252,3	983
CAM10801	16x2x0,75	26,3	334,8	1.184
CAM10802	20x2x0,75	28,8	417,3	1.394
CAM10803	24x2x0,75	31,5	499,8	1.589
CAM10804	30x2x0,75	34,1	623,6	2.000
CAM10805	3x3x0,75	16,0	89,8	437
CAM10806	6x3x0,75	20,3	174,9	687
CAM10807	10x3x0,75	25,6	288,3	1.097
CAM10808	12x3x0,75	26,5	345,1	1.191

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA 281 H				
CAM10809	2x2x1	15,1	56,8	387
CAM10810	6x2x1	19,8	161,0	652
CAM10811	10x2x1	25,2	265,3	1.055
CAM10812	12x2x1	25,9	317,4	1.127
CAM10813	16x2x1	28,5	421,6	1.363
CAM10814	20x2x1	31,2	525,8	1.614
CAM10815	24x2x1	35,1	630,0	2.047
CAM10816	30x2x1	37,2	786,3	2.331
CAM10817	3x3x1	17,4	114,2	509
CAM10818	6x3x1	22,4	223,7	898
CAM10819	10x3x1	27,7	369,7	1.269
CAM10820	12x3x1	28,6	442,7	1.380
CAM10821	2x2x1,5	17,0	78,5	474
CAM10822	6x2x1,5	23,2	226,1	936
CAM10823	10x2x1,5	28,6	373,7	1.314
CAM10824	12x2x1,5	29,6	447,5	1.427
CAM10825	16x2x1,5	32,6	595,1	1.735
CAM10826	20x2x1,5	36,8	742,7	2.278
CAM10827	24x2x1,5	40,4	890,3	2.616
CAM10828	30x2x1,5	42,6	1111,6	2.969
CAM10829	3x3x1,5	19,4	163,0	624
CAM10830	6x3x1,5	25,4	321,3	1.126
CAM10831	10x3x1,5	31,5	532,4	1.606
CAM10832	12x3x1,5	32,8	637,9	1.772

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, Armour SWB, other colors



ÖLFLEX® INSTRUM F90 378 H

Fire resistant, overall screened instrumentation cable LSZH

Info

RTE4XOHM1 300 V
EN 50288-7
IEC 60331-23

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, overall screened, XLPE over MICA-tape insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)
  IEC 60331-23 (90 min./750°C)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

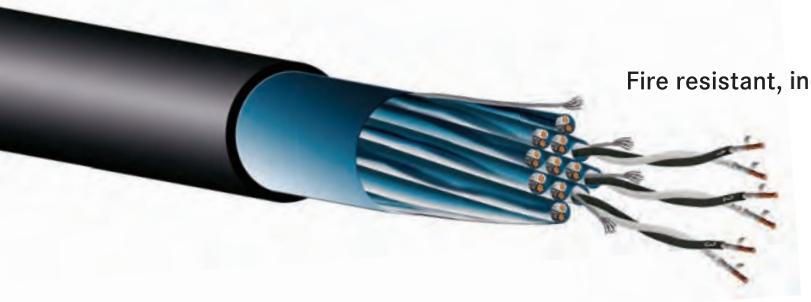
Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM F90 378 H				
CAM10833	1x2x0,5	6,6	15,1	47
CAM10834	2x2x0,5	9,7	25,4	93
CAM10835	6x2x0,5	13,7	66,7	185
CAM10836	10x2x0,5	17,8	108,0	285
CAM10837	12x2x0,5	18,4	128,7	308
CAM10838	16x2x0,5	20,7	170,0	401
CAM10839	20x2x0,5	23,3	211,3	511
CAM10840	24x2x0,5	26,0	252,6	593
CAM10841	30x2x0,5	27,5	314,6	690
CAM10842	1x3x0,5	6,9	20,2	56
CAM10843	3x3x0,5	11,6	51,2	135
CAM10844	6x3x0,5	15,4	97,7	251
CAM10845	10x3x0,5	20,1	159,7	389
CAM10846	12x3x0,5	20,8	190,6	427
CAM10847	1x2x0,75	7,0	20,2	54
CAM10848	2x2x0,75	10,4	35,7	111
CAM10849	6x2x0,75	15,0	97,5	235
CAM10850	10x2x0,75	19,3	159,4	352
CAM10851	12x2x0,75	20,2	190,3	395
CAM10852	16x2x0,75	22,4	252,2	504
CAM10853	20x2x0,75	25,2	314,0	642
CAM10854	24x2x0,75	28,1	375,9	747
CAM10855	30x2x0,75	30,0	468,7	890
CAM10856	1x3x0,75	7,4	27,9	67
CAM10857	3x3x0,75	12,5	74,3	166
CAM10858	6x3x0,75	16,7	143,9	312
CAM10859	10x3x0,75	21,8	236,7	487
CAM10860	12x3x0,75	22,5	283,1	539

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM F90 378 H				
CAM10861	1x2x1	7,4	25,6	62
CAM10862	2x2x1	11,0	46,5	128
CAM10863	6x2x1	15,9	130,1	278
CAM10864	10x2x1	20,7	213,6	430
CAM10865	12x2x1	21,4	255,4	472
CAM10866	16x2x1	24,0	338,9	619
CAM10867	20x2x1	27,0	422,5	786
CAM10868	24x2x1	30,2	506,0	915
CAM10869	30x2x1	32,2	631,4	1.094
CAM10870	1x3x1	7,8	36,1	77
CAM10871	3x3x1	13,3	98,7	196
CAM10872	6x3x1	17,9	192,7	382
CAM10873	10x3x1	23,4	318,0	597
CAM10874	12x3x1	24,2	380,7	664
CAM10875	1x2x1,5	8,2	36,5	78
CAM10876	2x2x1,5	12,6	68,2	171
CAM10877	6x2x1,5	18,2	195,1	378
CAM10878	10x2x1,5	23,7	322,1	587
CAM10879	12x2x1,5	24,5	385,5	649
CAM10880	16x2x1,5	27,5	512,5	852
CAM10881	20x2x1,5	30,9	639,4	1.083
CAM10882	24x2x1,5	34,8	766,3	1.279
CAM10883	30x2x1,5	37,1	956,7	1.532
CAM10884	1x3x1,5	8,9	52,3	104
CAM10885	3x3x1,5	15,2	147,5	267
CAM10886	6x3x1,5	20,5	290,3	524
CAM10887	10x3x1,5	26,8	480,7	821
CAM10888	12x3x1,5	27,7	575,9	919

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned copper conductor, other colors



ÖLFLEX® INSTRUM F90 379 H

Fire resistant, individual and overall screened instrumentation cable LSZH

Info

RTE4XHOHM1 300 V
EN 50288-7
IEC 60331-23

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Product features

Twisted pair or triad signal cable, individual and overall screened, XLPE over MICA-tape insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)
  IEC 60331-23 (90 min./750°C)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM F90 379 H				
CAM10889	2x2x0,5	10,6	35,7	114
CAM10890	6x2x0,5	15,3	97,7	247
CAM10891	10x2x0,5	19,7	159,7	374
CAM10892	12x2x0,5	20,6	190,6	422
CAM10893	16x2x0,5	23,1	252,6	550
CAM10894	20x2x0,5	25,9	314,6	696
CAM10895	24x2x0,5	29,0	376,6	813
CAM10896	30x2x0,5	30,7	469,5	957
CAM10897	3x3x0,5	12,8	66,7	165
CAM10898	6x3x0,5	17,2	128,7	318
CAM10899	10x3x0,5	22,2	211,3	483
CAM10900	12x3x0,5	23,2	252,6	548
CAM10901	2x2x0,75	11,6	46,0	139
CAM10902	6x2x0,75	16,4	128,5	293
CAM10903	10x2x0,75	21,5	211,0	456
CAM10904	12x2x0,75	22,2	252,3	504
CAM10905	16x2x0,75	24,9	334,8	659
CAM10906	20x2x0,75	28,0	417,3	835
CAM10907	24x2x0,75	31,5	499,8	991
CAM10908	30x2x0,75	33,4	623,6	1.170
CAM10909	3x3x0,75	13,7	89,8	197
CAM10910	6x3x0,75	18,6	174,9	382
CAM10911	10x3x0,75	24,2	288,3	597
CAM10912	12x3x0,75	25,1	345,1	666

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM F90 379 H				
CAM10913	2x2x1	12,3	56,8	157
CAM10914	6x2x1	17,7	161,0	346
CAM10915	10x2x1	23,0	265,3	539
CAM10916	12x2x1	23,8	317,4	597
CAM10917	16x2x1	26,7	421,6	781
CAM10918	20x2x1	30,0	525,8	988
CAM10919	24x2x1	33,6	630,0	1.154
CAM10920	30x2x1	35,8	786,3	1.386
CAM10921	3x3x1	14,8	114,2	235
CAM10922	6x3x1	19,7	223,7	446
CAM10923	10x3x1	26,0	369,7	713
CAM10924	12x3x1	26,9	442,7	797
CAM10925	2x2x1,5	13,8	78,5	196
CAM10926	6x2x1,5	20,1	226,1	453
CAM10927	10x2x1,5	26,2	373,7	706
CAM10928	12x2x1,5	27,1	447,5	784
CAM10929	16x2x1,5	30,4	595,1	1.028
CAM10930	20x2x1,5	34,4	742,7	1.319
CAM10931	24x2x1,5	38,5	890,3	1.539
CAM10932	30x2x1,5	41,0	1111,6	1.849
CAM10933	3x3x1,5	16,6	163,0	302
CAM10934	6x3x1,5	22,5	321,3	594
CAM10935	10x3x1,5	29,6	532,4	947
CAM10936	12x3x1,5	30,6	637,9	1.063

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned COPPER conductor, other colors

ÖLFLEX® INSTRUM SWA F90 380 H

Fire resistant, armoured overall screened instrumentation cable LSZH

Info

RTE4XOHM1FM1 300 V
EN 50288-7
IEC 60331-23

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured twisted pair or triad signal cable, overall screened, XLPE over MICA-tape insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2, IEC 60332-3-22 (Cat. A)
  IEC 60331-23 (90 min./750°C)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA F90 380 H				
CAM10937	1x2x0,5	11,2	15,1	221
CAM10938	2x2x0,5	14,5	25,4	341
CAM10939	6x2x0,5	18,7	66,7	527
CAM10940	10x2x0,5	23,8	108,0	852
CAM10941	12x2x0,5	24,6	128,7	905
CAM10942	16x2x0,5	26,9	170,0	1.062
CAM10943	20x2x0,5	29,7	211,3	1.259
CAM10944	24x2x0,5	32,6	252,6	1.436
CAM10945	30x2x0,5	34,9	314,6	1.764
CAM10946	1x3x0,5	11,5	20,2	238
CAM10947	3x3x0,5	16,7	51,2	433
CAM10948	6x3x0,5	20,7	97,7	642
CAM10949	10x3x0,5	26,3	159,7	1.034
CAM10950	12x3x0,5	27,0	190,6	1.092
CAM10951	1x2x0,75	11,6	20,2	238
CAM10952	2x2x0,75	15,3	35,7	374
CAM10953	6x2x0,75	20,0	97,5	605
CAM10954	10x2x0,75	25,5	159,4	974
CAM10955	12x2x0,75	26,3	190,3	1.040
CAM10956	16x2x0,75	28,8	252,2	1.228
CAM10957	20x2x0,75	31,6	314,0	1.446
CAM10958	24x2x0,75	35,5	375,9	1.844
CAM10959	30x2x0,75	37,6	468,7	2.072
CAM10960	1x3x0,75	12,0	27,9	259
CAM10961	3x3x0,75	17,6	74,3	482
CAM10962	6x3x0,75	22,7	143,9	848
CAM10963	10x3x0,75	28,2	236,7	1.194
CAM10964	12x3x0,75	28,9	283,1	1.268

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA F90 380 H				
CAM10965	1x2x1	12,0	25,6	254
CAM10966	2x2x1	15,9	46,5	404
CAM10967	6x2x1	21,9	130,1	791
CAM10968	10x2x1	26,9	213,6	1.092
CAM10969	12x2x1	27,6	255,4	1.155
CAM10970	16x2x1	30,4	338,9	1.390
CAM10971	20x2x1	34,4	422,5	1.844
CAM10972	24x2x1	37,8	506,0	2.104
CAM10973	30x2x1	39,8	631,4	2.354
CAM10974	1x3x1	12,6	36,1	285
CAM10975	3x3x1	18,3	98,7	529
CAM10976	6x3x1	23,9	192,7	953
CAM10977	10x3x1	29,8	318,0	1.350
CAM10978	12x3x1	30,6	380,7	1.441
CAM10979	1x2x1,5	13,0	36,5	294
CAM10980	2x2x1,5	17,7	68,2	490
CAM10981	6x2x1,5	24,4	195,1	967
CAM10982	10x2x1,5	30,1	322,1	1.349
CAM10983	12x2x1,5	30,9	385,5	1.434
CAM10984	16x2x1,5	34,8	512,5	1.926
CAM10985	20x2x1,5	38,5	639,4	2.297
CAM10986	24x2x1,5	42,5	766,3	2.650
CAM10987	30x2x1,5	45,9	956,7	3.291
CAM10988	1x3x1,5	13,8	52,3	335
CAM10989	3x3x1,5	20,4	147,5	652
CAM10990	6x3x1,5	26,7	290,3	1.180
CAM10991	10x3x1,5	34,1	480,7	1.869
CAM10992	12x3x1,5	35,0	575,9	2.000

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, Armour SWB, other colors

ÖLFLEX® INSTRUM SWA F90 381 H

Fire resistant, armoured individual and overall screened instrumentation cable LSZH

Info

RTE4XHOHM1FM1 300 V
EN 50288-7
IEC 60331-23

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Product features

Armoured twisted pair or triad signal cable, individual and overall screened, XLPE over MICA-tape insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)
  IEC 60331-23 (90 min./750°C)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized Steel Wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
300/300 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA F90 381 H				
CAM10993	2x2x0,5	15,5	35,7	382
CAM10994	6x2x0,5	20,5	97,7	634
CAM10995	10x2x0,5	25,9	159,7	1.007
CAM10996	12x2x0,5	26,8	190,6	1.080
CAM10997	16x2x0,5	29,5	252,6	1.294
CAM10998	20x2x0,5	32,6	314,6	1.538
CAM10999	24x2x0,5	36,5	376,6	1.957
CAM11000	30x2x0,5	38,3	469,5	2.163
CAM11001	3x3x0,5	17,8	66,7	488
CAM11002	6x3x0,5	23,2	128,7	868
CAM11003	10x3x0,5	28,6	211,3	1.203
CAM11004	12x3x0,5	29,6	252,6	1.295
CAM11005	2x2x0,75	16,7	46,0	435
CAM11006	6x2x0,75	22,4	128,5	822
CAM11007	10x2x0,75	27,7	211,0	1.140
CAM11008	12x2x0,75	28,6	252,3	1.223
CAM11009	16x2x0,75	31,3	334,8	1.456
CAM11010	20x2x0,75	35,4	417,3	1.928
CAM11011	24x2x0,75	39,1	499,8	2.226
CAM11012	30x2x0,75	41,2	623,6	2.493
CAM11013	3x3x0,75	18,8	89,8	540
CAM11014	6x3x0,75	24,8	174,9	982
CAM11015	10x3x0,75	30,6	288,3	1.375
CAM11016	12x3x0,75	31,5	345,1	1.467

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SWA F90 381 H				
CAM11017	2x2x1	17,3	56,8	468
CAM11018	6x2x1	23,6	161,0	909
CAM11019	10x2x1	29,4	265,3	1.281
CAM11020	12x2x1	30,2	317,4	1.362
CAM11021	16x2x1	34,1	421,6	1.827
CAM11022	20x2x1	37,6	525,8	2.170
CAM11023	24x2x1	41,3	630,0	2.482
CAM11024	30x2x1	43,6	786,3	2.793
CAM11025	3x3x1	19,8	114,2	601
CAM11026	6x3x1	25,9	223,7	1.079
CAM11027	10x3x1	32,6	369,7	1.556
CAM11028	12x3x1	34,2	442,7	1.849
CAM11029	2x2x1,5	18,8	78,5	541
CAM11030	6x2x1,5	26,3	226,1	1.098
CAM11031	10x2x1,5	32,8	373,7	1.556
CAM11032	12x2x1,5	34,5	447,5	1.846
CAM11033	16x2x1,5	38,0	595,1	2.224
CAM11034	20x2x1,5	42,2	742,7	2.677
CAM11035	24x2x1,5	47,3	890,3	3.358
CAM11036	30x2x1,5	50,0	1111,6	3.801
CAM11037	3x3x1,5	22,6	163,0	836
CAM11038	6x3x1,5	28,9	321,3	1.320
CAM11039	10x3x1,5	37,2	532,4	2.113
CAM11040	12x3x1,5	38,2	637,9	2.267

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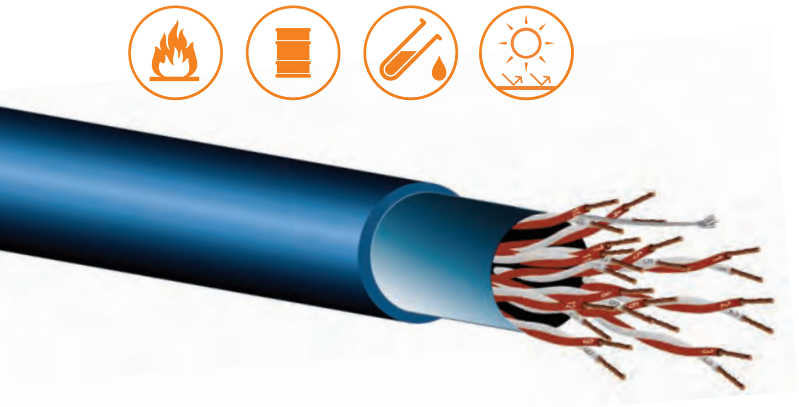
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Conductor Class 5, Tinned conductor, Armour SWB, other colors



ÖLFLEX® INSTRUM NF 670

Overall screened instrumentation cable

Info

U/RRXOHR 300/500 V
NF M 87-202

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair, triad or quad signal cable, overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
  NF M 87-202
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded or solid Annealed Copper
- **Core insulation:** PVC
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC, blue
- **Armour:** Double Steel tape
- **Outer sheath:** PVC, blue (RAL 5015)

Technicald ata

Core identification code:
according to NF M 87-202

Insulation resistance:
500 MOhm x km

Conductor stranding:
according to NF M 87-202

Nominal Voltage Uo/U:
300/500 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM NF 670				
CAM11041	3x2x0,5	8,2	31,7	79
CAM11042	7x2x0,5	10,5	70,8	146
CAM11043	12x2x0,5	13,9	119,8	237
CAM11044	19x2x0,5	16,5	188,3	353
CAM11045	27x2x0,5	19,7	266,6	482
CAM11046	7x3x0,5	11,7	105,1	200
CAM11047	12x3x0,5	15,5	178,5	328
CAM11048	2x0,9	6,8	20,4	56
CAM11049	3x0,9	7,2	29,4	70
CAM11050	4x0,9	7,8	38,5	86
CAM11051	3x2x0,9	10,4	56,5	124
CAM11052	7x2x0,9	13,8	128,8	246
CAM11053	12x2x0,9	18,4	219,2	403
CAM11054	19x2x0,9	21,8	345,7	606
CAM11055	27x2x0,9	26,5	490,3	857
CAM11056	7x3x0,9	15,4	192,1	341
CAM11057	12x3x0,9	20,8	327,7	575

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Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN:

ÖLFLEX® INSTRUM NF 671

Individual and Overall screened instrumentation cable

Info

U/RXHROHR 300/500 V
NF M 87-202

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Twisted pair or triad signal cable, individual and overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
  NF M 87-202
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded or solid Annealed Copper
- **Core insulation:** PVC
- **Screen:** PVC pair jacket over IS Aluminum/ PET + TC Drain wire. OS Aluminum/PET + TC Drain wire
- **Outer sheath:** PVC, blue (RAL 5015)

Technicald ata

- **Core identification code:** according to NF M 87-202
- **Insulation resistance:** 500 MOhm x km
- **Conductor stranding:** according to NF M 87-202
- **Nominal Voltage Uo/U:** 300/500 V
- **Test voltage:** C/C 1500 V x 1 minute
- **Temperature range:** during operation: -30° to +70°C during installation: -5° to +50°C
- **Minimum Bending Radius:** 8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM NF 671				
CAM11058	3x2x0,5	12,9	38,6	152
CAM11059	7x2x0,5	17,5	87,0	310
CAM11060	12x2x0,5	23,4	147,5	506
CAM11061	19x2x0,5	28,0	232,2	769
CAM11062	27x2x0,5	33,7	329,0	1.051
CAM11063	7x3x0,5	18,3	121,3	369
CAM11064	12x3x0,5	24,5	206,3	606
CAM11065	3x2x0,9	15,8	63,5	220
CAM11066	7x2x0,9	21,4	145,0	450
CAM11067	12x2x0,9	29,0	246,9	751
CAM11068	19x2x0,9	34,2	389,6	1.107
CAM11069	27x2x0,9	41,7	552,7	1.563
CAM11070	7x3x0,9	22,5	208,3	553
CAM11071	12x3x0,9	30,5	355,4	927

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AVAILABLE ALSO IN:

ÖLFLEX® INSTRUM NF 672

Armoured and Overall screened instrumentation cable

Info

U/RXOHRNR 300/500 V
NF M 87-202

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured twisted pair, triad or quad signal cable overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
  NF M 87-202
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded or solid Annealed Copper
- **Core insulation:** PVC
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC, blue
- **Armour:** Double Steel tape
- **Outer sheath:** PVC, blue (RAL 5015)

Technicald ata

Core identification code:
according to NF M 87-202

Insulation resistance:
500 MOhm x km

Conductor stranding:
according to NF M 87-202

Nominal Voltage Uo/U:
300/500 V

Test voltage:
C/C 1500 V x 1 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM NF 672				
CAM11072	3x2x0,5	11,1	31,7	192
CAM11073	7x2x0,5	13,5	70,8	286
CAM11074	12x2x0,5	17,3	119,8	435
CAM11075	19x2x0,5	19,8	188,3	584
CAM11076	27x2x0,5	23,2	266,6	765
CAM11077	7x3x0,5	14,8	105,1	361
CAM11078	12x3x0,5	18,9	178,5	547
CAM11079	2x0,9	9,8	20,4	152
CAM11080	3x0,9	10,1	29,4	171
CAM11081	4x0,9	10,7	38,5	193
CAM11082	3x2x0,9	13,3	56,5	263
CAM11083	7x2x0,9	17,1	128,8	442
CAM11084	12x2x0,9	21,9	219,2	669
CAM11085	19x2x0,9	25,3	345,7	916
CAM11086	27x2x0,9	30,5	490,3	1.259
CAM11087	7x3x0,9	18,7	192,1	558
CAM11088	12x3x0,9	24,4	327,7	872

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Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN:

ÖLFLEX® INSTRUM STA NF 673

Armoured, Individual and Overall screened instrumentation cable

Info

U/RXHROHRNR 300/500 V NF M 87-202

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Armoured twisted pair or triad signal cable, individual and overall screened, PVC insulated and PVC jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0, NF M 87-202
- **Halogen acid gas**
  IEC 60754-1 (max 20%)
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded or solid Annealed Copper
- **Core insulation:** PVC
- **Screen:** PVC pair jacket over IS Aluminum/ PET + TC Drain wire.
  OS Aluminum/PET + TC Drain wire
- **Inner sheath:** PVC, blue
- **Armour:** Double Steel tape
- **Outer sheath:** PVC, blue (RAL 5015)

Technicald ata

Core identification code:
according to NF M 87-202

Insulation resistance:
500 MOhm x km

Conductor stranding:
according to NF M 87-202

Nominal Voltage Uo/U:
300/500 V

Test voltage:
C/C 1500 V x 1 minute

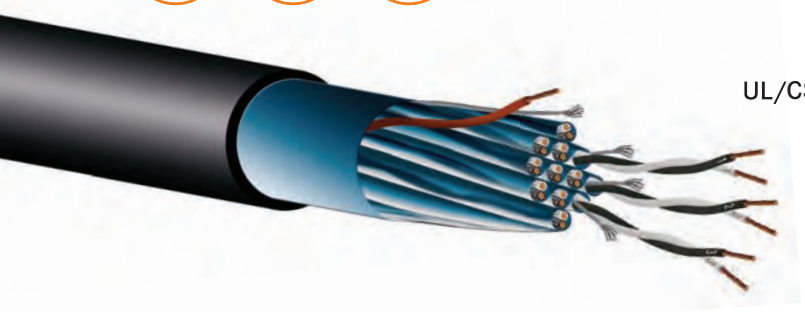
Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
10 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM STA NF 673				
CAM11089	3x2x0,5	16,2	38,6	337
CAM11090	7x2x0,5	21,0	87,0	563
CAM11091	12x2x0,5	27,4	147,5	864
CAM11092	19x2x0,5	32,0	232,2	1.191
CAM11093	27x2x0,5	37,9	329,0	1.572
CAM11094	7x3x0,5	21,8	121,3	633
CAM11095	12x3x0,5	28,5	206,3	981
CAM11096	3x2x0,9	19,1	63,5	442
CAM11097	7x2x0,9	25,0	145,0	756
CAM11098	12x2x0,9	33,0	246,9	1.188
CAM11099	19x2x0,9	38,4	389,6	1.636
CAM11100	27x2x0,9	46,1	552,7	2.222
CAM11101	7x3x0,9	26,5	208,3	898
CAM11102	12x3x0,9	34,5	355,4	1.385

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN:



I 304

UL/CSA 300 V PLTC ITC Instrumentation Cable with Individually Shielded Pairs/Triads and an Overall Shield (ISOS)

Info

RRXHOHR 300 V
PLTC per UL 13, ITC per UL 2250,
CMG per UL 444, AWM 2464
CMG FT4, AWM I/II A/B FT4, CSA
C22.2 No. 214, CSA C22.2 No. 210

Benefits

- Sunlight resistant
- Fire behaviour
- Oil resistant
- RoHS

Productf eatures

Stranded bare copper conductors; PVC insulation (cabled pairs or triads); individually foil-shielded pairs or traids with a tinned copper drain wire; orange PVC communication wire; overall foil shield with a tinned copper drain wire (100% coverage); specially blended black PVC jacket

Norm references / Approvals

- **Oil resistance**
  OR-01
- **Fire behaviour**
  FR-03
- **Motion Type**
  FL-01
- **Mechanical Properties**
  MP-02

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Conductor stranding:
Class B

Nominal Voltage Uo/U:
300 V

Temperature range:
during operation: -30° to +105°C

Minimum Bending Radius:
8 x Outer Diameter

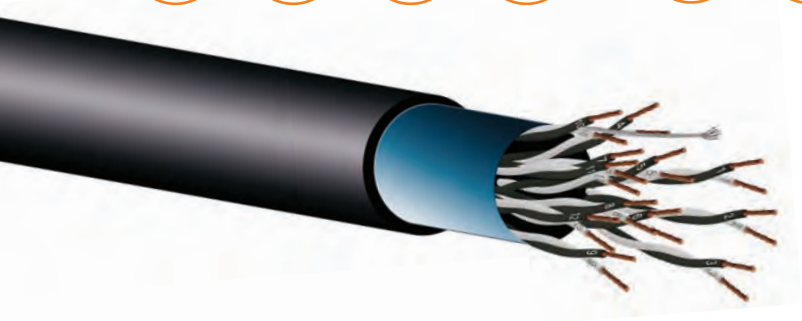
Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** PVC
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Outer sheath:** PVC, black

Article Number	Number cores and AWG per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
I304				
CAM11103	1x2x20 AWG	5,0	13,4	37
CAM11104	2x2x20 AWG	8,1	35,7	81
CAM11105	8x2x20 AWG	13,0	117,6	210
CAM11106	12x2x20 AWG	16,0	171,1	308
CAM11107	1x2x18 AWG	5,1	20,8	53
CAM11108	2x2x18 AWG	10,0	53,6	121
CAM11109	4x2x18 AWG	11,1	98,2	186
CAM11110	6x2x18 AWG	13,1	141,4	242
CAM11111	8x2x18 AWG	15,0	184,5	293
CAM11112	12x2x18 AWG	18,1	272,3	421
CAM11113	16x2x18 AWG	21,0	358,6	522
CAM11114	1x2x16 AWG	6,1	31,3	69
CAM11115	2x2x16 AWG	11,0	77,4	169
CAM11116	3x2x16 AWG	11,1	116,1	206
CAM11117	4x2x16 AWG	13,0	141,4	245
CAM11118	6x2x16 AWG	15,0	205,4	325
CAM11119	8x2x16 AWG	16,1	269,4	419
CAM11120	12x2x16 AWG	20,1	395,9	575
CAM11121	16x2x16 AWG	23,1	523,8	756
CAM11122	24x2x16 AWG	28,5	778,3	1.064
CAM11123	1x3x18 AWG	6,0	29,8	67
CAM11124	2x3x18 AWG	11,0	71,4	173
CAM11125	4x3x18 AWG	13,1	131,0	249
CAM11126	6x3x18 AWG	15,0	190,5	330
CAM11127	8x3x18 AWG	16,1	251,5	423
CAM11128	1x3x16 AWG	6,1	43,2	89
CAM11129	2x3x16 AWG	12,1	98,2	224
CAM11130	4x3x16 AWG	14,1	189,0	334
CAM11131	6x3x16 AWG	17,1	276,8	471
CAM11132	8x3x16 AWG	19,0	363,1	579
CAM11133	12x3x16 AWG	25,4	537,2	839

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN:



ÖLFLEX® INSTRUM SC 701 H

Overall screened ship board instrumentation cable LSZH

Info

RE4XOHM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV, RINA, BV, LR Type Approval

Productf eatures

Twisted pair or triad signal cable, overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC 701 H				
CAM00325	2 x 0,5	5,8	13,9	40
CAM00327	3 x 2 x 0,5	8,5	34,5	80
CAM00329	7 x 2 x 0,5	11,2	75,8	149
CAM00331	12 x 2 x 0,5	15,0	127,5	245
CAM00333	19 x 2 x 0,5	17,7	199,8	358
CAM00344	3 x 0,5	6,0	19,0	48
CAM00345	3 x 3 x 0,5	9,6	50,0	108
CAM00347	7 x 3 x 0,5	12,7	112,0	206
CAM00349	12 x 3 x 0,5	16,8	189,4	332
CAM00357	2 x 0,75	6,6	20,6	53
CAM00359	3 x 2 x 0,75	10,3	51,6	114
CAM00361	7 x 2 x 0,75	13,5	113,4	214
CAM00363	12 x 2 x 0,75	18,1	190,7	352
CAM00365	19 x 2 x 0,75	21,4	299,0	517
CAM00376	3 x 0,75	7,0	28,4	64
CAM00377	3 x 3 x 0,75	11,4	74,8	149
CAM00379	7 x 3 x 0,75	15,3	167,5	297
CAM00381	12 x 3 x 0,75	20,6	283,5	491

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC 701 H				
CAM00389	2 x 1	7,0	28,6	63
CAM00391	3 x 2 x 1	10,9	70,4	136
CAM00393	7 x 2 x 1	14,7	153,9	267
CAM00395	12 x 2 x 1	19,4	258,4	430
CAM00397	19 x 2 x 1	23,2	404,6	647
CAM00408	3 x 1	7,4	39,1	77
CAM00409	3 x 3 x 1	12,4	101,7	186
CAM00411	7 x 3 x 1	16,4	227,1	364
CAM00413	12 x 3 x 1	22,0	383,7	604
CAM00421	2 x 1,5	8,1	39,5	81
CAM00423	3 x 2 x 1,5	13,0	102,9	191
CAM00425	7 x 2 x 1,5	17,4	229,9	380
CAM00427	12 x 2 x 1,5	23,4	388,5	627
CAM00429	19 x 2 x 1,5	27,7	610,7	930
CAM00440	3 x 1,5	8,5	55,3	101
CAM00441	3 x 3 x 1,5	14,7	150,5	263
CAM00443	7 x 3 x 1,5	19,5	340,9	523
CAM00445	12 x 3 x 1,5	26,6	578,9	884

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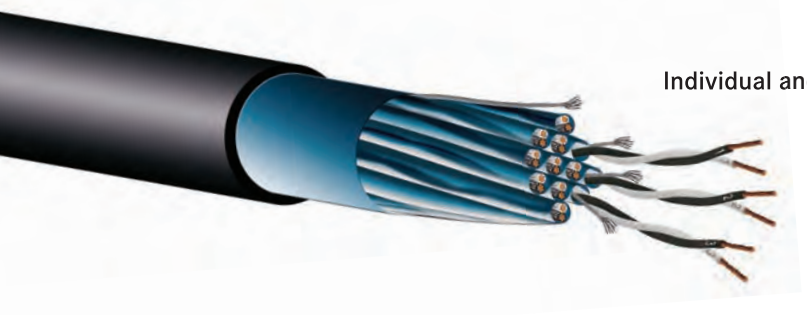
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Tinned copper conductors (but without BV Type Approval)



ÖLFLEX® INSTRUM SC 702 H

Individual and overall screened ship board instrumentation cable LSZH

Info

RE4XHOHM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Twisted pair or triad signal cable, Individual and overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC 702 H				
CAM00336	3 x 2 x 0,5	9,6	45,1	106
CAM00338	7 x 2 x 0,5	12,6	100,5	200
CAM00340	12 x 2 x 0,5	16,7	169,8	322
CAM00342	19 x 2 x 0,5	19,7	266,8	477
CAM00351	3 x 3 x 0,5	10,6	60,6	131
CAM00353	7 x 3 x 0,5	14,0	136,7	254
CAM00355	12 x 3 x 0,5	18,8	231,8	421
CAM00368	3 x 2 x 0,75	11,2	67,1	142
CAM00370	7 x 2 x 0,75	15,1	149,6	282
CAM00372	12 x 2 x 0,75	20,3	252,7	466
CAM00374	19 x 2 x 0,75	23,9	397,1	689
CAM00383	3 x 3 x 0,75	12,7	90,2	184
CAM00385	7 x 3 x 0,75	16,8	203,7	361
CAM00387	12 x 3 x 0,75	22,6	345,5	600

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC 702 H				
CAM00400	3 x 2 x 1	12,2	93,6	179
CAM00402	7 x 2 x 1	16,1	208,1	348
CAM00404	12 x 2 x 1	21,7	351,2	576
CAM00406	19 x 2 x1	25,6	551,5	858
CAM00415	3 x 3 x 1	13,5	124,9	224
CAM00417	7 x 3 x 1	18,2	281,2	456
CAM00419	12 x 3 x 1	24,4	476,5	756
CAM00432	3 x 2 x 1,5	14,2	126,1	230
CAM00434	7 x 2 x 1,5	19,1	284,0	467
CAM00436	12 x 2 x 1,5	26,0	481,3	787
CAM00438	19 x 2 x1,5	30,7	757,6	1.173
CAM00447	3 x 3 x 1,5	16,0	173,7	304
CAM00449	7 x 3 x 1,5	21,6	395,1	624
CAM00451	12 x 3 x 1,5	29,3	671,7	1.052

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AVAILABLE ALSO IN: Tinned copper conductors

ÖLFLEX® INSTRUM SC SWB 703 H

Armoured overall screened ship board instrumentation cable LSZH

Info

RE4XOHAM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Armoured twisted pair or triad signal cable, overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB 703 H				
CAM00453	2 x 0,5	8,9	13,9	109
CAM00455	3 x 2 x 0,5	11,9	34,5	181
CAM00457	7 x 2 x 0,5	15,0	75,8	306
CAM00459	12 x 2 x 0,5	18,6	127,5	440
CAM00461	19 x 2 x 0,5	21,2	199,8	584
CAM00472	3 x 0,5	9,2	19,0	119
CAM00473	3 x 3 x 0,5	12,8	50,0	214
CAM00475	7 x 3 x 0,5	16,2	112,0	373
CAM00477	12 x 3 x 0,5	20,6	189,4	558
CAM00485	2 x 0,75	9,8	20,6	130
CAM00487	3 x 2 x 0,75	13,4	51,6	225
CAM00489	7 x 2 x 0,75	17,1	113,4	391
CAM00491	12 x 2 x 0,75	21,7	190,7	584
CAM00493	19 x 2 x 0,75	25,0	299,0	787
CAM00504	3 x 0,75	10,1	28,4	144
CAM00505	3 x 3 x 0,75	15,2	74,8	309
CAM00507	7 x 3 x 0,75	18,9	167,5	495
CAM00509	12 x 3 x 0,75	24,1	283,5	751

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB 703 H				
CAM00517	2 x 1	10,2	28,6	143
CAM00519	3 x 2 x 1	14,7	70,4	290
CAM00521	7 x 2 x 1	18,2	153,9	457
CAM00523	12 x 2 x 1	23,2	258,4	688
CAM00525	19 x 2 x 1	26,7	404,6	937
CAM00536	3 x 1	10,5	39,1	161
CAM00537	3 x 3 x 1	15,9	101,7	350
CAM00539	7 x 3 x 1	19,9	227,1	575
CAM00541	12 x 3 x 1	25,6	383,7	881
CAM00549	2 x 1,5	11,2	39,5	171
CAM00551	3 x 2 x 1,5	16,6	102,9	362
CAM00553	7 x 2 x 1,5	21,0	229,9	603
CAM00555	12 x 2 x 1,5	27,0	388,5	921
CAM00557	19 x 2 x 1,5	31,3	610,7	1.275
CAM00568	3 x 1,5	11,9	55,3	202
CAM00569	3 x 3 x 1,5	18,3	150,5	453
CAM00571	7 x 3 x 1,5	23,3	340,9	783
CAM00573	12 x 3 x 1,5	30,1	578,9	1.215

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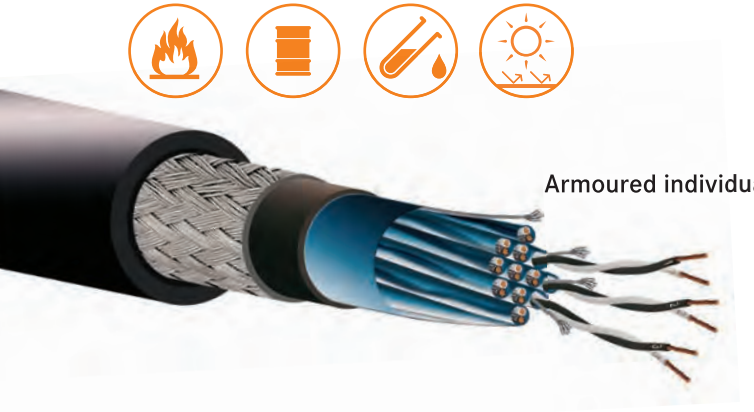
AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour



ÖLFLEX® INSTRUM SC SWB 704 H

Armoured individual and overall screened ship board instrumentation cable LSZH

Info

RE4XHOHAM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Armoured twisted pair or triad signal cable, Individual and overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB 704 H				
CAM00464	3 x 2 x 0,5	12,7	45,1	211
CAM00466	7 x 2 x 0,5	16,2	100,5	366
CAM00468	12 x 2 x 0,5	20,4	169,8	547
CAM00470	19 x 2 x 0,5	23,4	266,8	738
CAM00479	3 x 3 x 0,5	13,7	60,6	245
CAM00481	7 x 3 x 0,5	17,7	136,7	445
CAM00483	12 x 3 x 0,5	22,3	231,8	660
CAM00496	3 x 2 x 0,75	15,0	67,1	300
CAM00498	7 x 2 x 0,75	18,7	149,6	478
CAM00500	12 x 2 x 0,75	23,8	252,7	722
CAM00502	19 x 2 x 0,75	27,5	397,1	988
CAM00511	3 x 3 x 0,75	16,2	90,2	351
CAM00513	7 x 3 x 0,75	20,6	203,7	587
CAM00515	12 x 3 x 0,75	26,4	345,5	897

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB 704 H				
CAM00528	3 x 2 x 1	15,8	93,6	340
CAM00530	7 x 2 x 1	19,7	208,1	555
CAM00532	12 x 2 x 1	25,2	351,2	849
CAM00534	19 x 2 x1	29,4	551,5	1.192
CAM00543	3 x 3 x 1	17,1	124,9	401
CAM00545	7 x 3 x 1	21,7	281,2	687
CAM00547	12 x 3 x 1	28,0	476,5	1.061
CAM00560	3 x 2 x 1,5	18,0	126,1	425
CAM00562	7 x 2 x 1,5	22,7	284,0	710
CAM00564	12 x 2 x 1,5	29,5	481,3	1.111
CAM00566	19 x 2 x1,5	34,9	757,6	1.603
CAM00575	3 x 3 x 1,5	19,6	173,7	511
CAM00577	7 x 3 x 1,5	25,1	395,1	896
CAM00579	12 x 3 x 1,5	32,8	671,7	1.415

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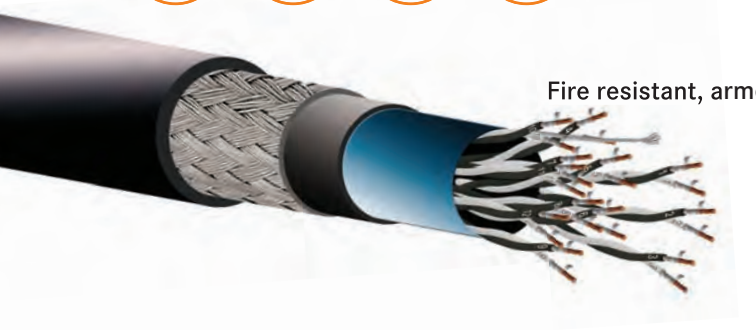
AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour



ÖLFLEX® INSTRUM SC SWB F90 705 H

Fire resistant, armoured overall screened ship board instrumentation cable LSZH

Info

RTE4XOHAM1 150/250 V
IEC 60092-376
IEC 60331-21

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Twisted pair or triad signal cable, overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)
  IEC 60331-21 (90 min./750 °C)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB F90 705 H				
CAM00709	2 x 0,5	9,9	13,9	127
CAM00711	3 x 2 x 0,5	13,7	34,5	218
CAM00713	7 x 2 x 0,5	17,7	75,8	382
CAM00715	12 x 2 x 0,5	22,2	127,5	554
CAM00717	19 x 2 x 0,5	25,6	199,8	737
CAM00728	3 x 0,5	10,3	19,0	140
CAM00729	3 x 3 x 0,5	15,5	50,0	298
CAM00731	7 x 3 x 0,5	19,3	112,0	468
CAM00733	12 x 3 x 0,5	24,7	189,4	704
CAM00741	2 x 0,75	10,8	20,6	149
CAM00743	3 x 2 x 0,75	15,8	51,6	304
CAM00745	7 x 2 x 0,75	19,8	113,4	473
CAM00747	12 x 2 x 0,75	25,4	190,7	709
CAM00749	19 x 2 x 0,75	29,5	299,0	971
CAM00760	3 x 0,75	11,2	28,4	166
CAM00761	3 x 3 x 0,75	17,4	74,8	372
CAM00763	7 x 3 x 0,75	21,9	167,5	600
CAM00765	12 x 3 x 0,75	28,3	283,5	912

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB F90 705 H				
CAM00773	2 x 1	11,2	28,6	162
CAM00775	3 x 2 x 1	16,5	70,4	336
CAM00777	7 x 2 x 1	20,9	153,9	544
CAM00779	12 x 2 x 1	26,9	258,4	819
CAM00781	19 x 2 x 1	31,1	404,6	1.115
CAM00792	3 x 1	11,8	39,1	189
CAM00793	3 x 3 x 1	18,2	101,7	415
CAM00795	7 x 3 x 1	23,2	227,1	695
CAM00797	12 x 3 x 1	30,0	383,7	1.064
CAM00805	2 x 1,5	12,4	39,5	197
CAM00807	3 x 2 x 1,5	18,6	102,9	418
CAM00809	7 x 2 x 1,5	23,7	229,9	697
CAM00811	12 x 2 x 1,5	30,7	388,5	1.065
CAM00813	19 x 2 x 1,5	36,2	610,7	1.525
CAM00824	3 x 1,5	13,0	55,3	227
CAM00825	3 x 3 x 1,5	20,5	150,5	524
CAM00827	7 x 3 x 1,5	26,4	340,9	905
CAM00829	12 x 3 x 1,5	34,9	578,9	1.454

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Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour

ÖLFLEX® INSTRUM SC SWB F90 706 H

Fire resistant, armoured individual and overall screened ship board instrumentation cable LSZH

Info

RTE4XHOHAM1 150/250 V
IEC 60092-376
IEC 60331-21

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Armoured twisted pair or triad signal cable, Individual and overall screened, XLPE over MICA-tape insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)
  IEC 60331-21 (90 min./750 °C)

Design

- **Conductor:** Stranded Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 2 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

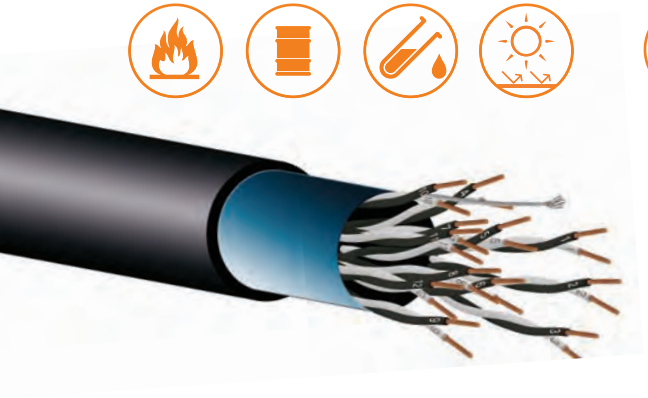
Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB F90 706 H				
CAM00720	3 x 2 x 0,5	15,3	45,1	290
CAM00722	7 x 2 x 0,5	19,1	100,5	451
CAM00724	12 x 2 x 0,5	24,4	169,8	676
CAM00726	19 x 2 x 0,5	28,1	266,8	913
CAM00735	3 x 3 x 0,5	16,6	60,6	337
CAM00737	7 x 3 x 0,5	21,0	136,7	551
CAM00739	12 x 3 x 0,5	27,0	231,8	834
CAM00752	3 x 2 x 0,75	17,0	67,1	349
CAM00754	7 x 2 x 0,75	21,6	149,6	570
CAM00756	12 x 2 x 0,75	27,8	252,7	863
CAM00758	19 x 2 x 0,75	32,4	397,1	1.196
CAM00767	3 x 3 x 0,75	18,7	90,2	420
CAM00769	7 x 3 x 0,75	23,9	203,7	703
CAM00771	12 x 3 x 0,75	30,9	345,5	1.076

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB F90 706 H				
CAM00784	3 x 2 x 1	17,9	93,6	399
CAM00786	7 x 2 x 1	22,6	208,1	650
CAM00788	12 x 2 x 1	29,4	351,2	1.009
CAM00790	19 x 2 x1	34,7	551,5	1.443
CAM00799	3 x 3 x 1	19,5	124,9	472
CAM00801	7 x 3 x 1	25,0	281,2	807
CAM00803	12 x 3 x 1	32,7	476,5	1.263
CAM00816	3 x 2 x 1,5	19,9	126,1	478
CAM00818	7 x 2 x 1,5	25,6	284,0	814
CAM00820	12 x 2 x 1,5	33,5	481,3	1.272
CAM00822	19 x 2 x1,5	40,2	757,6	1.937
CAM00831	3 x 3 x 1,5	22,0	173,7	588
CAM00833	7 x 3 x 1,5	28,4	395,1	1.028
CAM00835	12 x 3 x 1,5	38,4	671,7	1.758

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour



ÖLFLEX® INSTRUM SC 707 H

Overall screened ship board instrumentation cable LSZH

Info

FE4XOHM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV, RINA, BV, LR Type Approval

Productf eatures

Twisted pair or triad signal cable, overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Flexible Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 5 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

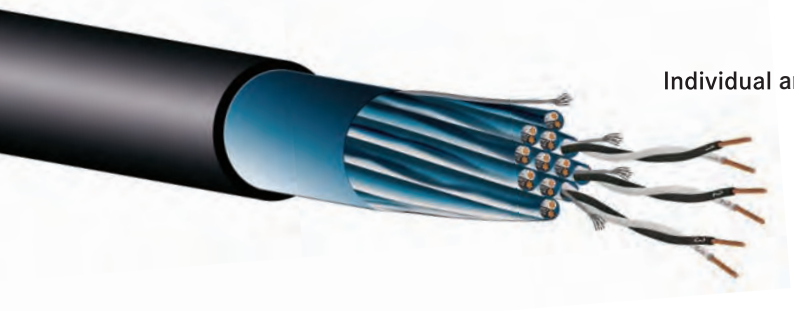
Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC 707 H				
CAM01385	3 x 3 x 0,75	11,4	74,9	148
CAM01387	7 x 3 x 0,75	15,3	167,8	297
CAM01389	12 x 3 x 0,75	20,5	284,0	491
CAM01397	2 x 1	7,1	28,4	63
CAM01399	3 x 2 x 1	11,1	69,7	137
CAM01401	7 x 2 x 1	14,9	152,3	269
CAM01403	12 x 2 x 1	19,8	255,6	431
CAM01405	19 x 2 x 1	23,6	400,2	649
CAM01416	3 x 1	7,5	38,7	77
CAM01417	3 x 3 x 1	12,6	100,7	187
CAM01419	7 x 3 x 1	16,7	224,6	365
CAM01421	12 x 3 x 1	22,4	379,6	606
CAM01429	2 x 1,5	8,1	36,0	78
CAM01431	3 x 2 x 1,5	13,0	92,5	182
CAM01433	7 x 2 x 1,5	17,5	205,4	358
CAM01435	12 x 2 x 1,5	23,5	346,6	590
CAM01437	19 x 2 x 1,5	27,8	544,3	872
CAM01448	3 x 1,5	8,5	50,1	97
CAM01449	3 x 3 x 1,5	14,8	134,8	249
CAM01451	7 x 3 x 1,5	19,6	304,3	491
CAM01453	12 x 3 x 1,5	26,7	516,1	829

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Tinned copper conductors (but without BV Type Approval)



ÖLFLEX® INSTRUM SC 708 H

Individual and overall screened ship board instrumentation cable LSZH

Info

FE4XHOHM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Twisted pair or triad signal cable, Individual and overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Flexible Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 5 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC 708 H				
CAM01376	3 x 2 x 0,75	11,2	67,1	142
CAM01378	7 x 2 x 0,75	15,0	149,8	282
CAM01380	12 x 2 x 0,75	20,0	253,1	455
CAM01382	19 x 2 x 0,75	23,8	397,7	688
CAM01391	3 x 3 x 0,75	12,6	90,4	184
CAM01393	7 x 3 x 0,75	16,7	204,0	360
CAM01395	12 x 3 x 0,75	22,5	346,0	599
CAM01408	3 x 2 x 1	12,4	92,9	180
CAM01410	7 x 2 x 1	16,4	206,5	349
CAM01412	12 x 2 x 1	22,1	348,4	579
CAM01414	19 x 2 x1	26,3	547,1	875
CAM01423	3 x 3 x 1	13,7	123,9	226
CAM01425	7 x 3 x 1	18,5	278,8	458
CAM01427	12 x 3 x 1	24,9	472,4	759
CAM01440	3 x 2 x 1,5	14,2	115,7	221
CAM01442	7 x 2 x 1,5	19,2	259,5	446
CAM01444	12 x 2 x 1,5	26,1	439,4	751
CAM01446	19 x 2 x1,5	30,8	691,2	1.115
CAM01455	3 x 3 x 1,5	16,1	158,0	291
CAM01457	7 x 3 x 1,5	21,6	358,4	592
CAM01459	12 x 3 x 1,5	29,4	608,9	997

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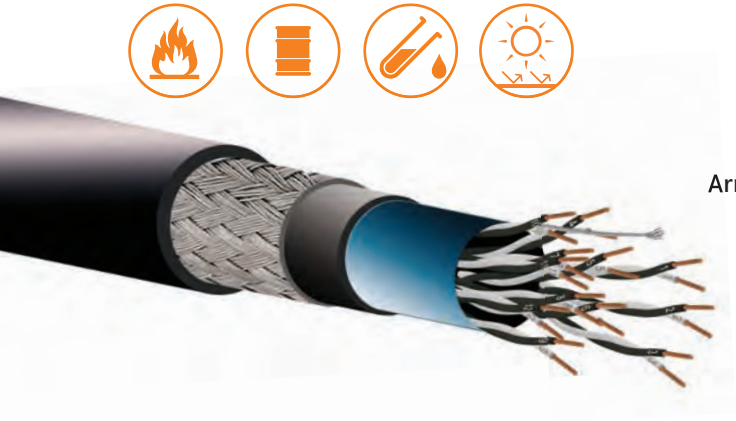
AVAILABLE ALSO IN: Tinned copper conductors



ÖLFLEX® INSTRUM SC SWB 709 H

Armoured overall screened ship board instrumentation cable LSZH

Info

FE4XOHAM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Armoured twisted pair or triad signal cable, overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Flexible Annealed Copper
- **Core insulation:** XLPE
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 5 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB 709 H				
CAM01513	3 x 3 x 0,75	15,1	74,9	308
CAM01515	7 x 3 x 0,75	18,8	167,8	494
CAM01517	12 x 3 x 0,75	24,0	284,0	749
CAM01525	2 x 1	10,3	28,4	145
CAM01527	3 x 2 x 1	14,9	69,7	294
CAM01529	7 x 2 x 1	18,5	152,3	462
CAM01531	12 x 2 x 1	23,6	255,6	694
CAM01533	19 x 2 x 1	27,2	400,2	945
CAM01544	3 x 1	10,6	38,7	163
CAM01545	3 x 3 x 1	16,2	100,7	353
CAM01547	7 x 3 x 1	20,5	224,6	590
CAM01549	12 x 3 x 1	26,2	379,6	901
CAM01557	2 x 1,5	11,2	36,0	168
CAM01559	3 x 2 x 1,5	16,6	92,5	353
CAM01561	7 x 2 x 1,5	21,1	205,4	582
CAM01563	12 x 2 x 1,5	27,1	346,6	885
CAM01565	19 x 2 x 1,5	31,6	544,3	1.233
CAM01576	3 x 1,5	11,9	50,1	198
CAM01577	3 x 3 x 1,5	18,3	134,8	440
CAM01579	7 x 3 x 1,5	23,4	304,3	752
CAM01581	12 x 3 x 1,5	30,2	516,1	1.160

Unless specified otherwise, the shown product values are nominal values. Detailed values (e.g. tolerances) are available upon request.
Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour

ÖLFLEX® INSTRUM SC SWB 710 H

Armoured individual and overall screened ship board instrumentation cable LSZH

Info

FE4XHOHAM1 150/250 V
IEC 60092-376

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Armoured twisted pair or triad signal cable, Individual and overall screened, XLPE insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)

Design

- **Conductor:** Flexible Annealed Copper
- **Core insulation:** XLPE
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 5 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB 710 H				
CAM01504	3 x 2 x 0,75	15,0	67,1	299
CAM01506	7 x 2 x 0,75	18,6	149,8	476
CAM01508	12 x 2 x 0,75	23,8	253,1	720
CAM01510	19 x 2 x 0,75	27,4	397,7	986
CAM01519	3 x 3 x 0,75	16,2	90,4	350
CAM01521	7 x 3 x 0,75	20,5	204,0	586
CAM01523	12 x 3 x 0,75	26,3	346,0	895
CAM01536	3 x 2 x 1	16,0	92,9	344
CAM01538	7 x 2 x 1	20,0	206,5	560
CAM01540	12 x 2 x 1	25,6	348,4	856
CAM01542	19 x 2 x1	29,8	547,1	1.202
CAM01551	3 x 3 x 1	17,5	123,9	414
CAM01553	7 x 3 x 1	22,0	278,8	693
CAM01555	12 x 3 x 1	28,4	472,4	1.070
CAM01568	3 x 2 x 1,5	18,0	115,7	416
CAM01570	7 x 2 x 1,5	22,8	259,5	690
CAM01572	12 x 2 x 1,5	29,6	439,4	1.075
CAM01574	19 x 2 x1,5	35,0	691,2	1.547
CAM01583	3 x 3 x 1,5	19,6	158,0	498
CAM01585	7 x 3 x 1,5	25,2	358,4	865
CAM01587	12 x 3 x 1,5	32,9	608,9	1.361

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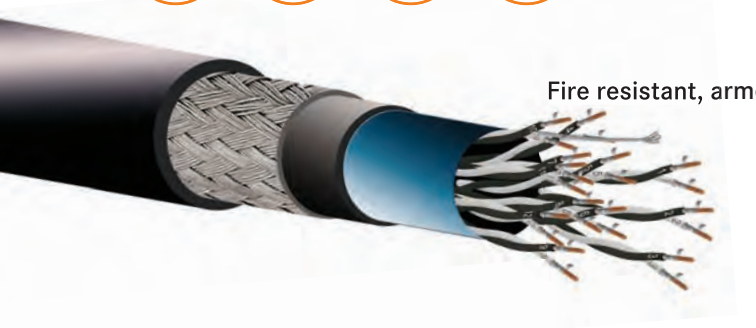
AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour



ÖLFLEX® INSTRUM SC SWB F90 711 H

Fire resistant, armoured overall screened ship board instrumentation cable LSZH

Info

FTE4XOHAM1 150/250 V
IEC 60092-376
IEC 60331-21

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Armoured twisted pair or triad signal cable, overall screened, XLPE over MICA-tape insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)
  IEC 60331-21 (90 min./750 °C)

Design

- **Conductor:** Flexible Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 5 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB F90 711 H				
CAM01641	3 x 3 x 0,75	17,4	74,9	371
CAM01643	7 x 3 x 0,75	21,9	167,8	598
CAM01645	12 x 3 x 0,75	28,2	284,0	910
CAM01653	2 x 1	11,3	28,4	164
CAM01655	3 x 2 x 1	16,7	69,7	339
CAM01657	7 x 2 x 1	21,2	152,3	549
CAM01659	12 x 2 x 1	27,2	255,6	827
CAM01661	19 x 2 x 1	31,7	400,2	1.140
CAM01672	3 x 1	11,9	38,7	191
CAM01673	3 x 3 x 1	18,4	100,7	419
CAM01675	7 x 3 x 1	23,5	224,6	701
CAM01677	12 x 3 x 1	30,4	379,6	1.073
CAM01685	2 x 1,5	12,4	36,0	195
CAM01687	3 x 2 x 1,5	18,6	92,5	410
CAM01689	7 x 2 x 1,5	23,8	205,4	677
CAM01691	12 x 2 x 1,5	30,7	346,6	1.030
CAM01693	19 x 2 x 1,5	36,3	544,3	1.468
CAM01704	3 x 1,5	13,0	50,1	222
CAM01705	3 x 3 x 1,5	20,6	134,8	511
CAM01707	7 x 3 x 1,5	26,5	304,3	874
CAM01709	12 x 3 x 1,5	35,0	516,1	1.400

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Photographs are not to scale and do not represent detailed images of the respective products

AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour

ÖLFLEX® INSTRUM SC SWB F90 712 H

Fire resistant, armoured individual and overall screened ship board instrumentation cable LSZH

Info

FTE4XHOHAM1 150/250 V
IEC 60092-376
IEC 60331-21

Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Fire behaviour
- Halogen free
- Low smoke
- Oil resistant
- RoHS
- DNV Type Approval

Productf eatures

Armoured twisted pair or triad signal cable, Individual and overall screened, XLPE over MICA-tape insulated and LSZH jacketed

Norm references / Approvals

- **Hydrocarbon & Oil resistance**
  CEI 20-34/0
- **Smoke**
  IEC 61034-1 and 2
- **Halogen acid gas**
  IEC 60754-1 and 2
- **Fire behaviour**
  IEC 60332-1-2
  IEC 60332-3-22 (Cat. A)
  IEC 60331-21 (90 min./750 °C)

Design

- **Conductor:** Flexible Annealed Copper
- **Core insulation:** XLPE, over MICA-tape wrapped conductor
- **Screen:** IS/OS Aluminum/PET + TC Drain wire
- **Inner sheath:** LSZH, black
- **Armour:** Galvanized steel wire braid
- **Outer sheath:** LSZH, black

Technicald ata

Core identification code:
Pairs are black & white with printed numbers
Triads are black, white, red with printed numbers

Insulation resistance:
5000 MOhm x km

Conductor stranding:
Class 5 IEC 60228

Nominal Voltage Uo/U:
150/250 V

Test voltage:
C/C 1500 V x 5 minute

Temperature range:
during operation: -30° to +70°C
during installation: -5° to +50°C

Minimum Bending Radius:
8 x Outer Diameter

Article Number	Number cores and mm² per conductor	Approx. Outer Diameter (mm)	Copper index (kg/km)	Approx. Weight (kg/km)
ÖLFLEX® INSTRUM SC SWB F90 712 H				
CAM01636	12 x 2 x 0,75	27,7	253,1	861
CAM01638	19 x 2 x 0,75	32,3	397,7	1.193
CAM01647	3 x 3 x 0,75	18,6	90,4	419
CAM01649	7 x 3 x 0,75	23,8	204,0	702
CAM01651	12 x 3 x 0,75	30,8	346,0	1.074
CAM01664	3 x 2 x 1	18,1	92,9	403
CAM01666	7 x 2 x 1	23,1	206,5	668
CAM01668	12 x 2 x 1	29,8	348,4	1.018
CAM01670	19 x 2 x1	35,2	547,1	1.455
CAM01679	3 x 3 x 1	19,7	123,9	477
CAM01681	7 x 3 x 1	25,3	278,8	814
CAM01683	12 x 3 x 1	33,1	472,4	1.274
CAM01696	3 x 2 x 1,5	20,0	115,7	470
CAM01698	7 x 2 x 1,5	25,7	259,5	794
CAM01700	12 x 2 x 1,5	33,6	439,4	1.237
CAM01702	19 x 2 x1,5	40,3	691,2	1.881
CAM01711	3 x 3 x 1,5	22,1	158,0	575
CAM01713	7 x 3 x 1,5	28,5	358,4	997
CAM01715	12 x 3 x 1,5	38,5	608,9	1.705

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AVAILABLE ALSO IN: Tinned copper conductors, tinned copper wire braid armour

1. General

The **resistance** of the product materials in the application environment, correct product assembly and subjected load in the context of permitted limit values (technical data) have a significant impact on the safety and durability of our products. Notes on product usage and technical data can primarily be found on the catalogue product pages, both in the text sections and the tables provided.

Selection tables A1–A13 provide an overview of similar products and enable comparisons on the basis of important product properties (e.g. “permitted temperature range”, “permitted bending radius”) and main application parameters (e.g. “outdoor use, unprotected”), thus facilitating the selection process.

The **“technical tables”** (T1–T30) focus on the following:

- Chemical resistance (T1, T24), radiation resistance (T28), weather and oil resistance (T15)
- Assembly of PROFIBUS and Industrial Ethernet cables (T2), assembly of cables for power chains (T3), assembly of cables for conveyor technology (T4, T5)
- Assembly/installation/fastening of cables in special cases (T19)
- Assembly, thread dimensions and tightening torques of cable glands (T21)
- Electrical load capacity, conversion factors, installation type according to VDE, Germany (T12)
- Electrical load capacity, installation type according to NEC, USA (T13)
- Load capacity with regard to thermal stress and tensile strain (T19)
- Conductor cross-sections with different measurement systems (T16)

This and the following information on special product groups/topics represent guidelines on the use and application of our products, but do not cover the competent project planning of electrical equipment in all its aspects.

2. Cables and wires

The applications of cables and wires are extremely diverse and thus governed by a whole range of application standards in the various standard groups (IEC, EN, NEC...).
One example is the international standard IEC 60204-1:2009, Electrical equipment of machines – Part 1: General requirements with reference to the requirements of cables and wires as well as their application conditions.

In all cases, meeting these **general** specifications requires the user to perform a professional examination as to the existence of **specific** product standards with other/extended requirements that may take precedence.

In this case, support is provided by the catalogue product pages in form of product and application standards – e.g. “Oil resistance according to VDE 0473-811” or “Railway applications: EN 50306-2”. In the area of low voltage harmonised cables (e.g. H05VV5-F/ ÖLFLEX® 140), DIN VDE 0298-300 in table A4 provides a list of requirements and criteria that are largely applicable to other low voltage cables as well as notes on recommended applications.

In addition, the application information provided in IEC publication 62440:2008-02 Ed. 1.0 must be observed for electrical cables with nominal voltages up to 450/750 V.

A summary of the most important information on cable and wire applications contained in the aforementioned documents is provided below.

General

Conductors, cables and wires must be selected so that they are suitable for the relevant operating conditions (e.g. voltage, current, protection against electric shock, bundling of cables and wires) and external influences (e.g. ambient temperature, presence of water or corrosive materials, mechanical stress, incl. stress experienced during installation, fire risk).

Electrical voltage

The control and connecting cables listed in the catalogue are subject to the **"low voltage directive” 2006/95/EC for electrical equipment with a nominal voltage between 50 and 1000 V (alternating current) and between 75 and 1500 V (direct current)**.

The nominal voltage is the reference voltage for which cables and wires are constructed and tested. The nominal voltage of cables and wires used with AC supplies must be greater than or equal to the nominal supply voltage. In the case of a DC supply, the nominal supply voltage must not exceed the nominal voltage of the cable by a factor greater than 1.5. The continuous operating voltage of AC and DC supplies must not exceed the nominal supply voltage by more than 10 %.

The nominal voltage of cables and wires is expressed by the ratio U/U_0 in volts, whereby:

- **U_0** is the effective voltage between a phase conductor and the earth (metal sheath/screening of the cable or surrounding medium)
- **U** is the effective voltage between two phase conductors of a multi-core cable or a system of single core cables

The dielectric strength of the insulation of cables, conductors and wires must be sufficient for the required test voltage.
For cables and wires subjected to voltages over 50 V AC or 120 V DC, the test voltage is a minimum of 2000 V AC for a duration of 5 minutes. For alternating currents with a maximum of 50 V and direct currents with a maximum of 120 V (typical values for SELV or PELV systems), the test voltage must be a minimum of 500 V AC for a duration of 5 minutes. The AC test voltages are detailed on the individual product pages in the catalogue under “technical data” and can also be used to make selections in cases where no meaningful U/U_0 ratio can be provided.

2. Cables and wires – continued

Conductor cross-sections with different measurement systems

IEC 60228 is an important international standard that describes cables with metric cross-sections. North America and other regions currently employ conductor cross-sections according to the AWG (American Wire Gauge) system with kcmil" used for larger cross-sections. A table is provided under T16 to support safe, alternative usage of cables from both these measurement systems.

Tensile strain

The following applies to **all** conductors up to maximum tensile strain of 1000 N: Max. 15 N per mm^2 conductor cross-section (excl. screening, concentric conductors and divided protective conductors) for static tensile strain when **using** moving/flexible cables and cables for/in fixed installation.

Transport and storage

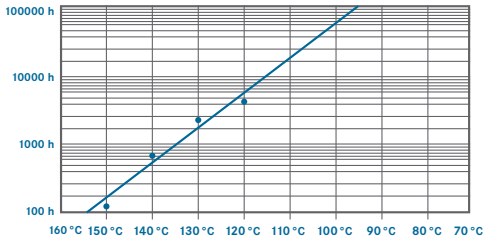
Cables and wires that are **not** designated for outdoor use must be stored indoors, in dry conditions and protected from direct sunlight. If stored outside, all cable and wire ends must be sealed to prevent the ingress of water.

The ambient temperature for transport and storage must be between -25 °C and +55 °C (max. +70 °C for no longer than 24 hours). Particularly in the lower temperature ranges, mechanical stress through vibration, shock, bending and twisting must be avoided. This is especially important for PVC-insulated cables and wires. The following guidelines apply for the maximum storage of cables and wires before use and without prior testing:

- One year if stored outdoors
- Two years if stored indoors

7. Service life

The average service life of cables is dictated not just by the mechanical and chemical stress, but also by the operating or ambient temperature. As is customary in mechanical engineering, the continuous temperature range of a cable, as specified in our technical data, refers almost exclusively to a period of at least 20,000 h. The adjacent example of an ageing curve according to Arrhenius illustrates the behaviour of an insulating material on the basis of time and temperature. The material tested here has a temperature index of Approx. +110 °C at 20,000 h. The material can also be specified with an index of +135 °C, but in this case only for a duration of Approx. 3000 h.



8. Connection technology

The quality of an electrical connection greatly depends on the choice of suitable components in the relevant nominal cross-sections and the use of recommended tools for processing.

Size differences between the cable and the tubular cable lug/conductor end sleeve are attributable to the fact that class 5 and 6 conductors can be pressed with just one crimp contact – even if the conductors have different structures (bunched, stranded or compressed conductors). Despite the sleeves appearing to be too large for the relevant cross-sections, the correct combination of conductor, contact and tool will ensure gas-tight crimping. The dimensional accuracy at the aforementioned connection points is governed by standards, incl.:

- DIN EN 60228 (VDE 0295), September 2005 – "Conductors for cables and insulated leads"
- DIN 46228 – 4, September 1990 – "Tubular end-sleeves with plastic sleeve"
- Crimping quality according to DIN 46228-1 and DIN EN 50027

9. Testing and inspection

The operator must ensure that the correct functioning and condition of electrical systems and equipment is checked by or under the supervision of a certified electrician. This must occur prior to initial commissioning and before reactivation following any modifications or maintenance work.

Inspection intervals must be set such that any problems that can reasonably be expected are identified in good time. In many cases, the service life can only be established empirically in the relevant applications. Indicators for inspection intervals can be based, for example, on the temperature load (see "Service life") or the number of permitted alternating bending cycles for drag chains (see information on relevant product pages in the catalogue). As a rule, cables and wires in fixed installations will have a longer service life and will thus also be suitable for longer inspection intervals. Shorter intervals are recommended for cables and wires used at the limit of their permitted parameters. This applies to the following in particular (see also "Technical data" and "Application" on the relevant product pages in the catalogue):

- Minimum bending radius
- Temperature range
- Presence of radiation (e.g. sunlight)
- Existence of tensile strain
- Influence of surrounding chemical substances and unverified resistance
- In the case of water accumulation or condensation in the area of the connection points. Cables and wires should be subjected to a visual inspection to identify any changes to their appearance. This should be done no later than when the cables or wires are likely to have been exposed to excessive loads (be they electrical, thermal, mechanical or chemical).

Type designations for control cables and harmonised cables (excerpts)

Control cables

□□□□□ □□ x □
1 2 3 4 5 6 7 8

1. Basic type

N	VDE standard (N) or X in line with VDE

2. Insulating material

Y	Thermoplastic resins
X	Cross-linked thermoplastic resins
G	Elastomers
HX	Halogen-free materials

3. Cable designation

A	Core cable
D	Solid wire
AF	Fine-wire core cable
F	Socket core
L	Fluorescent tube cable
LH	Connecting cable, light mechanical loads
MH	Connecting cable, moderate mechanical loads
SH	Connecting cable, heavy mechanical loads
SSH	Connecting cable for special loads
SL	Control cable/welding cable
S	Control cable
LS	Light control cable
FL	Flat cable
Si	Silicone cable
Z	Twin cable
GL	Glass fibre
Li	Braided conductor as per VDE 0812
LiF	Braided conductor as per VDE 0812, extra-fine wire

4. Special features

T	Supporting element
Ö	Enhanced oil resistance
U	Flame-retardant
w	Heat-resistant, weather-resistant
FE	Insulation retained for a limited time
C	Screening braid
D	Screening as Cu wire wrapping
S	Steel wire braiding as mech. protection

5. Sheaths

As point 2.
"Insulating material" P/PUR polyurethane

6. Protective conductor

-O	Without protective conductor
-J	With protective conductor

7. Number of cores

... number of cores

8. Conductor cross-section

Figures in mm²

Harmonised cables

□□ □□□ – □ □□□
1 2 3 4 5 6 7 8 9

1. Basic type

H	Harmonised type
A	National type

2. Nominal voltage

01 100/100 volts
03 300/300 volts
05 300/500 volts
07 450/750 volts

3. Insulating material

V	PVC
V2	PVC +90 °C
V3	PVC flexible at cold temperatures
B	Ethylene propylene rubber
E	PE polyethylene
X	XPE, cross-linked PE
R	Rubber
S	Silicone rubber

4. Outer/inner sheath material

V	PVC
V2	PVC +90 °C
V3	PVC flexible at cold temperatures
V5	PVC with enhanced oil resistance
R	Rubber
N	Chloroprene rubber
Q	Polyurethane
J	Glass fibre braiding
T	Textile braiding

5 Special features

C4	Copper wire screen braiding
H	Flat cable, divisible
H2	Flat cable, not divisible
H6	Flat cable, not divisible, for lifts
H8	Helical/spiral cable

6. Conductor type

U	Single-wire
R	Multi-wire
K	Fine-wire (fixed installation)
F	Fine-wire (flexible installation)
H	Extra-fine wire
Y	Tinsel wire
D	Fine-wire conductor for welding cable
E	Extra-fine wire conductor for welding cable

7. Number of cores

... number of cores

8. Protective conductor

X	Without protective conductor
G	With protective conductor

9. Conductor cross-section

Figures in mm²

Telecommunications cables

□□ – □□□ □ x □ x □ □□
1 2 3 4 5 6 7 8 9 10

1. Basic type

A-	Outdoor cable
G-	Mining cable
J-	Installation cable
Li	Hose, flexible cable
S-	Jumper cable

2. Additional designation

B	Lightning protection design
J	Induction protection
E	Electronics

3. Insulating material

Y	PVC 11Y PUR
2Y	Polyethylene
O2Y	Cellular PE 9Y PP
5Y	PTFE
6Y	FEP
7Y	ETFE
P	Paper

4. Special features

F	Petroleum jelly filling
L	Aluminium sheath
LD	Corrugated aluminium sheath
(L)	Aluminium strip
(ST)	Metal foil screening
(K)	Copper strip screening
C	Copper screen braiding
(Z)	Steel wire braiding
W	Corrugated steel sheath
M	Lead sheath
Mz	Special lead sheath
b	Armouring
c	Jute sleeve + ground
E	Ground layer + strip

5. Sheathing

(see point 3. "Insulating material")

6. Number of elements

... number of stranding elements

7. Stranding element

1	Single core
2	Pair

8. Conductor diameter

... in mm

9. Stranding element

F	Star quad (railway)
St	Star quad (phantom)
StI	Star quad (trunk cable)
StIII	Star quad (local cable)
TF	Star quad for TF
S	Signal cable (railway)
PiMF	Screened pair

10. Stranding type

Lg	Twisted into layers
Bd	Twisted into bundles

EXAMPLE: NSHTÖU 24G 1.5
ÖLFLEX® CRANE NSHTÖU cable, 24-core, with protective cond., cross-section: 1.5 mm²

EXAMPLE: H05 VV-F 3G 1.5
Medium PVC hose, 3-core, with protective cond., cross-section: 1.5 mm²

EXAMPLE: A2Y(L)2Y 6 x 2 x 0.8 Bd
Telephone cable for local network with PE insulation and layered sheath

Type designations for telecommunications cables and fibre-optic cables

Fibre-optic cables

□ – □□□□□□ □□ □ □

1 2 3 4 5 6 7 8 9 10

1. Basic type

A	Outdoor cable
AT	Outdoor cable, divisible
J	Indoor cable
J/A or U	Indoor/outdoor cable, universal cable

2. Fibres

B	Loose tube, unfilled
D	Loose tube, filled
V	Tight-buffered fibres

3. Design elements

F	Petroleum jelly filling
Q	Swelling tape

4. Further design elements

S	Metal element in cable core

5. Sheath

2Y	PE sheath
11Y	PUR sheath
H	Halogen-free sheath
(ZM)	With metallic strain relief elements
(ZN)	With non-metallic strain relief elements
(ZN)2Y	PE sheath with non-metallic strain relief elements

6. Armouring

B	Armouring
B2Y	Armouring with PE casing
(BN)	Glass yarn armouring
(SG)	Steel sheath
(SR)	Corrugated steel sheath
(SR)2Y	Corrugated steel sheath with PE casing

7. Number of fibres

Number of fibres

8. Fibre type

E	Monomode fibre glass/glass (SM GOF)
G	Gradient fibre glass/glass (MM GOF)
K	Stepped fibre glass/plastic (PCF)
P	Polymer optical fibre/plastic (POF)

9. Core diameter/fibre sheath diameter

50/125	Multimode glass fibre
62,5/125	Multimode glass fibre
9/125	Monomode glass fibre
200/230	Plastic-coated glass fibre
980/1000	Polymer optical fibre

10. Category: fibre quality

OM3	For 50/125 OM3 multimode fibres
OM2	For 50/125 OM2 multimode fibres
OM1	For 62.5/125 OM1 multimode fibres
OS2	For 9/125 OS2 monomode fibres (G 652D)

EXAMPLE 1: A-DQ(ZN)(SR)2Y 12G 50/125 OM3
Outdoor cable with corrugated steel sheath, central loose tube, non-metallic strain relief made of glass yarn, 12 fibres, 50/125 µm OM3 multimode fibres

EXAMPLE 2: J-V2Y(ZN)11Y 2P 980/1000
Plastic fibre-optic cable, two-fibre (duplex), indoor cable with PE inner sheath, non-metallic strain relief, PUR outer sheath

Cable's identification code GEN to CEI-UNEL 35011

CONDUCTORS

U	Solid Conductor
R	Stranded conductor
F	Flexible Conductor
FF	Extra Flexible Conductor

INSULATIONS

R	PVC
R2	PVC Type R2
R3	PVC 105°C
R7	PVC 90°C
E	Polyethylene
E4	Cross-linked Polyethylene (XLPE)
G4	Silicon Rubber
G7	Hich Module Ethylene Propylene Rubber (HEPR)
G10	Low Smoke Cross-Linked Polyolefin (XLPO)
T	Mica Glass Tape

CABLE'S SHAPE

O	Round shape cable
D	Flat Cable
X	Cores twisted in pairs, triad, quad

SHIELDS

C	Copper Concentric conductor
H	Aluminium Polyester Tape
H1	Copper tape or Copper wires shield
H2	Copper Braid Shield
H3	Double Copper Braid Shield
H5	Longitudinal Aluminium Tape

ARMOURS

A	Steel Wire Braid
F	Steel Wires
N	Steel Tape
Z	Steel Stripes
L	Lead Jacket
H4	Longitudinal Corrugated Steel Tape

JACKETS

R	PVC
R4	Polyamide (nylon)
E	Polyethylene
E4	Cross-linked Polyethylene (XLPE)
G	Cross-linked Elastomer
M1	Low Smoke Halogen Free Thermoplastic Material
M2	Low Smoke Halogen Free cross-linked Material
T	Textitle Braid
T1	Glass Type
T2	Special Textile
P	Polyutherane
Tpe	Termoplastic Elastomer

Colour Codes of Insulations and Outer Sheaths

THERMOCOUPLE		IEC 60584 [1) 2)]		ANSI MC 96.1 [1)]	
Material ⊕ ⊖		Designation TEC	CC	Designation TEC	CC
R	+ PLATINUM -13% RHODIUM - PLATINUM	**RCA/SCA** 0°C up to + 100°C	Copper/Copper-Nickel (Class 1:————————) (Class 2: ± 30 µV/± 2.5°C)		
S	+ PLATINUM -13% RHODIUM - PLATINUM	**RCB/SCB** 0°C up to + 200°C	Copper/Copper-Nickel (Class 1:————————) (Class 2: ± 60µV/ ± 5°C)	**SX** 0°C up to + 200°C	Copper/Copper-Nickel (± 57µV/ ± 5°C)
			**Cu** **CuNi**		**Cu** **CuNi**
B	+ PLATINUM -30% RHODIUM - PLATINUM - 6% RHODIUM	**BC** 0°C up to +100°C	Copper/Copper (± 40µV/ ±3.5°C)	**BX** 0°C up to +100°C	Copper-alloy/Copper (Copper/Copper) (-33µV/-3.7°C) (+ 0.0µV/ + 0°C)
			**Cu** **Cu**		**Cu-alloy (Cu)** **Cu (Cu)**
J	+ IRON - COPPER -NICKEL	**JX** -25°C up to +200°C	Iron/Copper-Nickel (Class 1: ± 85 µV/± 1.5°C) (Class 2: ± 140 µV/± 2.5°C)	**JX** 0°C up to 200°C	Iron/Copper-Nickel (special: ±1.1°C) (standard: ±2.2°C)
			**Fe** **CuNi**		**Fe** **CuNi**
T	+ COPPER - COPPER -NICKEL	**TX** -25°C up to +100°C	Copper/Copper-Nickel (Class 1: ± 30 µV/± 0.5°C) (Class 2: ± 60 µV/± 1.0°C)	**TX** 0°C up to 100°C	Copper/Copper-Nickel (special: ±0.5°C) (standard: ±1.0°C)
			**Cu** **CuNi**		**Cu** **CuNi**
E	+ NICKEL-CHROMIUM - COPPER-NICKEL	**EX** -25°C up to +200°C	Nickel-Chromium/Copper-Nickel (Class 1: ± 120 µV/± 1.5°C) (Class 2: ± 200 µV/± 2.5°C)	**EX** 0°C up to 200°C	Nickel-Chromium/ Copper-Nickel (± 1.7°C)
			**NiCr** **CuNi**		**NiCr** **CuNi**
K	+ NICKEL-CHROMIUM - NICKEL-ALUMINIUM	**KX** -25°C up to + 200°C	Nickel-Chromium/Nickel-Aluminium (Class 1: : ± 60 µV/± 1.5°C) (Class 2: ± 100 µV/± 2.5°C)	**KX** 0°C up to +200°C	Nickel-Chromium/Nickel-Aluminium (± 2.2°C)
		KCB 0°C up to + 100°C	Copper/Copper-Nickel (Class 1:————————) (Class 2: ± 100µV/ ± 2.5°C)		**NiCr** **Ni**
		KCA 0°C up to + 150°C	Iron/Copper-Nickel (Class 1:————————) (Class 2: ± 100µV/ ± 2.5°C)	**VX** ISA RP 1.1 0°C up to +100°C	Copper/Copper-Nickel (± 2.2°C)
			KX **NiCr Ni** / KCB **Cu CuNi** / KCA **Fe CuNi**		**Cu** **CuNi**
-N	+ NICKEL-CHROM. - SILICON - NICKEL-SILICON	**NX** -25°C up to + 200°C	Nickel-Chromium-Silicon Nickel-Silicon (Class 1: ± 60 µV/± 1.5°C) (Class 2: ± 100 µV/± 2.5°C)		
		NC 0°C up to + 150°C	Copper/Copper-Nickel (Class 1:————————) (Class 2: ± 100µV/ ± 2.5°C)		
			**NX** **CuCrSi** **NiSi** / **NC** **Cu** **CuNi**		

[1)] In all standards the basic e.m.f. values of the same thermocouple type are identical
[2)] Following Standards are corresponding with the IEC-Standard 60584
- ♦ DIN 43722
- ♦ BS 4937 part 20 + 30
- ♦ NFC 32-424
- ♦ JIS C 1610 section 1

Temperature ranges and tolerances to IEC 60584. part 3, July 1989.
Colour coding for conductors and outer sheaths to IEC 60584. part 3, July 1989
Besides the identification letter of the thermocouple type, extension cables are identified by „X“ compens ating cables by „C“
The colour coding of BC is according to KERPEN works standard, as it is not specified in IEC 60584.
The colour coding of NX and NC is a proposal for standardization in IEC 60584.

The identification system of ANSI does not differ between extension and compensating cables; all materials are marked „X“.
For BX the temperature range and tolerance have to be agreed upon between end-user and manufacturer.

TEC = thermoelectric cables
CC = compensating cables

VDE 0293-308/HD 308 S2
Core ID code for colour-coded low-voltage cables

For marking cores in multi- and several-core cables for use in electrical systems and distribution systems.
For the supply of permanently secured or portable supplies and for portable equipment cables. 3a and 4a: only suitable for specific applications.

Number of cores	Cables with protective conductor (code J or G)	Cables without protective conductor (code O or X)	Cables with concentric conductor
2	–	BU/BN	BU/BN
3	GNYE/BN/BU	BN/BK/GY	BN/BK/GY
3a	–	BU/BN/BK	BU/BN/BK
4	GNYE/BN/BK/GY	BU/BN/BK/GY	BU/BN/BK/GY
4a	GNYE/BU/BN/BK	–	–
5	GNYE/BU/BN/BK/GY	BU/BN/BK/GY/BK	BU/BN/BK/GY/BK
6 and above	GNYE/BK with printed numbers	BK with printed numbers	BK with printed numbers

T11: conductor resistances and strand structure (metric)

Conductor resistances and conductor stranding (metric)

Conductor resistances: from 0.5 mm² as per DIN EN 60228 (VDE 0295) for conductors made of soft-annealed copper and single and multi-core cables.

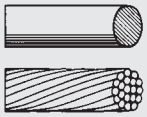
Nominal cross-section in mm²	Conductor resistances at 20 °C for 1 km in Ω (max. value)			
	Made of wires with metal sheath		Made of bare wires	
	Class 2	Class 5 + 6	Class 2	Class 5 + 6
0.08		250.0		243.0
0.14		142.0		138.0
0.25		82.0		79.0
0.34		59.0		57.0
0.38		52.8		48.5
0.5	36.7	40.1	36.0	39.0
0.75	24.8	26.7	24.5	26.0
1	18.2	20.0	18.1	19.5
1.5	12.2	13.7	12.1	13.3
2.5	7.56	8.21	7.41	7.98
4	4.70	5.09	4.61	4.95
6	3.11	3.39	3.08	3.30
10	1.84	1.95	1.83	1.91
16	1.16	1.24	1.15	1.21
25	0.734	0.795	0.727	0.780
35	0.529	0.565	0.524	0.554
50	0.391	0.393	0.387	0.386
70	0.270	0.277	0.268	0.272
95	0.195	0.210	0.193	0.206
120	0.154	0.164	0.153	0.161
150	0.126	0.132	0.124	0.129
185	0.100	0.108	0.0991	0.106
240	0.0762	0.0817	0.0754	0.0801
300	0.0607	0.0654	0.0601	0.0641
400	0.0475		0.0470	
500	0.0369		0.0366	
630	0.0286		0.0283	
800	0.0224		0.0221	
1000	0.0177		0.0176	

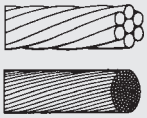
Example conductor stranding (metric)

Cross-section in mm²	Multi-wire conductor	Several-wire conductor	Fine-wire conductor	Extra-fine wire conductor			
0.14				~ 18 x 0.10	~ 18 x 0.1	~ 36 x 0.07	~ 72 x 0.05
0.25			~ 14 x 0.15	~ 32 x 0.10	~ 32 x 0.1	~ 65 x 0.07	~ 128 x 0.05
0.34		7 x 0.25	~ 19 x 0.15	~ 42 x 0.10	~ 42 x 0.1	~ 88 x 0.07	~ 174 x 0.05
0.38		7 x 0.27	~ 19 x 0.16	~ 19 x 0.16	~ 48 x 0.1	~ 100 x 0.07	~ 194 x 0.05
0.5	7 x 0.30	7 x 0.30	~ 16 x 0.20	~ 28 x 0.15	~ 64 x 0.1	~ 131 x 0.07	~ 256 x 0.05
0.75	7 x 0.37	7 x 0.37	~ 24 x 0.20	~ 42 x 0.15	~ 96 x 0.1	~ 195 x 0.07	~ 384 x 0.05
1.0	7 x 0.43	7 x 0.43	~ 32 x 0.20	~ 56 x 0.15	~ 128 x 0.1	~ 260 x 0.07	~ 512 x 0.05
1.5	7 x 0.52	7 x 0.52	~ 30 x 0.25	~ 84 x 0.15	~ 192 x 0.1	~ 392 x 0.07	~ 768 x 0.05
2.5	7 x 0.67	~ 19 x 0.41	~ 50 x 0.25	~ 140 x 0.15	~ 320 x 0.1	~ 651 x 0.07	~ 1280 x 0.05
4	7 x 0.85	~ 19 x 0.52	~ 56 x 0.30	~ 224 x 0.15	~ 512 x 0.1	~ 1040 x 0.07	
6	7 x 1.05	~ 19 x 0.64	~ 84 x 0.30	~ 192 x 0.20	~ 768 x 0.1	~ 1560 x 0.07	
10	7 x 1.35	~ 49 x 0.51	~ 80 x 0.40	~ 320 x 0.20	~ 1280 x 0.1	~ 2600 x 0.07	
16	7 x 1.70	~ 49 x 0.65	~ 128 x 0.40	~ 512 x 0.20	~ 2048 x 0.1		
25	7 x 2.13	~ 84 x 0.62	~ 200 x 0.40	~ 800 x 0.20	~ 3200 x 0.1		
35	7 x 2.52	~ 133 x 0.58	~ 280 x 0.40	~ 1120 x 0.20			
50	~ 19 x 1.83	~ 133 x 0.69	~ 400 x 0.40	~ 705 x 0.30			
70	~ 19 x 2.17	~ 189 x 0.69	~ 356 x 0.50	~ 990 x 0.30			
95	~ 19 x 2.52	~ 259 x 0.69	~ 485 x 0.50	~ 1340 x 0.30			
120	~ 37 x 2.03	~ 336 x 0.67	~ 614 x 0.50	~ 1690 x 0.30			
150	~ 37 x 2.27	~ 392 x 0.69	~ 765 x 0.50	~ 2123 x 0.30			
185	~ 37 x 2.52	~ 494 x 0.69	~ 944 x 0.50	~ 1470 x 0.40			
240	~ 37 x 2.87	~ 627 x 0.70	~ 1225 x 0.50	~ 1905 x 0.40			
300	~ 61 x 2.50	~ 790 x 0.70	~ 1530 x 0.50	~ 2385 x 0.40			
400	~ 61 x 2.89		~ 2035 x 0.50				
500	~ 61 x 3.23		~ 1768 x 0.60				
630	~ 91 x 2.97		~ 2286 x 0.60				

NOTE ON STANDARDS:

For single-wire conductors ... **(class 1),** please see DIN EN 60228 (VDE 0295), table 1
For multi-wire conductors ... **(class 2),** please see DIN EN 60228 (VDE 0295), table 2
For fine-wire conductors ... **(class 5),** please see DIN EN 60228 (VDE 0295), table 3
For extra-fine wire conductors ... **(class 6),** please see DIN EN 60228 (VDE 0295), table 4


single-wire


multi-/several-wire

fine-wire

extra-fine wire

TEMPERATURE COEFFICIENT Kt for the measurement of the ELECTRIC RESISTANCE
Electric resistance at 20°C = Rta x Temperature coefficient (Kt)
Rta = electric resistance at environment temperature

C°	Kt	C°	Kt	C°	Kt
10	1,042	17	1,012	24	0,984
11	1,037	18	1,008	25	0,980
12	1,033	19	1,004	26	0,977
13	1,029	20	1,000	27	0,973
14	1,025	21	0,996	28	0,969
15	1,020	22	0,992	29	0,965
16	1,016	23	0,988	30	0,962

T15: properties of cable insulation and sheathing

Applies only to the base materials. Deviations are possible depending on the use/design. Please refer to the relevant page in the catalogue.

Usage criteria	Material									
Parameter	Material resistant to org. oils	Polyvinylchloride	Heat-resistant polyvinylchloride	High-pressure polyethylene	Low-pressure polyethylene	Polyurethane	Polyamide	Polybutylene terephthalate	Polytetrafluoroethylene	Tetrafluoroethylene Hexafluoropropylene copolymer
Abbreviations	Lapp type: P4/11	PVC	PVC	LDPE	HDPE	PUR	PA	PBTP	PTFE	FEP
Code as per VDE	–	Y	Y	2Y	2Y	11Y	4Y	–	5Y	6Y
Operating temperature	-40 +120	-30 +70	-20 +90	-50 +70	-50 +100	-40 +90/100	-40 +80	-60 +110	-190 +260	-100 +200
Dielectric constant (10^{-3})	2.4	4.0	3.5	2.3	2.3	4.0 – 6.0	3.5 – 7.0	3.0 – 4.0	2.1	2.1
Spec. contact resistance (Ω x cm)	10^{15}	10^{12} – 10^{15}	10^{12} – 10^{15}	10^{17}	10^{17}	10^{12}	10^{14}	10^{16}	10^{18}	10^{18}
Tensile strength in N/mm² MPa	10 – 20	10 – 25	10 – 25	20 – 30	30	30 – 45	50 – 180	50 – 100	14 – 40	20 – 25
Elongation at break in %	450 – 550	150 – 300	150 – 300	500	800	300 – 600	200 – 300	50 – 300	240 – 400	250 – 350
Water absorption (20 °C) in %	1 – 2	0.4	0.4	0.1	0.1	1.5	1 – 2	0.5	0.01	0.01
Weather resistance	very good	moderate	moderate	good	moderate	very good	good	good	very good	very good
Fuel resistance	good	moderate	moderate	low	low	good	moderate	good	very good	very good
Oil resistance	Resistance to org. oil: very good	good	good	moderate	moderate	good	good	good	very good	very good
Flammability	flammable	self-ext-inguishing	self-ext-inguishing	flammable	flammable	self-ext-inguishing*	flammable	flammable	non-flammable	non-flammable

Usage criteria	Material								
Parameter	Ethylene tetrafluoroethylene	Perfluoroalkoxy polymer	Chloroprene rubber	Silicone rubber	Ethylene vinyl acetate	Ethylene propylene rubber	Thermoplastic polyolefin elastomer	Thermoplastic polyester elastomer	Styrene three-block copolymer
Abbreviations	ETFE	PFA	CR	SI	EVA	EPM/EPDM	TPE-O	TPE-E	TPE-S
Code as per VDE	7Y	–	5G	2G	4G	3G	–	12Y	–
Operating temperature	-100 +150	-190 +260	-40 +100	-60 +180	-30 +125	-30 +120	-40 +120	-70 +125	-75 +105/140
Dielectric constant (10^{-3})	2.6	2.1	6.0 – 8.0	2.8 – 3.2	5 – 7	3.2	2.7 – 3.6	3.7 – 5.1	2.2 – 2.6
Spec. contact resistance (Ω x cm)	10^{16}	10^{15}	10^{13}	10^{15}	10^{13}	10^{14}	5 x 10^{14}	10^{12}	10^{16}
Tensile strength in N/mm² MPa	40 – 50	30	25	5 – 10	5	5 – 25	≥ 6	3 – 25	9 – 25
Elongation at break in %	100 – 300	300	450	200 – 350	200	200 – 450	≥ 400	280 – 650	500 – 700
Water absorption (20 °C) in %	0.01	0.01	1	1.0	0.01	0.02	1.5	0.3 – 0.6	1 – 2
Weather resistance	very good	very good	very good	very good	good	good	very good	very good	moderate
Fuel resistance	very good	very good	low	low	low	low	moderate	good	good
Oil resistance	very good	good	good	moderate	low	low	moderate	very good	low
Flammability	non-flammable	non-flammable	self-ext-inguishing	hardly flammable	flammable	flammable	flammable	flammable	flammable

Appendix III: Common Test Methods for Cables under Fire Conditions

Reaction to Fire - IEC and corresponding European Standards

IEC Standard CENELEC Standard		CENELEC Standard	
No.	**Title**	**No.**	**Title**
IEC 60332	**Tests on electric and optical cables under fire conditions**	**EN 50265**	**Test for resistance to vertical flame propagation for a single insulated conductor or cable**
-1-1 [1]	Test on a single vertical insulated wire or cable - Apparatus	-1	Apparatus
-1-2 [2]	Test on a single vertical insulated wire or cable - Procedure	-2-1 [1]	Procedures - 1 kW pre-mixed flame
-1-3	Test on a single vertical insulated wire or cable - Procedure for determination of flaming droplets/particles	-2-2	Procedures - Diffusion flame
IEC 60332	**Tests on electric cables under fire conditions**		
-2-1	Test on a single vertical insulated wire or cable - Apparatus		
-2-2	Test on a single vertical insulated wire or cable - Procedure		
IEC 60332-3 [2]	**Tests on bunched wires or cables**	**EN 50266** [2]	**Test f. vertical flame spread of vertically mounted bunched wires o.cables**
-10	Apparatus	-1	Apparatus
-21	Procedures Category A F/R	-2-1	Procedures Category A F/R
-22	Procedures Category A	-2-2	Procedures Category A
-23	Procedures Category B	-2-3	Procedures Category B
-24	Procedures Category C	-2-4	Procedures Category C
-25	Procedures - small cables	-2-5	Procedures - small cables
IEC 60754 [3]	**Tests on gases evolved during combustion of materials from cables**	**EN 50267** [3]	**Tests on gases evolved during combustion of materials from cables**
-1	Determination of amount of halogen acid gas	-1	Apparatus
-2	Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity	-2-1	Procedures - Determination of the amount of halogen acid gas
		-2-2	Procedures - Determination of degree of acidity of gases for materials by measuring pH and conductivity
		-2-3	Procedures - Determination of degree of acidity of gases for cables by determination of the weighted average of pH and conductivity
IEC 61034 [2]	**Measurement of smoke density of cables burning u. defined conditions**	**EN 50268** [2]	**Measurement of smoke density of cables burning u. defined conditions**
-1	Test apparatus	-1	Apparatus
-2	Test procedure and requirements	-2	Procedure

Resistance to Fire (IEC 60 331)

IEC Standard		CENELEC Standard	
No.	**Title**	**No.**	**Title**
IEC 60331	**Tests for electric cables under fire conditions** **Circuit Integrity**	**(under consideration)**	**(under consideration)**
-11	Apparatus – Fire alone at temperature of at least 750°C		
-21	Procedures and requirements – Cables of rated voltage up to and including 0,6/1 kVProcedures Category A		
-22	Procedures and requirements – Cables of rated voltage greater than 1 kV (under consideration)		
-23	Proc. and requirements – Electric data cables		
-25	Proc. and requirements – Optical fibres cables		

[1] Tests almost identical
[2] Tests identical
[3] The formal structure of the standards differs in some points, but procedure and requirements of tests are identical

US dimension units for cables – comparison with metric dimensions

In North American markets, cable cross-sections are usually stated as AWG (American Wire Gauge) sizes or, for large cable cross-sections (above AWG 4/0), using the unit “kcmil”. You will find these units in the relevant standards for designing cables by current rating.

Multi-standard cables must comply with both the specifications of the metric system (in which the cross-section in mm² is stated as the nominal size) as well the requirements of the AWG system. For this reason, both systems are compared below based on the nominal size.

Please note that exact correspondences between the two systems do not exist as the specifications of the two systems differ in terms of the cross-section and conductor resistance. The following table can be used to help you when selecting the correct nominal cross-section.

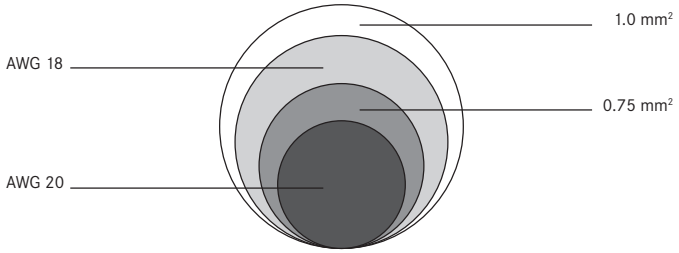
Standards required as part of project planning, such as UL1581 or IEC 60228 (VDE 0295), must be applied accordingly.

Please note that when selecting appropriate connecting elements such as conductor end sleeves, the **actual** conductor cross-section is decisive. This is stated on the relevant product page.

Column 1a	Column 1b	Column 2	Column 3	Column 4	Column 5a	Column 5b
North American cross-section required		Geometric conversion	Metric nominal cross-section that meets the electrical requirements	Metric nominal cross-section required	North American size that meets the electrical requirements	
AWG	kcmil	mm²	mm²	mm²	AWG	kcmil
	750	380.03	**400**	400		800
	500	253.35	**300**	300		750
	450	228.02	**240**	240		500
	400	202.68				450
	350	177.35	**185**	185		400
	300	152.01				350
	250	126.68	**150**	150		300
4/0		107.22	**120**	120		250
3/0		85.01	**95**	95	4/0	
2/0		67.43	**70**	70	3/0	
1/0		53.49			2/0	
1		42.41	**50**	50	1/0	
2		33.62	**35**	35	1	
3		26.67			2	
4		21.15	**25**	25	3	
5		16.77			4	
6		13.30	**16**	16	5	
7		10.55			6	
8		8.37	**10**	10	7	

Column 1a	Column 1b	Column 2	Column 3	Column 4	Column 5a	Column 5b
North American cross-section required		Geometric conversion	Metric nominal cross-section that meets the electrical requirements	Metric nominal cross-section required	North American size that meets the electrical requirements	
AWG	kcmil	mm²	mm²	mm²	AWG	kcmil
9		6.63			8	
10		5.26	**6**	6	9	
11		4.17			10	
12		3.31	**4**	4	11	
13		2.62			12	
14		2.08	**2.5**	2.5	13	
15		1.65			14	
16		1.31	**1.5**	1.5	15	
17		1.04			16	
18		0.82	**1**	1	17	
19		0.65	**0.75**	0.75	18	
20		0.52			19	
21		0.41	**0.5**	0.5	20	
22		0.33	**0.34**	0.34	21	
23		0.26			22	
24		0.20	**0.25**	0.25	23	
25		0.16			24	
26		0.13	**0.14**	0.14	25	

Principle of cross-section figures



EXAMPLE 1:

The electro-technical project planning requirements as per North-American standards stipulate that you require a cable of AWG 20.

The relevant product page in the catalogue does not list any cables with this AWG size. A size of AWG 20 is listed in the above table in column 1a. Column 3 lists the metric nominal cross-section that, as a minimum, meets the electrical requirements of size AWG 20. Thus, you will require a cable with a nominal cross-section of 0.75 mm².

EXAMPLE 2:

The electro-technical project planning requirements as per European standards stipulate that you require a cable of 0.75 mm².

The product page in the catalogue lists only AWG figures or large metric cross-sections. Nominal cross-section 0.75 mm² is listed in the above table in column 4. Column 5a lists the AWG size that, at a minimum, meets the electrical requirements of a nominal cross-section of 0.75 mm². Thus, you will require a cable with size AWG 18.

General dimensions*:

The base units are as follows:
In the British gravitational system:
Length (ft) – force (lbf = Lb) – time (s)

In the British absolute system:
Length (ft) – mass (lb) – time (s)

1. Measures of length

1 mil	=	0.0254 mm
1 inch (in;")	=	25.4 mm
1 foot (ft;')	=	0.305 m
1 yard (yd)	=	0.914 m
1 chain (ch)	=	20.1 m
1 statute mile	=	1.61 km
1 nautical mile	=	1.835 km
1 statute mile	=	1760 yards

2. Measures of volume

1 cubic inch	=	16.39 cm^3
1 cubic foot	=	0.0283 m^3
1 cubic yard	=	0.765 mm^3
1 US liquid gallon	=	3.79 l
1 pint	=	0.473 l
1 quart	=	0.946 l
1 brit gallon	=	4.53 l
1 barrel	=	119.2 l

3. Measures of area

1 circ. mil (CM)	=	0.507 · 10-3 mm^2
1 kcmil (MCM)	=	0.5067 mm^2
1 square inch (sq. in.)	=	645.16 mm^2
1 square foot (sq.ft.)	=	0.0929 m^2
1 square yard	=	0.836 m^2
1 acre	=	0.00405 km^2
1 square mile	=	2.59 km^2
1 m^2	=	10.764 sq. ft.

4. Units of mass

British gravitational system:
1 slug = 1 lbs · s^2/ft

British absolute system:
1 pound = 1 lb

1 slug= 32.174 lb, with 32.174 ft/s^2
as the standard value of gravitational acceleration

1 grain	=		64.80 mg
1 dram	=		1.770 g
1 ounce (oz)	=	16 drams	= 28.35 g
1 pound (lb)	=	16 oz	= 453.59 g
1 stone	=	14 lbs	= 6.35 kg
1 US ton (short ton)	=	0.907 t	
1 Brit. ton (long ton)	=	0.016 t	

5. Units of force

British gravitational system:
pound-force 1 lbf = 1 Lb

British absolute system:
poundal 1 pdl = 1 lb · ft/s^2

1 lbf = 32.174 pdl – 9.80665 lb · m/s^2

6. Conversion to metric units

1 pound-force (lbf)	=	0.454 kp
1 Brit. ton-force	=	1016 kp
1 poundal (pdl)	=	0.1383 N
1 lbf	=	4.445 N

7. Electrical units per unit of length

1µf per mile	=	0.62 µF/km
1 megohm per mile	=	1.61 MΩ · km
1 megohm per 1000 ft	=	3.28 Ω · km
1 ohm per 1000 yd	=	1.0936 Ω/km

8. Weights per unit of length

1 lb per foot	=	1.488 kg/m
1 lb per yard	=	0.469 kg/m
1 lb per mile	=	0.282 kg/m

9. Density

1 lb/ft^3 = 16.02 kg/m^3

10. Specific weight

1 lbf/ft^3 = 16.02 kp/m^3

11. Copper wire weight per mile

lb/mile	=	Ø mm
5	=	0.404
6.5	=	0.51
7.5	=	0.55
10	=	0.64
20	=	0.90
40	=	1.27

12. Units of energy

1 horsepower	=	0.746 kW (H.P.)
1 Brit. therm. unit	=	0.252 kcal

Insulation wall thickness is often expressed in n/64 inches with n/64 inch equalling Approx. 0.4 mm.

13. Further dimensions for wire weights

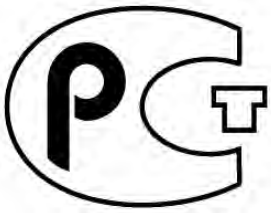
and electrical field strengths:

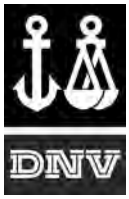
lbf pr. MFeet	=	1.488 kg/km
lbf pr. Mile	=	0.282 kg/km
40 V/mil	=	1.6 kV/mm
80 V/mil	=	3.2 kV/mm
100 V/mil	=	4.0 kV/mm
250 V/mil	=	10.0 kV/mm

* Most of these units are no longer in use and are provided purely for information purposes.

Trademark approvals

Thanks to their outstanding characteristics, many of our products have been tested and approved by the following approval associations.
You will find the certification marks on the individual product pages, if applicable.





Laying guidelines for cables and wires

Cables must be selected in accordance with the laying and operating conditions. They must be protected against mechanical, thermal and chemical effects as well against moisture penetrating through the cable ends.

Insulated power cables must not be laid underground. Temporary covering of NSSHÖU rubber-sheathed cables or trailing cables with soil, sand or a similar material, e.g. on building sites, does not constitute underground installation.

Fasteners and fixtures must not cause any damage to fixed wires and cables. Where cables or wires running horizontally along walls or ceilings are fixed using clips, the following guidelines regarding clip spacing must be observed:

For non-reinforced cables and wires, 20 x outside diameter.

These spacing guidelines also apply when laying cables in conduits and racks. When laying cables vertically, the spacing between clips can be increased depending on the type of cable or clip.

Thermal stress

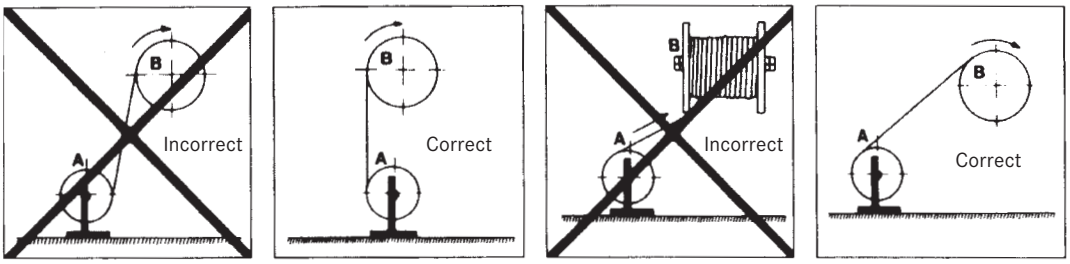
The temperature limits for the respective cable designs can be found in the technical data. The upper temperature limits must not be exceeded as a result of the cable heating up due to current heat and thermal environmental factors.
The lower temperature limits denote the lowest permitted ambient temperature.

Tensile strain

Tensile strain on the conductor should be as low as possible.
The following tensile strains for conductors must not be exceeded for cables.

- Cables for static installation. When laying permanent cables, 50 N per mm^2 conductor cross-section.
- For fibre optic cables, BUS, LAN, industrial and Ethernet cables, the respective permitted strain must be observed.
  These values can be found in the product data sheets or are available on request.

For more information on this subject, see tables T3, T4 and T5.

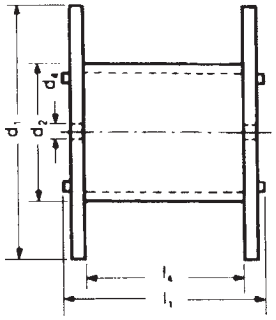


Winding and unwinding cables

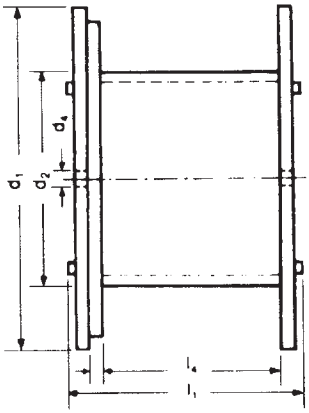
Wooden drums: holding capacity

Drum ID number	Cable Ø mm										
	6	9	12	15	20	25	30	40	50	60	80
71	2024	892	468	297	165	–	–	–	–	–	–
81	2755	1152	643	430	219	151	–	–	–	–	–
91	–	2202	1206	749	402	285	162	–	–	–	–
101	–	–	1540	1000	576	365	220	–	–	–	–
121	–	–	–	1991	1139	688	450	249	–	–	–
141	–	–	–	2479	1352	839	564	327	–	–	–
161	–	–	–	–	2435	1608	1028	549	319	–	–
181	–	–	–	–	–	1867	1197	640	373	256	–
201	–	–	–	–	–	2522	1583	812	558	296	163
221	–	–	–	–	–	–	2383	1328	678	566	278
250	–	–	–	–	–	–	–	1892	1107	699	363

Up to drum size 10 with cable bushing



From drum size 12 with spiral



Wooden drums: dimensions and load-bearing capacity

Drum ID number	Drum size	Diameter (mm)			Width (mm)		Load-bearing capacity kg	Weight kg
		d_1	d_2	d_4	l_1	l_4		
071	07	710	355	80	520	400	250	25
081	08	800	400	80	520	400	400	31
091	09	900	450	80	690	560	750	47
101	10	1000	500	80	710	560	900	71
121	12	1250	630	80	890	670	1700	144
141	14	1400	710	80	890	670	2000	175
161	16/8	1600	800	80	1100	850	3000	280
181	18/10	1800	1000	100	1100	840	4000	380
201	20/12	2000	1250	100	1340	1045	5000	550
221	22/14	2240	1400	125	1450	1140	6000	710
250	25/14	2500	1400	125	1450	1140	7500	875
251	25/16	2500	1600	125	1450	1130	7500	900
281	28/18	2800	1800	140	1635	1280	10000	1175

T24: chemical resistance of plastics

Reagent	Concentration	at +°C %	Polyamide PA 6	Polyamide PA 6.6	Polyamide PA 12	Thermoplastic polyurethane PU	Polypropylene PP	Polyethylene HD-PE	Polyethylene LD-PE	Polystyrene PS	Nitrile butadiene rubber NBR
Exhaust gases containing carbon dioxide	all	60						⛒	⛒		
Exhaust gases, containing SO_2	low	60						⛒	⛒		
Acetaldehyde	40%	20	✖	✖	⛒		⛒				20 °C ⛒
Acetone	100%	20	⛒	⛒	⛒	✖	⛒	✖	✖		✖
Acrylic acid	100%	> 30	✖	✖	✖						✖
Alums, aqueous	diluted	40					⛒	⛒	⛒	⛒	20 °C ⛒
Allyl alcohol	96%	20	✖	✖	⛒	⛒	⛒	⛒	20% ⛒		
Aluminium chloride, aqueous	diluted	40					⛒	⛒	⛒	⛒	20 °C ⛒
Aluminium sulphate, aqueous	diluted	40					⛒	⛒	⛒	⛒	20 °C ⛒
Formic acid, aqueous	10%	20	✖	✖	⛒		⛒	⛒		⛒	
Ammonia, aqueous	saturated	20	20% ⛒	20% ⛒	20% ⛒		⛒	⛒	⛒	25% ⛒	
Ammonium chloride, aqueous	saturated	60				3% ✖	⛒	⛒	⛒		20 °C ⛒
Ammonium nitrate, aqueous	diluted	40					⛒	⛒	⛒	⛒	20 °C ⛒
Ammonium sulphate, aqueous	diluted	40					⛒	⛒	⛒		✖
Aniline, pure	100%	20	✖	✖	✖		⛒	⛒	⛒	✖	
Aniline hydrochloride, aqueous	saturated						⛒	✖	✖		
Benzaldehyde, aqueous	saturated	20	pure ✖	pure ✖	pure ✖		⛒			✖	✖
Benzine	100%	20	⛒	⛒	⛒		✖	⛒	✖	✖	⛒
Benzoic acid, aqueous	all	40	20% ✖	20% ✖			⛒	⛒	⛒	⛒	✖
Benzole	100%	20	⛒	⛒	⛒		✖	✖	✖	✖	✖
Bleaching liquor	12.5 Cl	20	✖	✖	✖	3% ✖	⛒	⛒	⛒	⛒	✖
Drilling oil	all	20	✖	✖	✖		✖	✖	✖	✖	✖
Chrome alum, aqueous	diluted	40					⛒	⛒	⛒		20 °C ⛒
Cyclohexanol	–	20	⛒	⛒	⛒		⛒	⛒	⛒	⛒	⛒
Diesel fuel		85	⛒	⛒	⛒	20 °C ⛒	20 °C ⛒	20 °C ⛒	20 °C ⛒		
Ferric chloride, aqueous, neutral	10%	20	⛒	⛒	⛒		⛒	⛒	⛒	⛒	⛒
Glacial acetic acid	100%	20					⛒	⛒	⛒		✖
Acetic acid	10%	20	✖	✖	⛒	3% ✖	⛒	⛒	⛒	✖	
Ethyl alcohol, aqueous	10%	20	40 vol% ⛒	40 vol% ⛒	40 vol% ⛒			⛒		⛒	
Ethylene chloride	100%	20					✖	✖	✖		✖
Ethylene oxide	100%	20					✖				
Ethyl ether	100%	20					✖				✖
Potassium ferrocyanide, aqueous	saturated	60					⛒	⛒	⛒		
Fluorine	50%	40	pure ✖	pure ✖	pure ✖	✖	✖	✖			
Formaldehyde, aqueous	diluted	40	pure ⛒	pure ⛒	pure ✖		40% ⛒	40% ⛒	40% ⛒	30% ⛒	20 °C ✖
Glucose, aqueous	all	50					⛒	⛒	⛒		
Urea, aqueous	to 10%	40	20% ⛒	20% ⛒	20% ⛒		⛒	⛒	⛒	⛒	
Flame-retardant hydraulic fluid		80	⛒	⛒	⛒						
Hydraulic oils H and HL (DIN 51524)		100	⛒	⛒	⛒						
Hydroxylamine sulphate, aqueous	to 12%	30					⛒				
Caustic potash, aqueous	50%	20	⛒	⛒	⛒		⛒	⛒	⛒	⛒	
Potassium bromide, aqueous	all	20	10% ⛒	10% ⛒	10% ⛒		⛒	⛒	⛒	⛒	
Potassium chloride, aqueous	10%	20	⛒	⛒	⛒		⛒	⛒	⛒	⛒	⛒
Potassium dichromate, aqueous	40%	20	5% ✖	5% ✖	5% ✖		⛒	⛒	⛒		⛒
Potassium nitrate, aqueous	all	20	10% ⛒	10% ⛒	10% ⛒		⛒	⛒	⛒	⛒	⛒
Potassium permanganate, aqueous	saturated	20					⛒			⛒	
Hydrosilicofluoric acid, aqueous	to 30%	20	✖	✖			⛒	⛒	⛒		

⛒ Highly resistant
✖ Limited resistance
✖ Not resistant

The information is given to the best of our knowledge and experience, however, it must be regarded as being for guidance purposes only. In many cases, a final judgement can only be made by performing tests under actual working conditions.

Reagent	Concentration	at +°C %	Polyamide PA 6	Polyamide PA 6.6	Polyamide PA 12	Thermoplastic polyurethane PU	Polypropylene PP	Polyethylene HD-PE	Polyethylene LD-PE	Polystyrene PS	Nitrile butadiene rubber NBR
Carbon dioxide, dry	100 %	60					⛒	⛒	⛒	50 °C ⛒	20 °C ⛒
Carbonic acid	100 %	60	⛒	⛒	⛒						20 °C ⛒
Cresylic acid, aqueous	to 90 %	20	pure ✖	pure ✖			⛒	⛒	✖	✖	✖
Coolant DIN 53521		120	✖	✖							
Copper chloride, aqueous	saturated	20					⛒	⛒	⛒		⛒
Copper sulphate, aqueous	saturated	60					⛒	⛒	⛒		20 °C ⛒
Magnesium carbonate, aqueous	saturated	100					⛒			50 °C ⛒	
Magnesium chloride, aqueous	saturated	20	10 % ⛒	10 % ⛒	10 % ⛒		⛒	⛒	⛒	⛒	⛒
Methyl alcohol	100 %	20	⛒	⛒	⛒		40 °C ⛒	⛒	⛒	⛒	⛒
Methylene chloride	100 %	20	✖	✖	✖		✖	✖	✖		
Lactic acid, aqueous	to 90 %	20	10 % ⛒	10 % ⛒	10 % ⛒	3 % ✖	⛒	⛒	⛒	80 % ⛒	⛒
Mineral oil			⛒	⛒	⛒		20 °C ⛒	20 °C ⛒	20 °C ⛒		
Sodium chlorate, aqueous	saturated	20	10 % ✖	10 % ✖	10 % ✖		⛒	⛒	⛒		
Sodium hydroxide, aqueous	10 %	20	⛒	⛒	⛒	3 % ✖	⛒	⛒	⛒	⛒	
Nickel chloride, aqueous	saturated	20	10 % ✖	10 % ✖	10 % ✖		⛒			⛒	⛒
Nickel sulphate, aqueous	saturated	20	10 % ✖	10 % ✖	10 % ✖		⛒	⛒	⛒		⛒
Nitroglycerin	diluted	20						✖	✖		
Oil and grease		20	⛒	⛒	⛒		✖				
Oleic acid	–	20	⛒	⛒	⛒		⛒	⛒	⛒	⛒	✖
Oxalic acid	all	20	10 % ✖	10 % ✖	10 % ✖	3 % ✖	⛒	⛒	⛒	⛒	✖
Ozone	pure		✖	✖	✖		✖	✖	✖		
Petroleum	100 %	80	⛒	⛒	⛒		20 °C ⛒	20 °C ⛒	20 °C ✖	✖	
Phosgene, gaseous	100 %	20					✖	✖	✖		
Phosphoric acid, aqueous	diluted	20	10 % ✖	10 % ✖	10 % ✖	3 % ✖	⛒	⛒	⛒	86 % ⛒	✖
Phosphorus pentoxide	100 %	20					⛒				
Mercury	pure	20	⛒	⛒	⛒		⛒	⛒	⛒	⛒	⛒
Nitric acid, aqueous	50 %	20	✖	✖	✖	3 % ✖	✖	✖	✖	30 % ⛒	✖
Hydrochloric acid, aqueous	30 %	20	20 % ✖	20 % ✖	20 % ✖	3 % ✖	⛒	⛒	⛒	15 % ⛒	✖
Lubricating grease, ester oil base		110	✖	✖							
Polyphenyl ester base		110	⛒	⛒	⛒						
Lubricating grease, silicone oil base		110	⛒	⛒	⛒						
Carbon disulphide	100 %	20	⛒	⛒	⛒		⛒	✖	✖	✖	✖
Sodium sulfide, aqueous	diluted	40					⛒	⛒	⛒		
Sulphuric acid, aqueous	10 %	20	✖	✖	✖	3 % ✖	50 % ⛒	50 % ⛒	50 % ⛒	⛒	✖
Sea water		40	⛒	⛒	⛒	20 °C ⛒	⛒	⛒	⛒	⛒	20 °C ⛒
Soap solution, aqueous	all	20	diluted ⛒	diluted ⛒	diluted ⛒	⛒	⛒	⛒		⛒	
Carbon tetrachloride	100 %	20	⛒	⛒	⛒		✖	✖	✖	✖	
Toluene	100 %	20	⛒	⛒	⛒	✖		✖	✖	✖	✖
Trichloroethylene	100 %	20	✖	✖	✖		✖	✖	✖		
Vinyl acetate	100 %	20					⛒				
Hydrogen	100 %	60	20 °C ⛒	20 °C ⛒	20 °C ⛒		⛒	⛒	⛒		20 °C ⛒
Xylene	100 %	20	⛒	⛒	⛒		✖	✖	✖	✖	✖
Zinc chloride, aqueous	diluted	60	10 % ✖	10 % ✖			⛒	⛒	⛒	50 °C ⛒	20 °C ⛒
Zinc sulphate, aqueous	diluted	60					⛒	⛒	⛒		20 °C ⛒
Zinc chloride, aqueous	diluted	40					⛒	⛒	⛒	✖	20 °C ⛒
Citric acid	to 10 %	40	20 °C ⛒	20 °C ⛒	20 °C ⛒	3 % ✖	⛒	⛒	⛒	⛒	20 °C ⛒

⛒ Highly resistant
✖ Limited resistance
✖ Not resistant

The information is given to the best of our knowledge and experience, however, it must be regarded as being for guidance purposes only. In many cases, a final judgement can only be made by performing tests under actual working conditions.

Materials of cables and wires exposed to ionising radiation

As a rule, cables are only tested for radiation resistance if their intended usage actually includes exposure to ionising radiation. For all other cables, specifications as to radiation resistance can thus only be made for the materials normally employed for such cables. As a result, these values are not representative of the durability of a complete cable.

However, the values do provide a basic point of reference and are particularly useful for relative comparisons of different products.

The radiation resistance of materials is defined via the Radiation Index (RI) in IEC 544-4 as the base 10 logarithm of the absorbed dose in grays (rounded to two decimal places) at which the elongation at break is reduced to ≥ 50% of the original value.

The following table lists the typical maximum dose of the individual materials in grays (or rad) of a gamma radiation source at which the elongation at break of the test sample remains above 50 % of its unaged value.

Conversions:
100 kGy = Approx. 10 Mrad; 1 Gy = 1 J/kg; 1 Mrad = Approx. 10 kGy

Material type	Radiation resistance in Gy Approx.	Radiation resistance in rad Approx.
PVC	8×10^5	8×10^7
PE LD	1×10^5	1×10^7
PE HD	7×10^4	7×10^6
VPE (XLPE)	1×10^5	1×10^7
PS	5×10^6	5×10^8
PA	1×10^5	1×10^7
PP	1×10^3	1×10^5
PETP	1×10^7	1×10^7
PUR	5×10^5	5×10^7
TPE-E	1×10^5	1×10^7
TPE-O	1×10^5	1×10^7
NR	8×10^5	8×10^7
SIR	2×10^5	2×10^7
EPR	1×10^6	1×10^8
EVA	1×10^5	1×10^7
CR	2×10^5	2×10^7
CSM	5×10^4	5×10^6
PVDF	1×10^5	1×10^7
ETFE	1×10^5	1×10^7
FEP	3×10^3	3×10^5
PFA	1×10^3	1×10^5
PTFE	1×10^3	1×10^5

Table 30: our products – contained substances and legislation

The use of hazardous substances in products is subject to ever stricter international laws and restrictions. All products in this catalogue meet the following legal requirements (among others):

- **REACH directive 1907/2006/EC**
- **RoHS directive 2011/65/EU, or 2002/95/EC**
- **Directive 1005/2009/EC on substances that deplete the ozone layer**

REACH:
Directive 1907/2006/EC represents the EU's standard system for the Registration, Evaluation, Authorisation and Restriction of Chemicals, or REACH for short. The purpose of the directive is to ensure a high level of protection for human health and the environment.

REACH came into force on 1 June 2007 and replaced a number of former specifications relating to the material composition of products, as previously governed, for example, by directive 76/769/EEC on the Approx.imation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations. All products fall within the meaning of REACH.
The following requirements of the REACH directive are therefore particularly significant:

1. Information requirement for manufacturers and importers of products containing a material on the "candidate list" at a concentration in excess of 0.1% of the mass of the product.
2. Observance of substances requiring authorisation in accordance with REACH Annex XIV.
3. Observance of the manufacturing, marketing and use restrictions specified in REACH Annex XVII.

No duty of substance registration applies to the LAPP GROUP. The duty of registration is linked to specific conditions, such as the manufacture of substances or preparations, or the release of substances from products. The LAPP GROUP does not meet any of these conditions.

The LAPP GROUP has attributed great importance to the subject of safety and the environment from a very early stage. Our aim is to implement the REACH directive by keeping our products free from substances of very high concern (SVHC) or to replace such substances with non-hazardous materials. We therefore keep a very close eye on the "candidate list", in which the European Chemicals Agency lists these dangerous substances, continuously evaluate our products and implement any necessary substitution measures.

We observe all registration requirements for materials in accordance with REACH Annex XIV as well as the manufacturing, marketing and use restrictions specified in REACH Annex XVII.

For further information on the subject of REACH, visit www.lappkabel.com or contact our competent REACH experts regarding specific substances.

RoHS:
The full title of the RoHS directive is as follows: "DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment". The "new" RoHS directive 2011/65/EC was published on 1 July 2011 and replaces the previous RoHS directive 2002/95/EC. Different transitional periods apply for the amendments introduced by the new RoHS directive.

In addition to the extended scope of the directive, which now also comprises "other" electrical and electronic equipment (EEE), one significant new feature is the obligation to assure compliance with the requirements of the RoHS directive by means of a conformity assessment procedure.

Irrespective of the scope of the RoHS directive, all products in this catalogue meet the substance-specific requirements of the RoHS The exceptions detailed in the RoHS directive notwithstanding, our products do not contain any of the restricted substances specified in the RoHS directive or exceed the maximum concentrations stipulated therein.

As a general rule: All information is provided to the best of our knowledge and belief. The information given represents the current state of the art. This is supported through continuous random testing of our products.

Given the vast number of our products, complete verification without exception is not possible. Therefore, the specifications above do not constitute a generally applicable guarantee in a legal or warranty sense.

Fire Performance Standard

At present, in cable industry, Fire Retardant, Low Smoke Halogen Free (LSZH), Low Smoke Fume (LSF) and Fire Resistant cables are all described as Fire survival Cables.

- **Fire retardant cables** are designed for use in fire situations where the spread of fames along a cable route needs to be retarded. Due to relative low cost, fire retardant cables are widely used as fire survival cables. No matter the cables are installed in single wire or in bundles, during a fire, the fame spread will be retarded and the fire will be confned to a small area, thus reducing the fire hazard due to fre propagation.

- **Low Smoke & Halogen Free & Fire Retardant (LSZH)** LSZH cables are not only characterized by the fire retardant perfor-mance but also by the halogen free properties, thus offering low corrosivity and toxicity. During a fire the LSZH cables will emit less smoke and acid gases which may damage the human being and expensive equipment. Compared with normal PVC cables, LSZH cables outperform by their fireretardancy, low corrosivity and low smoke emission properties, however, normal PVC cables have better mechanical and electrical properties.

- **Low Smoke Fume (LSF)** The low halogen content and low corrosivity of low smoke fume cables lies somewhat in between that of fre retardant cables and LSZH cables. LSF cables also contain halogen but the content is much less than that of PVC cables. LSF cables are designed to reduce the spread of fire toxic gases and smoke during fire. The LSF cables are usually manufactured from flameretardant PVC blended with HCL additive and smoke absorbent. These materials help improve the fireperformance of the LSF cables.

- **Fire Resistant (FR)** Fire resistant cables are designed to maintain circuit integrity of those vital emergency services during the fire. The individual conductors are wrapped with a layer of fire resisting mica/glass tape which prevents phase to phase and phase to earth contact even after the insulation has been burnt away. The fire resistant cables exhibit same performance even under fire with water spray or mechanical shock situation.

- **Fire Performance Class** The main concerns for the cables in their fire survival properties are their fame spread, smoke characterization and gas toxicity. In American fre standard, the concern lies more on the frst two and it differs from the European standard which concerns all these aspects. In USA, it is believed that the fire hazard is mainly due to CO toxic gas emitted and the heat release during the conversion of CO to CO2 during the fire. Therefore, to control the heat release is the most important concern for reducing the fre hazard. However, in European countries, halogen content, the corrosivity of the gases, the smoke density and the toxicity of the gas are equally important factors affecting the safety and survival of human during a fre.

IEC Standard for Flame Retardancy

The European Electrical Committee categorizes the fire performance of the cables into three classes, namely IEC 60332-1, IEC 60332-2, IEC 60332-3, IEC 60332-1 and IEC 60332-2 are used to assess the flame propagation characteristics of a single wire. IEC 60332-3 is used to assess the fame propagation characteristics of bundled cables. Comparatively speaking, IEC 60332-3 for bundled cables is more demanding than IEC 60332-1 for single wires.

- **IEC 60332-1/BS 4066-1 (Flame Test On Single Vertical Insulated Wires/Cables)**
  This test details a method of test for the assessment of the fame propagation characteristics of a single wire or cable. In this test, a 60cm cable sample is fixed vertically inside a metallic box and a 175mm long fame is applied at 45°C from a gas burner placed at 450mm from the top at the upper portion.
  The specimen is deemed to have passed this test, if after burning has ceased, the charred or affected position does not reach within 50mm of the lower edge of the top clamp which is equivalent to 425mm above the point of fame application. The test method is not suitable for the testing of some small wires due to the melting of the conductors during the time of application of the fame.

- **IEC 60332-3/BS 4066-3 (Flame Test On Bunched Wires/ Cables)**
  IEC60332-3C describes a method of type approval testing to define the ability of bunched cables to resist fire propagation. In this test, a cable specimen, consisting of number of 3.5m length of cables are fixed to a vertical ladder tray where they are applied with a fame from a gas burner for a specified times under controlled air flow. Four categories (A, B, C & D) are defined and distinguished by test duration and the volume of non metallic material of the sample under test. The cable specimen is deemed to have met the requirements of the standard if, after burning has ceased, the extent of charred or affected portion does not reach a height exceeding 2.5m above the bottom edge of the burner.

UL Standard for Fire Retardancy

If a cable can pass a specifed UL fire standard, an UL performance verification mark can be applied onto the cable jacket illustrating both the UL class and the number. There are five primary fire testing standards as follows.

- **CMP (Plenum Flame Test/ Steiner Tunnel Test)**
  Plenum rated cables meet the NFPA -262 standard (formerly known as UL910) which provides the most stringent requirement of all the tests. Cable samples on a horizontal tray in a tunnel type of chamber are burned at 87.9KW (300,000 BTU/Hr) for 20 minutes. To qualify for a plenum rating the cable specimen must have the fame spread of less than 5 feet or 1.5 meters with a smoke density during the test of (a) 0.5 peak and 0.15 maximum average. The CMP cables are usually installed in air ventilation ducts and air returns widely used in Canada and USA. The fire retardant properties of CMP cables are much better than that of normal LSZH cables complying with IEC 60332-1 and IEC 60332-3.

- **CMR (Riser Flame Test)**
  Riser rated cables meets UL1666. Cable samples on a vertical shaft are burned at 154.5KW (527,500 BTU/Hr) for 30 minutes. To qualify for a riser rating, cable specimen must have the fame spread of less than 12 feet beyond the ignition point. This test does not look at the smoke density or toxicity. Riser rated cables are suitable for vertical shafts not defined as an environmental air plenum.

- **CM (Vertical Tray Flame Test)**
  General purpose cables meet UL 1581. Cable samples on a 8 feet vertical tray are burned at 20KW (70,000 BTU/Hr) for 20 minutes. The cable specimen is deemed to pass the test if the fame spread will not extend to the upper portion and extinguish by itself. UL 1581 is similar to IEC 60332-3C except for that the number of testing samples is different. This test does not look at the smoke density or toxicity. The CMG cables are usually used in runs penetrating single floor. These cables cannot be installed in vertical pathways.

- **CMG (Vertical Tray Flame Test)**
  These general purpose cable also meet UL1581. CM and CMG are similar and both are recognized in Canada and USA. This test does not look at the smoke density or toxicity. The CMX cables are usually used in runs penetrating single floor. The cables cannot be installed in vertical pathways.

- **CMX (Vertical Wire Flame Test)**
  The restricted cables meet UL1581 Limited-use. The test consists of 25 feet long ventilated tunnel. The cable specimen is placed on a ladder inside the tunnel and the fame of 30,000 BTU/Hr is applied to the cable 15 seconds on and 15 seconds off five times for a total exposure to the fame of 1 minute and 15 seconds. To qualify for this test, after the test fame is removed the cable specimen can fame for not more than 60 seconds and the charred portion will not exceed by 25%. UL 1581 VW-1 is similar to IEC 60332-1 except for the difference in the time for fame applied. This test does not look at the smoke density or toxicity. The CMG cables are suitable for use in dwellings and for use in raceway. These cables cannot be installed in bundles and must be protected in metal conduit. This type of cable is chosen as the minimum requirement for commercial installations.

Standard for Fire Resistance

Fire resistant cables are designed for maintaining circuit integrity during a fire. The IEC and the BS adopted two different standards, namely the IEC 60331 and BS 6387.Comparatively speaking, the fire performance requirement for BS 6387 is more demanding.

- **IEC60331 Fire Resistance Test**
  A cable sample is placed over a gas burner and connected to an electrical supply at its rated voltage. Fire is applied for a period of 3 hours. The temperature on the cable is between 750 °C and 800 °C. After 3 hours, the fire and the power is switched off. 12 hours later, the cable sample is reenergized and must maintain its circuit integrity.

- **BS6387 Fire Resistance Test**
  BS6387 specifies the performance requirements for cables required to maintain circuit integrity under fire conditions. It details the following methods to categorize the cables according to cable withstand capacities. Resistance to fire alone - the cables is tested by gas burner fame while passing a current at its rate voltage. Four survival categories are defined Cat A (3 hours at 650°C), Cat B (3 hours at 750°C), Cat C (3 hours at 950°C), and Cat S (20 minutes at 950°C). Resistance to fire with water spray - a new sample of cable is exposed to fame at 650°C for 15 minutes while passing a current at its rated voltage and then the spray is turned on to give exposure to both fire and water for a further 15 minutes. A single survival category W is defined if the cables surpassed the testing requirement. Resistance to fire with mechanical shock - the final requirement is mechanical shock damage. A fresh sample is mounted on a backing panel in an S bend and is exposed to fames while the backing panel is stuck with a steel bar with the same diameter as the cables under test every 30 seconds for 15 minutes. The cables will be tested under the following temperatures: X (650°C/15min), Y(750°C/15min) and Z (950°C/15min). The highest standard for BS 6387 is CWZ.

Standard for Halogen & Smoke Emission, Corrosivity & Toxicity

- **IEC 60754-1/BS6425-1 (Emission of Halogen)**
  This specifies a test for determination of the amount of halogen acid gas other than the hydrofluoric acid evolved during combustion of compound based on halogenated polymers and compounds containing halogenated additives taken from cable constructions. Halogen includes Florine, Chlorine, Bromine, Iodine and Astatine.
  All these elements are toxic by their nature. In this test, when the burner is heated to 800°C, 1g sample is placed inside and the HCL is absorbed into water inside the chamber fed with air flow. The water is then tested with its acidity. If the hydrochloric acid yield is less than 5 mg/g, the cable specimen is categorized as LSZH.
  If the hydrochloric acid yield lies between 5mg/g to 15mg/g, the cable specimen is categorized as LSF. IEC60754-1 cannot be used for measuring the exact HCL yield if the yield is less than 5mg/g. This test cannot determine if the cable is 100% halogen free or not. To determine if the cable specimen is 100% halogen free or not, IEC60754-2 has to be employed.

- **IEC 60754-2 (Corrosivity)**
  This test specifies a method for the determination of degree of acidity of gases evolved during combustion of the cable specimen by measuring its pH and conductivity.
  The specimen is deemed to pass this test if the pH value is not less than 4.3 when related to 1 litre of water and conductivity is less than 10us/min.
  When the HCL yield lies between 2mg/g and 5mg/g, a cable specimen can pass IEC 60754-1 but its pH value will likely be less than 4.3 and therefore cannot pass the IEC 60754-2 test.

- **IEC 61034-1/ASTM E662 (Emission of Smoke)**
  This specifies a test for determination of smoke density.
  The 3 metre cube test measures the generation of smoke from electric cables during fire. A light beam emitted from a window is projected across the enclosure to a photo cell connected to a recorder at the opposite window.
  The recorder is adjusted to register from 0% for complete obscuration to 100% luminous transmissions. A 1 metre cable sample is placed in the centre of the enclosure and is applied with a fire. The minimum light transmission is recorded. The result is expressed as percentage of light transmitted.
  The specimen is deemed to pass this test (IEC61034-1 & 2) if the value is greater than 60%. The higher the light transmittance, the less smoke emitted during a fire.

- **ISO4589-2/BS2863 (Oxygen Index LOI)**
  This is a test for assessing the oxygen index of the material in accordance with the test method specified in ASTM D2863-95 (Measuring the minimum oxygen concentration to support candle-like combustion of plastics). At room temperature when the oxygen content in the air exceeds the oxygen index, the material will burn by itself automatically.
  The higher the oxygen index, the more retardant the cable will be. For example, if the oxygen index of a material is 21%, it means that the material will burn by itself even at room temperature because at room temperature the normal oxygen content is 21%. In general, the oxygen index of a LSZH cables ranges from 33% to 42%.

- **ISO4589-3/BS2782.1 (Temperature Index TI)**
  This is a test for assessing the performance of a material when it is tested in accordance with BS2782 Part 1 Method 143A and 143B. The oxygen index of a material will drop when the temperature rises.
  When the temperature rises and the oxygen index drops to 21%, the material will burn automatically. This temperature is defined as temperature index. For example, the temperature index of coal is 50%. When the temperature climbs to 150°C, its oxygen index drop to 21% and the coal will burn by itself automatically.
  The temperature index of the coal will then be defned as 150.
  In general, the temperature index of LSZH cables ranges from 250°C to 300.

- **ES713 (Toxicity Index)**
  This is a test defined by Naval Engineering Standard which is a directed at the analysis of a specified set of gaseous species which are commonly present in the combustion products of materials used in military application and which may cause lethality at the time of a fire. In this test, a 1g cable specimen is completely burnt inside a sealed chambers of volume 0.7-1m3 using a burner fed with air and gas to give a non-luminous fame. The resulting chamber atmosphere is quantitatively analysed for a specifed set of gases. For each gas, the measured concentration (Ci) is scaled up for 100g and the concentration is recalculated as though the combustion products is diffused into a volume of exactly 1m3.
  The resulting concentration (C8) is expressed as the ratio of critical factor (Cf) which is equal to the concentration of this gas considered fatal to human for 30 minutes exposure. The ratio C8/Cf is summed for all gases detected to give the toxicity index. The higher the toxicity index, the more toxic the cable materials is. In general, the toxicity index of LSZH materials are less than 5. LSZH cable will also emit toxic CO and if the cable materials contains P, N and S, the toxic gases generated will even be greater. Thus LSZH cables cannot be categorized as toxic free. CM, CMR and CMP cables in general contains halogen elements which are essential for passing the strict fire retardancy testing. For example, CMP cables are made from FEP which contains Flourine and are much toxic than normal LSZH cables. be defined as 150°C. In general, the temperature index of LSZH cables ranges from 250°C to 300°C.

For the use of our products is valid

The conformity of our products with the relevant European directives and compliance with the provisions contained therein shall be indicated by the CE marking.

The safety of our products is closely associated with how they are used. A knowledge of and adherence to the respective international/national standards of use (e.g. DIN VDE 0100; 0298) are mandatory.

There are particular risks if installed improperly. This applies to all our products/items:

Processing is only to be done by an authorized electrician! Otherwise, there is the risk of an electric shock or a fire ignited by electric current!

Safety

Without exception our products are tested for application safety in accordance with laid down standards and our own regulations, which complement the standards. Relevant legal requirements and safety regulations are also observed. Provided due care and attention is paid, the possibility of product-specific danger to the user may thus reasonably be excluded. Where products are used carelessly or incorrectly, however, considerable danger to persons and the environment may arise. For this reason, our cables must only be processed and/or used responsibly by trained electricians or specialists. This catalogue contains general information for the application of each product. Independent of such information, the application standards DIN VDE 0298 and DIN VDE 001 for cables will apply. Excerpts from these standards, as well as complementary selection and application tables, design and installation guidelines, are contained in the tables in the appendix to this catalogue. Our machines and installation tools are – where necessary – designed in accordance with the machine guidelines and display the CE identification mark. It must be noted, however, that our machines and installation tools must only be used by trained specialized personnel and for the purpose for which they were designed. We reserve the right to make modifications to our products, especially those based on technical improvements or continued development. All illustrations and numerical data etc. are therefore without warranty and are subject to change.



LAPP GROUP

CAMUNA CAVI. S.R.L
Operation: Via General Treboldi 128 • 25048 • EDOLO (BS) • Italy
Sales: Via Lavoratori Autobianchi 1 • 20832 • DESIO (MB) • Italy
www.camunacavi.it - info@camunacavi.it
Tel. (+39) 0364 773411
A Lapp Group Company