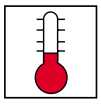
Nexans

Airfield Cables

Issue 10/2003

Piktogramme



Temperature
Permissible ambient temperature

Weather
Resistance to severe weather conditions

Impacts
Cable mechanical resistance to impacts

Chemical attacks
Resistance to chemicals

Flame - Fire
Cable fire performances

Corrosivity

Toxicity

Flexibility

Bending Radius
R = n x cable diameter

Halogen free

Water-tightness

Electro Magnetic Interference

Airport Cables

Airfield Lightnig Cables

400 Hz Cables

With the issue of this catalogue all former catalogues (also without date fo issue) are invalid.

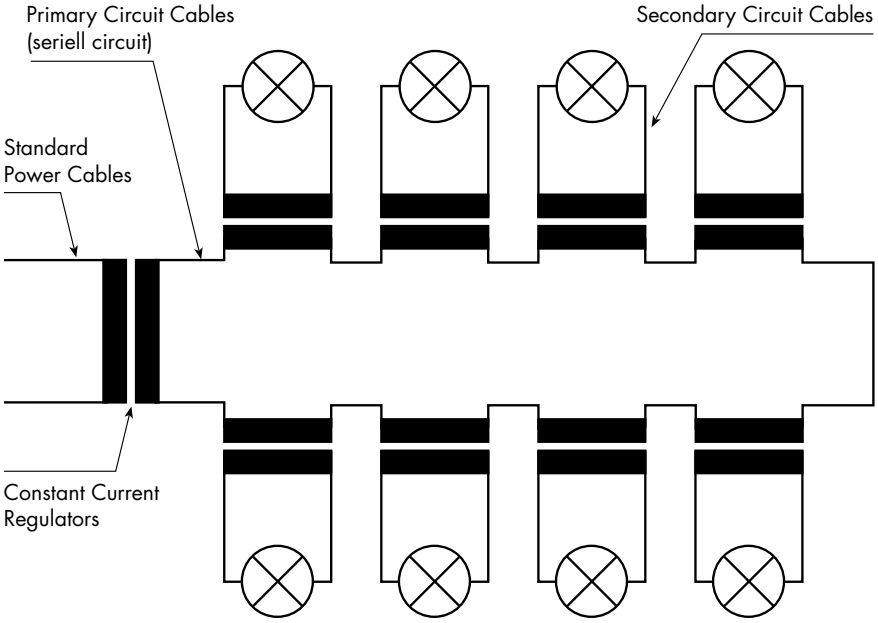
Airfield Lighting Cable Introduction

Regarding the Airfield Lighting cables, Nexans proposes a complete range of Primary, Secondary and Remote control cables.

The Primary is used between Constant Current Regulators (CCRs) and transformers, the Secondary between transformers and lights, and the Remote control between Control Tower and Constant Current Regulators (CCRs).

These cables have been installed for many years in many Airports and Air Bases all over the world.

Installation Principle for the Power Part of Airfield Lightning Systems



Main References

Germany	Nordholz, Fuhlendorf, Kyritz, Cuxhaven, Braunschweig, Tuttlingen, Hannover
Russia	Moscow, Ufa, Vnukovo
Czech Republic	1 Airport
Azerbaijan	Baku
Namibia	Windhoek
South Africa	1 Airport
Spain	Gerona, Barcelona

FLYCY
Primary circuit cable

1 x 6 RE/2.5 - 1/2 kV 1 x 6 RE/4 - 2.5/5 kV 1 x 6 RE/4 - 3/6 kV

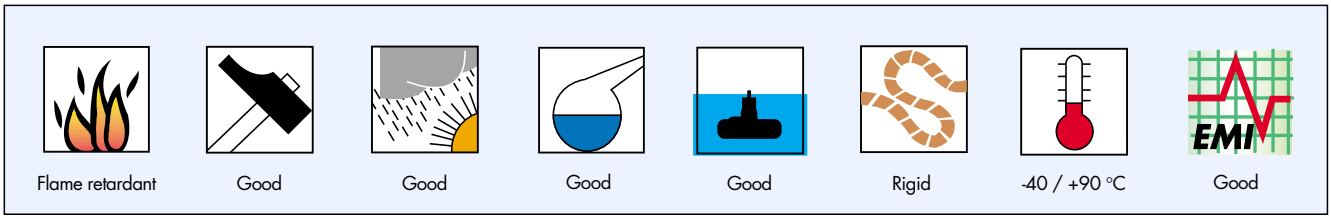
Applications
Airfield Lighting (high-voltage electric primary circuits, connected in series)

Max core temperature: 90°C

Design
1. Conductor
Solid bare copper (RE)
2. Insulation
PVC
(polyvinyl chloride)
3. Tape (optional)
4. Screen
Concentric layer of bare copper wires, counter helix of a copper tape
5. Outer Sheath
PVC
(polyvinyl chloride)
Colour: black (1 x 6 RE/2.5 - 1/2 kV)
red (1 x 6 RE/4 - 2.5/5 kV)
red (1 x 6 RE/4 - 3/6 kV)

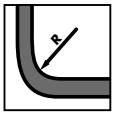
Marking
NEXANS VDE-Reg.-Nr. 7664 FLYCY 1 x 6 RE/2.5 - 1/2 kV
NEXANS FLYCY 1 x 6 RE/4 - 2.5/5 kV
NEXANS VDE-Reg.-Nr. 7664 FLYCY 1 x 6 RE/4 - 3/6 kV

Standards
ENV 50213 (European Pre-Standard)
IEC 50602-2 (Project)



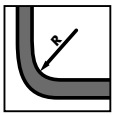
FLYCY 1 x 6 RE/2.3 - 1/2 kV

Cross section (mm^2)	Insulation thickness nominal (mm)	Cross section of screen (mm^2)	Outer sheath thickness nominal (mm)	Outer diameter nominal (mm)	Weight (kg/km)	Test voltage
1 x 6	1.5	2.5	1.4	10.0	170	11 kV/5 min


min. Bending radius: 150 mm

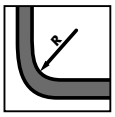
FLYCY 1 x 6 RE/4 - 2.5/5 kV

Cross section (mm^2)	Insulation thickness nominal (mm)	Cross section of screen (mm^2)	Outer sheath thickness nominal (mm)	Outer diameter nominal (mm)	Weight (kg/km)	Test voltage
1 x 6	3.0	4	1.4	13.0	250	11 kV/5 min


min. Bending radius: 195 mm

FLYCY 1 x 6 RE/4 - 3/6 kV

Cross section (mm^2)	Insulation thickness nominal (mm)	Cross section of screen (mm^2)	Outer sheath thickness nominal (mm)	Outer diameter nominal (mm)	Weight (kg/km)	Test voltage
1 x 6	3.0	4	1.4	13.0	250	11 kV/5 min


min. Bending radius: 195 mm

Other voltages, conductor design (class 2 and class 5) and colors of sheath on request.

FL2XCY 1 x 6 RM/6

Primary circuit cable

6/10 kV

Applications

Airfield Lighting (high-voltage electric primary circuits, connected in series)

Max core temperature: 90°C

Design

1. Conductor
Stranded bare copper (RM), Class 2 (7 wires)

2. Insulation
Extruded triple dielectric of internal semi-conductor natural colored cross-linked Polyethylen XLPE insulation and external semi-conductor (strippable)

3. Screen
Concentric layer of bare copper wires, counter helix of a copper tape

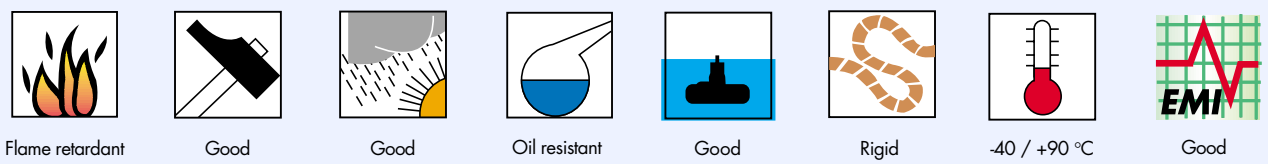
5. Outer Sheath
PVC
(polyvinyl chloride)
Colour: red

Marking

NEXANS VDE-Reg.-Nr. 7676 FL2XCY 1 x 6 RM/6 6/10 kV

Standards

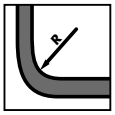
ENV 50213 (European Pre-Standard)
IEC 60502-2 (Project)



FL2XCY 1 x 6 RM/6

Cross section (mm^2)	Thickness of internal semi-conductor* (mm)	Insulation thickness nominal (mm)	Thickness of external semi-conductor* (mm)	Cross section of screen (mm^2)	Partial discharge test	Outer sheath thickness nominal (mm)	Outer diameter nominal (mm)	Weight (kg/km)	Test voltage
1 x 6	0.3	3.5	0.4	6	≤ 5 pC (10 kV)	1.4	15.6	420	15 kV/ 5 min

* Reference value



min. Bending radius: 235 mm

Other voltages, conductor design (class 1 and class 5) and colors of sheath on request.

FL2XCYRY 1 x 6 RM/6

6/10 kV

Applications

Airfield Lighting primary circuit (connected in series) in zones with the risk of mechanical demaging.

Max core temperature: 90°C

Design

1. Conductor
Bare copper, Class 2

2. Insulation
Extruded triple dielectric of internal semi-conductor natural colored cross-linked Polyethylen XLPE insulation and external semi-conductor (strippable)

3. Screen
Concentric layer of bare copper wires, counter helix of a copper tape

4. Sheath
PVC
Colour: red

5. Armouring
Steel wires, layed in a helix.

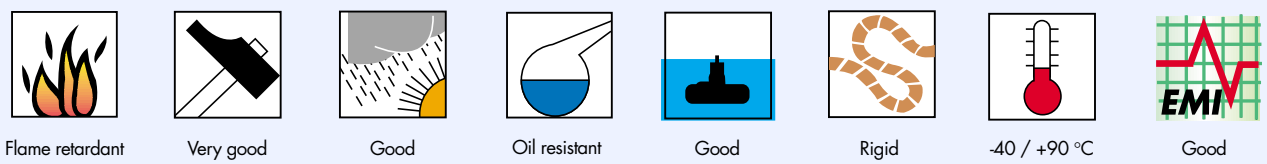
6. Outer Sheath
PVC
Colour: red

Marking

NEXANS FL2XCYRY 1 x 6 RM/6 6/10 kV

Standards

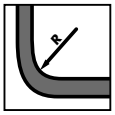
adapted to: ENV 50213 (European Pre-Standard)
IEC 60502-2 (Project)



FL2XCYRY 1 x 6 RM/6

Cross section (mm^2)	Thickness of internal semi-conductor* (mm)	Insulation thickness (mm)	Thickness of external semi-conductor* (mm)	Cross section of screen (mm^2)	Partial discharge test	Diameter of steel wires (mm)	Outer sheath thickness nominal* (mm)	Outer diameter nominal (mm)	Weight (kg/km)	Test voltage
6	0.3	3.5	0.4	6	≤ 5 pC (10 kV)	0.9	1.4	20.5	710	15 kV/ 5 min

* Reference value



min. Bending radius: 310 mm

Other voltages, conductor design (class 2 and class 5) and colors of sheath on request.

RHDt 1 x 6 RM/2,5

6/10 kV

Applications

Airfield Lighting (high-voltage electric primary circuits, connected in series)

Max core temperature: 90°C

Design

1. Conductor
Bare copper, Conductor class 2 (7 wires)

2. Insulation
Extruded triple dielectric of internal semi-conductor natural colored cross-linked Polyethylen XLPE insulation and external semi-conductor (strippable)

3. Screen
2 overlapped copper tapes

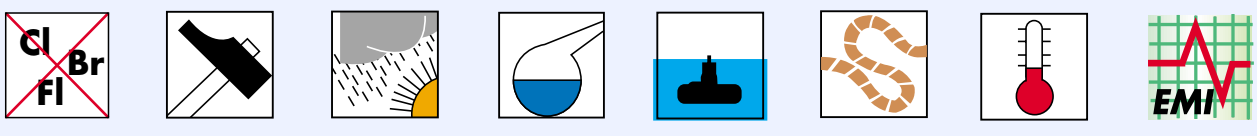
4. Outer Sheath
Halogenfree flame retardant compound HM4
Colour: red

Marking

NEXANS PRIMARIO DE BALISAMIENTO – RHDt – 6/10 kV 1x6 mm^2 <year>

Standards

Adapted to UNE 21-161-93 (Spain)

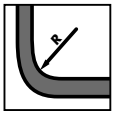


Halogen free | Good | Good | Oil resistant | Intermittent | Rigid | -20 / +90 °C | Good

RHDt 1 x 6 RM/2,5

Cross section (mm^2)	Thickness of internal semi-conductor* (mm)	Insulation thickness (mm)	Thickness of external semi-conductor* (mm)	Thickness of sheath* (mm^2)	Partial discharge test	Outer diameter nominal (mm)	Weight (kg/km)	Test voltage
6	0.3	3.5	0.4	2.8	≤ 5 pC (10 kV)	18.0 ± 0.5 mm	405	15 kV/ 5 min

* Reference value



min. Bending radius: 310 mm

RHV 1 x 6 RM

6/10 kV

Applications

Airfield Lighting (high-voltage electric primary circuits, connected in series)

Max core temperature: 90°C

Design

1. Conductor
Bare copper, Conductor class 2 (7 wires)

2. Insulation
Extruded triple dielectric of internal semi-conductor natural colored cross-linked Polyethylen XLPE insulation and external semi-conductor (strippable)

3. Screen
2 overlapped copper tapes

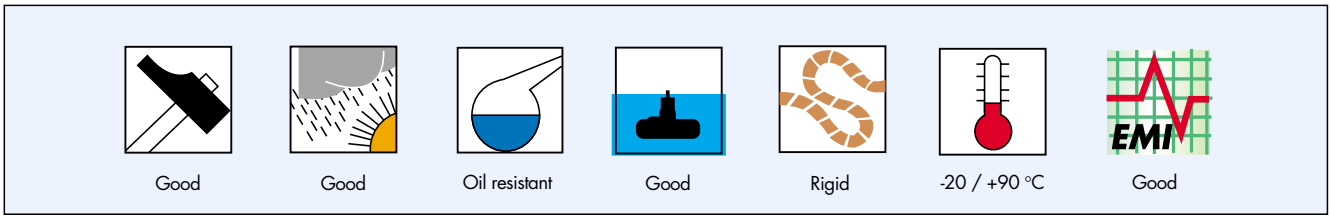
4. Outer Sheath
PVC
Colour: red

Marking

NEXANS PRIMARIO DE BALISAMIENTO – RHV – 6/10 kV 1x6 mm^2 <year>

Standards

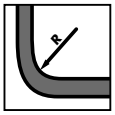
UNE 21-161-93 (Spain)



RHV 1 x 6 RM

Cross section (mm^2)	Thickness of internal semi-conductor* (mm)	Insulation thickness (mm)	Thickness of external semi-conductor* (mm)	Thickness of sheath* (mm^2)	Partial discharge test	Outer diameter nominal (mm)	Weight (kg/km)	Test voltage
6	0.3	3.5	0.4	2.8	≤ 5 pC (10 kV)	18.0 ± 0.5 mm	410	15 kV/ 5 min

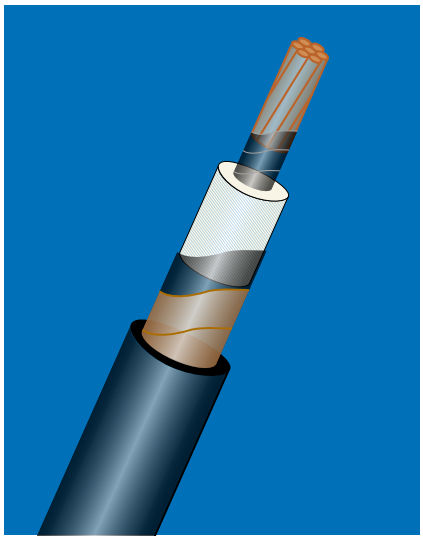
* Reference value



Bending radius: Static in use 10 D
Dynamic in use 20 D

FAA L-824 C
Primary circuit cable

5 kV



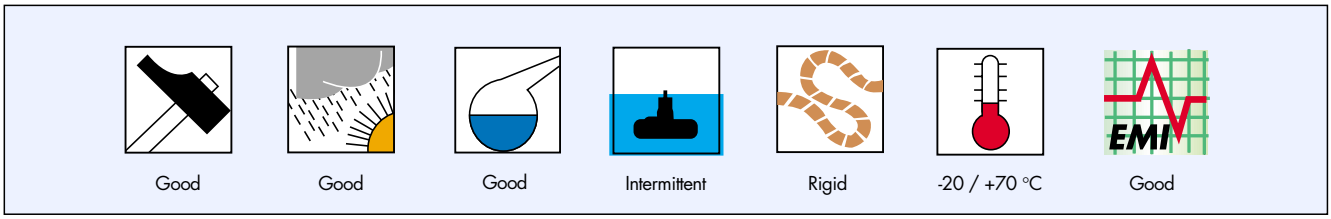
Applications
Airfield Lighting Equipment
Primary cable for the serie circuit connecting the Constant Current Regulators and the isolating transformers, and between the isolating transformers. This cable can be buried providing there is an extra mechanical protection.

Max core temperature: 90°C

Design
1. Conductor
Stranded bare or tinned copper, Class 2
Cross section: 6 mm^2 or 8 AWG
2. Semi-conductor
Extruded
3. Insulation
XLPE
(cross linked polyethylene)
4. Semi-conductor
Tape or extruded
5. Screen
Copper or brass tape(s)
6. Outer Sheath
PE, PVC, XLPE
(polyethylene) (polyvinyl chloride) (cross linked polyethylene)
Colour: black, others colours on request

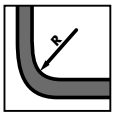
Marking
Sample: NEXANS - FAA L-824 C 1 x 6 mm^2 - 5 kV - year + Metric Marking

Standards
According to FAA L-824 Type C



FAA L-824 C

Section (mm²)	Insulation thickness nominal (mm)	Screen	Tape thickness (mm)	Outer sheath	Outer diameter nominal (mm)	Weight (kg/km)
1 x 6	2.3	Brass Tape	0.08	XLPE	11.0	156
1 x 6	2.3	Brass Tape	0.08	PVC	11.0	170
1 x 6	2.3	Brass Tape	0.08	PE	11.0	156
1 x 6	2.3	Copper Tape	0.10	XLPE	11.0	164
1 x 6	2.3	Copper Tape	0.10	PVC	11.0	180
1 x 6	2.3	Copper Tape	0.10	PE	11.0	164
1 x 8 AWG	2.3	Brass Tape	0.08	XLPE	11.5	180
1 x 8 AWG	2.3	Brass Tape	0.08	PVC	11.5	211
1 x 8 AWG	2.3	Brass Tape	0.08	PE	11.5	180
1 x 8 AWG	2.3	Copper Tape	0.10	XLPE	11.5	187
1 x 8 AWG	2.3	Copper Tape	0.10	PVC	11.5	218
1 x 8 AWG	2.3	Copper Tape	0.10	PE	11.5	187

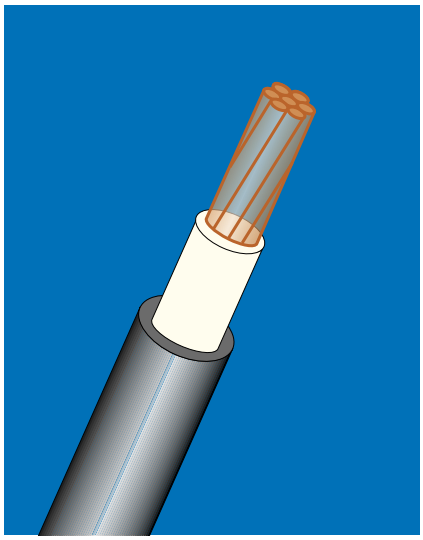


Bending radius: Static in use 10 D
Dynamic in use 20 D

Adapted to FAA L-824 C

Primary circuit cable

5 kV



Applications

Airfield Lighting Equipment
Primary cable for the serie circuit connecting the Constant Current Regulators and the isolating transformers, and between the isolating transformers. This cable can be buried providing there is an extra mechanical protection.

Max core temperature: 90°C

Design

1. Conductor
Stranded bare or tinned copper, Class 2
Cross section: 6 mm^2 or 8 AWG

2. Insulation
XLPE
(cross linked polyethylene)

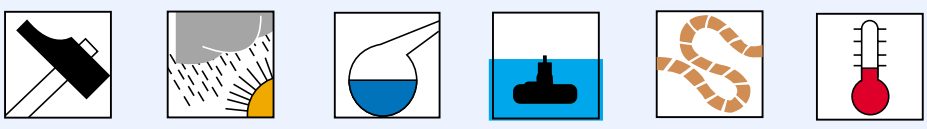
3. Outer Sheath
PE or PVC
(polyethylene) (polyvinyl chloride)
Colour: black, others colours on request

Marking

Sample: NEXANS - PRIMARY 1 x 6 mm^2 - 5 kV - year + Metric Marking

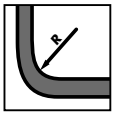
Standards

Adapted to FAA L-824 C
Specification by Nexans



Adapted to FAA L-824 C

Section (mm²)	Insulation thickness nominal (mm)	Outer sheath (mm)	Outer sheath thickness	Outer diameter nominal (mm)	Weight (kg/km)
1 x 6 1 x 6	2.3 2.3	PVC PE	0.8 0.8	11.0 11.0	156 170
1 x 8 AWG 1 x 8 AWG	2.3 2.3	PVC PE	0.8 0.8	11.5 11.5	180 211



Bending radius: Static in use 10 D
Dynamic in use 20 D

H07RN-F
Secondary circuit cable

450/750 V

Applications
Connection between transformers and Airfield Lighting Equipment. This cable can be buried providing there is an extra mechanical protection.

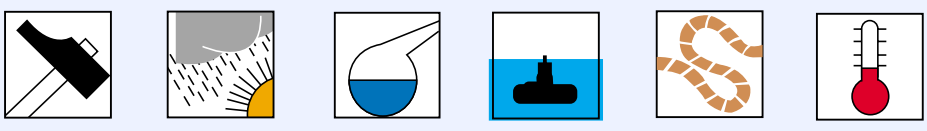
Max core temperature: 85°C

Design
1. Conductor
Flexible bare copper, Class 5
2. Insulation
Special cross linked elastomer
3. Outer Sheath
Cross linked oil resistant elastomer
Colour: black

Core Identification
2 cores: brown + blue, 3 cores: brown + blue + green/yellow

Marking
USE < HAR > H07RN-F

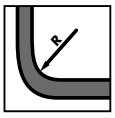
Standards
NF C 32-102-4, HD 22-4



H07RN-F

Cross section (mm²)	Permissible current rating A	Volt drop Delta U (cos phi 0.8) V/A · km	Outer diameter range Mini (mm)	Outer diameter range Maxi (mm)	Weight (kg/km)
1 x 2.5	32	14.0	6.3	7.9	66
1 x 4	43	8.7	7.2	9.0	94
1 x 6	56	5.9	7.9	9.8	109
2 x 2.5	32	16.2	10.2	13.1	161
2 x 4	43	10.1	11.8	15.0	238
2 x 6	56	6.7	13.1	17.0	279
3 x 2.5	32	16.2	10.9	14.0	195
3 x 4	43	10.1	12.7	16.2	290
3 x 6	56	7.0	14.1	18.0	346

Permissible current ratings are shown for an ambient temperature of 30° C where the cable is installed in fixed installations for a maximum operating and a conductor temperature of 85° C.



Bending radius
For movable installations: 6 to 8 x Outer diameter
For fixed installations: 3 x Outer diameter if = or < 12 mm
4 x Outer diameter if > 12 mm

FLGG 2 x 4
Secondary circuit cable

500 V

Applications
Airfield lighting cable for
secondary electrical circuits.

Max core temperature: 90°C

Design
1. Conductor
Tinned copper, Class 5
2. Insulation
Cross linked polyalkene
3. Separator
PTFE-Foil
4. Outer Sheath
Cross linked synthetic rubber compound
Colour: black
(Maximum temperature at sheath 170 °C for 5 hours (layable in asphalt))

Core Identification
Blue + brown

Marking
NEXANS FLGG 2x4 500 V

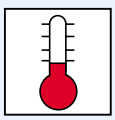

Fire retardandt
IEC 60332-3


Low smoke
IEC 61034

Halogen free
IEC 60754-1

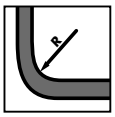

No toxic


No corrosivity
IEC 60754-2


-20 / +90 °C

FLGG 2 x 4

Cross section (mm^2)	Insulation thickness (mm)	Outer sheath thickness nominal (mm)	Outer diameter maximal (mm)	Weight (kg/km)
2 x 4	0.5	1.1	9.8	167



Bending radius: fixed installations 10 mm
flexible used 50 mm

400 Hz Introduction

400 Hz cables are used for the power supply of aircraft, computer systems and radar stations.

The engines of aircraft are stopped while the aircraft are stationary, in order to save fuel as well as to decrease noise level and the quantity of exhaust gas at the airport. All international airports offer a 400 Hz supply voltage for stationary aircraft.

Due to safety reasons computer systems, radar equipment and communication systems of airports are connected to uninterruptable power supply plants via 400 Hz cables. With that, a total power failure is prevented, and frequency and voltage fluctuations are compensated.

Nexans manufactures these interconnection cables for many different applications.

The 400 Hz network can be designed as a central, decentralized stationary or mobile system. The 400 Hz board supply requires cables and special plugs.

For distance up to 150 m a transmission voltage of 200/115 V is used. A higher voltage is chosen for larger plants with larger distances. For those plants a transformer is installed as near as possible to the aircraft (e.g at the end of the passager bridge) which reduces the supply voltage down to the board voltage of 200/115V.

Distance m	Transmission V
Up to 150 150 up to approx. 600 more than 600	200/115 600 950

400 Hz Cables

Construction

The main constructional features are circular stranded (RM) or circular fine stranded (RF) conductors, PVC or XLPE insulation, with or without screen/protection conductor, or with a special screen having a low transfer impedance; the outer sheath is mostly made of PVC, however, can also be made of PE. All cables can also be supplied in a halogen-free RHEYHALON® design.

With 4 core cables voltage asymmetries and higher inductive voltage drops occur in 400 Hz networks when high ratings are transmitted. These unfavorable cable characteristics can be improved by using 7 core cables. In those cables the centre core is used as earth or neutral conductor (green-yellow or blue), and six cores with the same cross section (black with white numbers) are laid in one layer round the centre core. Two opposite-located cores are switched in parallel to one phase conductor.

Application

400 Hz cables are directly buried or laid in buildings. RHEYHALON® designs are only suitable for indoor installation, cables with a PE sheath only for direct burial.

Flexible 400 Hz Cables

Construction
The main constructional features are circular finely stranded (RF) conductors, EPR or thermoplastic (elastomer) insulation, with or without screen, and a sheath made of chloronated elastomer or polyurethan for a flexible installation. Flexible 400 Hz cables can also be supplied with control cores and special screening.

Application
Flexible 400 Hz cables are used:

1. between the fixed installated cable network, outside at the passager bridge or within the cladding, from the building to the front of the passenger bridge,

2. as board supply cable from the end of the passenger bridge to the aircraft.
   Depending on the individual location the cable is wound or reeled. If required, these cables have additional control cores for controlling the voltage level (readjustment of the supply voltage) and for the up-and-down setting of the reeling equipment,

3. as interconnection cable between the mobile power supply unit and the aircraft.

Flexible 400 Hz cables are also installed in inspection and maintenance halls.

Application for trailing cables
The lenghts used are normally 10 - 25 m long. 400 Hz trailing cables, made by NEXANS, are highly flexible and withstand extreme environmental stresses.

Their special features are:
- high abrasion and tear resistance,
- resistance against oils, petrol, etc...,
- flame retardant,
- flexible at low temperatures
  -45°C in fixed installation
  -35°C in mobile installation.

Permissible bending radius (minimum rated values)
- 10 x D for free movement, and
- 4 x D for fixed installation.

400 Hz cables are normally connected with special plugs, which have an internationally harmonized pole configuration, and they can therefore be used with civil and military aircraft. Four poles are for the power supply , and two poles are used for the connection of control cores. Some suppliers also offer plugs with additional operating possibilities, e.g. for the on-and-off winding of trailing cables.

Rheyground 400 Hz

Power cables for 400 Hz systems
unscreened
0.6/1 kV

Applications

Power Cable for 400 Hz systems laying in earth, in water, outdoors, indoors and in cable ducts. The power is transmitted via 2 in parallel connected cores which are located opposite to each other.

Type Approval Certificates

VDE 0271 meeting the special requirements of 400 Hz

Max core temperature: 70°C

Design

1. Conductor
Bare copper, Class 2 or 5

2. Insulation
PVC
(polyvinyl chloride)
Compound type Y14

3. Power cores
6 cores laid-up over a centre core

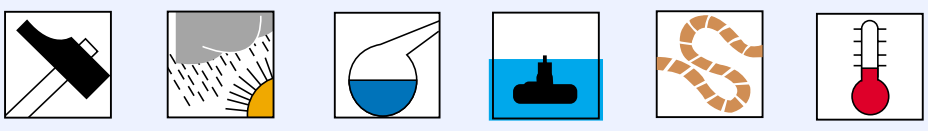
4. Outer Sheath
PVC
(polyvinyl chloride)
Compound type YM3
Colour: black

Core Identification

Centre core blue
6 black cores with white number 1 - 6

Marking

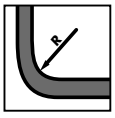
NEXANS RHEYGROUND 400 Hz (N)YY-O 7 x 35 RF



Rheyground 400 Hz

Cables (mm^2)	Outer diameter min. (mm)	Outer diameter nom. (mm)	Outer diameter max. (mm)	Weight approx. (kg/km)
(N) YY-O				
7 x 25 RF	33.5	35.0	36.0	2 800
7 x 35 RF	38.0	39.0	40.0	3 500

Product on request



Bending radius: 6 x D

Operating conditions

Rated voltage	
max. permissible operating voltage	Uo/U = 0.6/1.0 kV
in 3-phase or A.C. systems 1	Uo/U = 0.72/1.2 kV
A.C. test voltage	4 kV

Temperatures	
max. permissible operating temperature at conductor	70 °C
permissible surface temperature in mobile condition (laying)	+5/+50 °C

Smallest permissible bending radii	
during laying	12 x cable diameter
e.g. before sealing ends	6 x cable diameter
Permissible pulling forces during laying with pulling eye fitted on the conductors or with cable stocking	350 N/mm^2

Rheyground 400 Hz

Power cables for 400 Hz systems screened
0.6/1 kV

Applications

Power Cable for 400 Hz systems laying in earth, in water, outdoors, indoors and in cable ducts. The power is transmitted via 2 in parallel connected cores which are located opposite to each other.

Type Approval Certificates

VDE 0271 meeting the special requirements of 400 Hz

Max core temperature: 70°C

Design

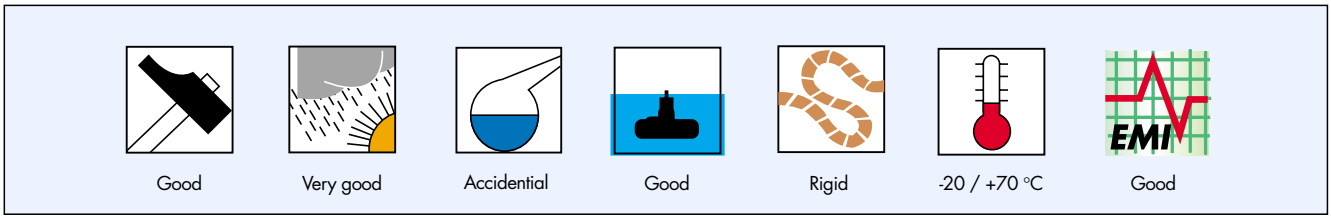
1. Conductor
Bare copper, Class 2 or 5
2. Insulation
Cross linked polyehtylene
3. Power cores
6 cores laid-up over a centre core
4. Screen
Bare copper braid
5. Outer Sheath
PVC
(polyvinyl chloride)
Compound type YM5
Colour: black

Core Identification

Centre core blue
6 black cores with white number 1 - 6

Marking

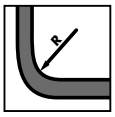
NEXANS RHEYGROUND 400 Hz (N)2XCY-O 7 x 70 RF



Rheyground 400 Hz

Cross section (mm²)	Diamater of core approx. (mm)	Outer diameter max. (mm)	Weight approx. (kg/km)
7 x 70 RF	11.9	46.5	6 430

Product on request



Bending radius: 6 x D

Operating conditions

Rated voltage	
max. permissible operating voltage	Uo/U = 0.6/1.0 kV
in 3-phase or A.C. systems 1	Uo/U = 0.72/1.2 kV
A.C. test voltage	4 kV

Temperatures	
max. permissible operating temperature at conductor	70 °C
permissible surface temperature in mobile condition (laying)	+5/+50 °C

Smallest permissible bending radii	
during laying	12 x cable diameter
e.g. before sealing ends	6 x cable diameter
Permissible pulling forces during laying with pulling eye fitted on the conductors or with cable stocking	350 N/mm²

Rheyground 400 Hz

Power cables for 400 Hz systems
screened
0.6/1 kV

Applications

Airfield power supply cable for
electrical 400 Hz circuits.

Max core temperature: 70°C

Design

1. Conductor
Bare copper, Class 2
2. Insulation
Cross linked polyethylene
3. Inner sheath
PVC YM5
4. Screen
Bare copper wires
5. Wrapping
Common core covering of wrapping and/or extruded filling compound
6. Outer Sheath
PVC YM5
Colour: black

Core Identification

Central wire: blue
First layer: bk1/bk2/bk3/bk1/bk2/bk3

Marking

I NEXANS I (N)2X2YC2Y 7x35RM/35 400 Hz 0,6/1 kV <year>

Rheyground 400 Hz

Conductor cross section (mm²)	Diameter of core nom. (mm)	Screen cross section (mm)	Outer diameter nom.
35.0	9.7	35.0	42.0

Rheycord® 400 Hz

Flexible Power cables for aircraft interconnection SHTTÖU-O

0.6/1 kV

Max core temperature: 90°C

Applications

Flexible interconnection cable for 400 Hz power supply systems. Suitable for use outdoor when freely moved or for cable car operation and as reeling cable.

Design

1. Conductor
Flexible bare copper, Class 5

2. Insulation
Power cores: EPR (ethylene propylen rubber)
Control cores: ethylenetetrafluorethylene

3. Power cores
6 cores laid-up over a centre core

4. Control cores
laid-up in quads located in outer interstices. SHTTöU has an overall reinforcements over each core

5. Wrapping
Common core covering of wrapping and/or extruded filling compound

6. Outer Sheath
Outer sheath comprising bonded inner and outer sheath of chloroprene rubber with integrated open meshed braid, outer jacket oil resistant, flame retardant, highly resistant against abrasion and tear
Colour: black

Core Identification

Power cores: centre core blue
6 black cores with white number 1 - 6
Control cores: 6 x 4 black printed with 1 - 24

Marking

Sample: Nexans Rheycord TT 400 Hz 7x35 + 6x(4x1)

Rheycord 400 Hz

Cross section (mm²)	Diameter of power cores max. (mm)	Diameter of control cores approx. (mm)	Outer diameter nom. (mm)	Weight approx. (kg/km)
7 x 25 + 6 (4 x 1)	9.6	1.8	42.0	2 850
7 x 35 + 6 (4 x 1)	10.9	1.8	44.0	3 050

Operating conditions

Rated voltage	
max. permissible operating voltage in 3-phase or A.C. systems	Uo/U = 720/1200 V
A.C. test voltage	
power core/power core/control cores	3.5 kV/5 min
control core/control core	2 kV/5 min

Rated voltage		
D.C. conductor resistance at 20°C		
core 25 mm²		≤ 0.780 Ω/km
core 35 mm²		≤ 0.554 Ω/km
core 1 mm²		≤ 19.5 Ω/km
2 cores 25 mm² located opposite in parallel		≤ 0.390 Ω/km
2 cores 35 mm² located opposite in parallel		≤ 0.277 Ω/km
Inductance and inductive resistance at 400 Hz, two opposite cores in parallel connected		
Planning reference value calculated from measured values		
25 mm²	L = 0.13 mH/km	X = 0.325 Ω/km
35 mm²	L = 0.1 mH/km	X = 0.25 Ω/km

Temperatures	
Limit temperature at conductor	
during operation	+ 90°C
during short circuit	+ 200°C
during short circuit for soft solder connections	+ 160°C
RHEYFLEX®-N Limit surface temperature	
fixed installed	-40/ + 80°C
mobile	-25/ + 60°C
RHEYCORD® Limit surface temperature	
fixed installed	-45/ + 90°C
mobile	-35/ + 80°C

Rheypur 400 Hz

Flexible Power cables for aircraft interconnection

0.6/1 kV

Photo similar

Max core temperature: 90°C

Applications

Flexible interconnection cable for 400 Hz power supply systems. Suitable for use outdoor when freely moved or for cable car operation and as reeling cable.

Design

1. Conductor
Flexible bare copper, Class 5

2. Insulation
Power cores: HEPR
Control cores: Thermoplastic

3. Power cores
6 cores laid-up over a centre core

4. Control cores
laid-up in triads located in outer interstices. It has an overall reinforcements over each core

5. Wrapping
Common core covering of wrapping and/or extruded filling compound

6. Outer Sheath
Outer sheath comprising bonded inner and outer sheath of Polyurethan with integrated open meshed braid, outer jacket oil resistant, flame retardant, highly resistant against abrasion and tear
Colour: orange

Core Identification

Power cores: centre core blue
6 black cores with white number 1 - 6
Control cores: 6 x 4 white printed with 1 - 24

Marking

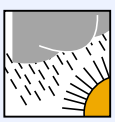
Sample: Nexans RHEYPUR 400 Hz 7x35 + 6x(4x1)

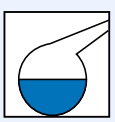
Standards

VDE 0295, Class 5/IEC 60228
VDE 0207, part 20
VDE 0207, part 5

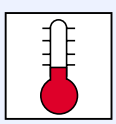

Flame retardant


Good


Good

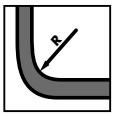

Good


Flexible


-35 / +80 °C

Rheycord 400 Hz

Cross section (mm²)	Diameter of power cores max. (mm)	Diameter of control cores nom. (mm)	Outer diameter max. (mm)	Weight approx. (kg/km)
7 x 35 + 6 (4 x 1)	10.9	1.9	43.0	2 850



Bending radius: 3-5 x D

Operating conditions

Rated voltage	
max. permissible operating voltage in 3-phase or A.C. systems	Uo/U = 720/1200 V
A.C. test voltage	
power core/power core/control cores	3.5 kV/5 min
control core/control core	2 kV/5 min

Resistance		
D.C. conductor resistance at 20°C		
core 25 mm²		≤ 0.780 Ω/km
core 35 mm²		≤ 0.554 Ω/km
core 1 mm²		≤ 19.5 Ω/km
2 cores 25 mm² located opposite in parallel		≤ 0.390 Ω/km
2 cores 35 mm² located opposite in parallel		≤ 0.277 Ω/km
Inductance and inductive resistance at 400 Hz, two opposite cores in parallel connected		
Planning reference value calculated from measured values		
25 mm²	L = 0.13 mH/km	X = 0.325 Ω/km
35 mm²	L = 0.1 mH/km	X = 0.25 Ω/km

Temperatures	
Limit temperature at conductor	
during operation	+ 90°C
during short circuit	+ 200°C
during short circuit for soft solder connections	+ 160°C
RHEYFLEX®-N Limit surface temperature	
fixed installed	-40/ + 80°C
mobile	-25/ + 60°C
RHEYCORD® Limit surface temperature	
fixed installed	-45/ + 90°C
mobile	-35/ + 80°C

GENERAL CONDITIONS

FOR THE SUPPLY OF PRODUCTS AND SERVICES OF THE ELECTRICAL AND ELECTRONICS INDUSTRY*

for commercial transactions between businesses

Zentralverband Elektrotechnik- und Elektronikindustrie e.V.
ZVEI

recommended by the Zentralverband Elektrotechnik- und Elektronikindustrie (ZVEI) e. V.

– January 2002 –

I. GENERAL

1. The scope of deliveries and/or services (hereinafter referred to as „Supplies") shall be determined by the written declarations of both Parties. General terms and conditions of the Purchaser shall apply only if and when expressly accepted by the supplier or the provider of services (hereinafter referred to as „Supplier") in writing.

2. The Supplier herewith reserves any industrial property rights and/or copyrights pertaining to its cost estimates, drawings and other documents (hereinafter referred to as „Documents"). The Documents shall not be made accessible to third parties without the Supplier's prior consent and shall, upon request, be returned without undue delay to the Supplier if the contract is not awarded to the Supplier. Sentences 1 and 2 shall apply mutatis mutandis to documents of the Purchaser; these may, however, be made accessible to third parties to whom the Supplier may rightfully transfer Supplies.

3. The Purchaser shall have the non-exclusive right to use standard software, provided that it remains unchanged, is used within the agreed performance parameters, and on the agreed equipment. The Purchaser may make one back-up copy without express agreement.

4. Partial Supplies shall be allowed, unless they are unreasonable to accept for the Purchaser.

II. PRICES AND TERMS OF PAYMENT

1. Prices shall be ex works and exclude packaging; value added tax shall be added at the then applicable rate.

2. If the Supplier is also responsible for assembly or erection and unless otherwise agreed, the Purchaser shall pay the agreed remuneration and any incidental costs required, e. g. travel costs, costs for the transport of tools and equipment, and personal luggage as well as allowances.

3. Payments shall be made free Supplier's paying office.

4. The Purchaser may set off only those claims that are undisputed or against which no legal recourse is possible.

III. RETENTION OF TITLE

1. Items pertaining to the Supplies („Retained Goods") shall remain the property of the Supplier until each and every claim the Supplier has against the Purchaser on account of the business connection has been fulfilled. If the combined value of the security interests of the Supplier exceeds the value of all secured claims by more than 20 %, the Supplier shall release a corresponding part of the security interest if so requested by the Purchaser.

2. For the duration of the retention of title, the Purchaser may not pledge the Retained Goods or use them as security, and resale shall be permitted only for dealers in the ordinary course of their business and only on condition that the reseller receives payment from its customer or makes the transfer of property to the customer dependent upon the customer fulfilling its obligation to effect payment.

3. The Purchaser shall inform the Supplier forthwith of any seizure or other act of disposition by third parties.

4. Where the Purchaser fails to fulfil its duties, including failure to make payments due, the Supplier shall be entitled to cancel the contract and take back the Retained Goods in the case of continued failure following expiry of a reasonable time set by the Supplier; the statutory provisions that a time limit is not needed remain unaffected. The Purchaser shall be obliged to surrender the Retained Goods.

IV. TIME FOR SUPPLIES; DELAY

1. Times set for Supplies can only be observed if all Documents to be supplied by the Purchaser, necessary permits and releases, especially concerning plans, are received in time and if agreed terms of payment and other obligations of the Purchaser are fulfilled. Unless these conditions are fulfilled in time, times set shall be extended appropriately; this shall not apply where the Supplier is responsible for the delay.

2. If non-observance of the times set is due to force majeure such as mobilization, war, rebellion or similar events, e. g. strike or lockout, such time shall be extended accordingly.

3. If the Supplier is responsible for the delay (hereinafter referred to as „Delay") and the Purchaser demonstrably suffered a loss therefrom, the Purchaser may claim a compensation as liquidated damages of 0,5 % for every completed week of Delay, but in no case more than a total of 5 % of the price of that part of the Supplies which because of the Delay could not be put to the intended use.

4. Purchaser's claims for damages due to delayed Supplies as well as claims for damages in lieu of performance exceeding the limits specified in No. 3 above shall be excluded in all cases of delayed Supplies even upon expiry of a time set to the Supplier to effect the Supplies. This shall not apply in cases of mandatory liability based on intent, gross negligence, or due to injury of life, body or health. Cancelation of the contract by the Purchaser based on statute shall be limited to cases where the Supplier is responsible for the delay. The above provisions do not imply a change in the burden of proof to the detriment of the Purchaser.

5. At the Supplier's request the Purchaser shall declare within a reasonable period of time whether the Purchaser cancels the contract due to the delayed Supplies or insists on the Supplies to be carried out.

6. If dispatch or shipment is delayed at the Purchaser's request by more than one month after notice of the readiness for dispatch was given, the Purchaser may be charged, for every month commenced, storage costs of 0,5 % of the price of the parts of the Supplies, but in no case more than a total of 5 %. The parties to the contract may prove that higher or as the case may be, lower storage costs have been incurred.

V. TRANSFER OF RISK

1. Even where delivery has been agreed, freight free, the risk shall pass to the Purchaser as follows:

   a) If the Supplies do not include assembly or erection, at the time when the Supplies are shipped or picked up by the carrier. Upon request of the Purchaser, the Supplier shall insure the Supplies against the usual risks of transport at the expense of the Purchaser;

   b) If the Supplies include assembly or erection, at the day of taking over in the own works or, if so agreed, after a trouble-free trial run.

2. The risk shall pass to the Purchaser if dispatch, shipping, the start or performance of assembly or erection, the taking over in the own works or the trial run is delayed for reasons for which the Purchaser is responsible or if the Purchaser has otherwise failed to accept the Supplies.

VI. ASSEMBLY AND ERECTION

Unless otherwise agreed in writing, assembly/erection shall be subject to the following provisions:

1. The Purchaser shall provide at its own expense and in good time

   a) all earth and construction work and other ancillary work outside the scope of the Supplies, including the necessary skilled and unskilled labour, construction materials and tools,

   b) the equipment and materials necessary for assembly and commissioning such as scaffolds, lifting equipment and other devices as well as fuels and lubricants,

   c) energy and water at the point of use including connections, heating and lighting,

   d) suitable dry and lockable rooms of sufficient size adjacent to the site for the storage of machine parts, apparatus, materials, tools, etc. and adequate working and recreation rooms for the erection personnel, including sanitary facilities as are appropriate in the specific circumstances. Furthermore, the Purchaser shall take all measures it would take for the protection of its own possessions to protect the possessions of the Supplier and of the erection personnel at the site,

   e) protective clothing and protective devices needed due to particular conditions prevailing on the specific site.

2. Before the erection work starts, the Purchaser shall make available at its own account any information required concerning the location of concealed electric power, gas and water lines or of similar installations as well as the necessary structural data.

3. Prior to assembly or erection, the materials and equipment necessary for the work to start must be available on the site or assembly/erection and any preparatory work must have advanced to such a degree that assembly/erection can be started as agreed and carried out without interruption. Access roads and the assembly/erection site itself must be level and clear.

4. If assembly, erection or commissioning is delayed due to circumstances for which the Supplier is not responsible, the Purchaser shall bear the reasonable

* Translation of the original German text

able costs incurred for idle times and any additional travelling of the Supplier or the erection personnel.

5. The Purchaser shall attest to the hours worked by the erection personnel towards the Supplier at weekly intervals and the Purchaser shall immediately confirm in writing if assembly, erection or commissioning has been completed.

6. If, after completion, the Supplier demands acceptance of the Supplies, the Purchaser shall comply therewith within a period of two weeks. In default thereof, acceptance is deemed to have taken place. Acceptance is also deemed to have been effected if the Supplies are put to use, after completion of an agreed test phase, if any.

VII. RECEIVING OF SUPPLIES

The Purchaser shall not refuse to receive Supplies due to minor defects.

VIII. DEFECTS AS TO QUALITY

The Supplier shall be liable for defects as to quality („Sachmängel", hereinafter referred to as „Defects") as follows:

1. All parts or services where a Defect becomes apparent within the limitation period shall, at the discretion of the Supplier, be repaired, replaced or provided again free of charge irrespective of the hours of operation elapsed, provided that the reason for the Defect had already existed at the time when the risk passed.

2. Claims based on Defects are subject to a limitation period of 12 months. This provision shall not apply where longer periods are prescribed by law according to Sec. 438 para. 1 No. 2 (*buildings and things used for a building*), Sec. 479 para. 1 (*right of recourse*), and Sec. 634a para. 1 No. 2 (defects of a building) German Civil Code („BGB"), as well as in cases of injury of life, body or health, or where the Supplier intentionally or grossly negligently fails to fulfil its obligation or fraudulently conceals a Defect. The legal provisions regarding suspension of expiration („Ablaufhemmung"), suspension („*Hemmung*") and recommencement of limitation periods remain unaffected.

3. The Purchaser shall notify Defects to the Supplier in writing and without undue delay.

4. In the case of notification of a Defect, the Purchaser may withhold payments to a reasonable extent taking into account the Defect occurred. The Purchaser, however, may withhold payments only if the subject-matter of the notification of the Defect occurred is justified beyond doubt. Unjustified notifications of Defect shall entitle the Supplier to have its expenses reimbursed by the Purchaser.

5. The Supplier shall first be given the opportunity to supplement its performance („Nacherfüllung") within a reasonable period of time.

6. If supplementary performance is unsuccessful, the Purchaser shall be entitled to cancel the contract or reduce the remuneration, irrespective of any claims for damages it may have according to Art. XI.

7. There shall be no claims based on Defect in cases of insignificant deviations from the agreed quality, of only minor impairment of usefulness, of natural wear and tear or damage arising after the transfer of risk from faulty or negligent handling, excessive strain, unsuitable equipment, defective workmanship, inappropriate foundation soil or from particular external influences not assumed under the contract, or from non-reproducible software errors. Claims based on defects attributable to improper modifications or repair work carried out by the Purchaser or third parties and the consequences thereof shall be likewise excluded.

8. The Purchaser shall have no claim with respect to expenses incurred in the course of supplementary performance, including costs of travel and transport, labour, and material, to the extent that expenses are increased because the subject-matter of the Supplies was subsequently brought to another location than the Purchaser's branch office, unless doing so complies with the intended use of the Supplies.

9. The Purchaser's right of recourse against the Supplier pursuant to Sec. 478 BGB is limited to cases where the Purchaser has not concluded an agreement with its customers exceeding the scope of the statutory provisions governing claims based on Defects. Moreover, No. 8 above shall apply mutatis mutandis to the scope of the right of recourse the Purchaser has against the Supplier pursuant to Sec. 478 para. 2 BGB.

10. Furthermore, the provisions of Art. XI (Other Claims for Damages) shall apply in respect of claims of damages. Any other claims of the Purchaser against the Supplier or its agents or any such claims exceeding the claims provided for in this Art. VIII, based on a Defect, shall be excluded.

IX. INDUSTRIAL PROPERTY RIGHTS AND COPYRIGHT; DEFECTS IN TITLE

1. Unless otherwise agreed, the Supplier shall provide the Supplies free from third parties' industrial property rights and copyrights (hereinafter referred to as „IPR") with respect to the country of the place of destination. If a third party asserts a justified claim against the Purchaser based on an infringement of an IPR with respect to the Supplies made by the Supplier and then used in conformity with the contract, the Supplier shall be liable to the Purchaser within the time period stipulated in Art. VIII No. 2 as follows:

   a) The Supplier shall choose whether to acquire, at its own expense, the right to use the IPR with respect to the Supplies concerned or whether to modify the Supplies such that they no longer infringe the IPR or replace them. If this would be unreasonable to demand from the Supplier, the Purchaser may cancel the contract or reduce the remuneration pursuant to the appli-cable statutory provisions.

   b) The Supplier's liability to pay damages shall be governed by Art. XI.

   c) The above obligations of the Supplier shall only apply if the Purchaser (i) immediately notifies the Supplier of any such claim asserted by the third party in writing, (ii) does not concede the existence of an infringement and (iii) leaves any protective measures and settlement negotiations to the discretion of the Supplier. If the Purchaser stops using the Supplies in order to reduce the damage or for other good reason, it shall be obliged to point out to the third party that no acknowledgement of the alleged infringement may be inferred from the fact that the use has been discontinued.

2. Claims of the Purchaser shall be excluded if it is itself responsible for the infringement of an IPR.

3. Claims of the Purchaser shall also be excluded if the infringement of the IPR is caused by specifications made by the Purchaser, by a type of use not foreseeable by the Supplier or by the Supplies being modified by the Purchaser or being used together with products not provided by the Supplier.

4. In addition, with respect to claims by the Purchaser pursuant to No. 1 a) above, Art. VIII Nos. 4, 5, and 9 shall apply mutatis mutandis in the event of an infringement of an IPR.

5. Where other defects in title occur, Art. VIII shall apply mutatis mutandis.

6. Any other claims of the Purchaser against the Supplier or its agents or any such claims exceeding the claims provided for in this Art. IX, based on a defect in title, shall be excluded.

X. IMPOSSIBILITY OF PERFORMANCE; ADAPTATION OF CONTRACT

1. To the extent that Supplies are impossible to be carried out, the Purchaser shall be entitled to claim damages, unless the Supplier is not responsible for the impossibility. The Purchaser's claim for damages shall, however, be limited to an amount of 10 % of the value of the part of the Supplies which, owing to the impossibility, cannot be put to the intended use. This limitation shall not apply in the case of mandatory liability based on intent, gross negligence or injury of life, body or health; this does not imply a change in the burden of proof to the detriment of the Purchaser. The right of the Purchaser to cancel the contract shall remain unaffected.

2. Where unforeseeable events within the meaning of Art. IV No. 2 substantially change the economic importance or the contents of the Supplies or considerably affect the Supplier's business, the contract shall be adapted taking into account the principles of reasonableness and good faith. Where doing so is economically unreasonable, the Supplier shall have the right to cancel the contract. If the Supplier intends to exercise its right to cancel the contract, it shall notify the Purchaser thereof without undue delay after having realised the repercussions of the event; this shall also apply even where an extension of the delivery period had previously been agreed with the Purchaser.

XI. OTHER CLAIMS FOR DAMAGES

1. Any claims for damages and reimbursement of expenses the Purchaser may have (hereinafter referred to as „Claims for Damages"), based on whatever legal reason, including infringement of duties arising in connection with the contract or tort, shall be excluded.

2. The above shall not apply in the case of mandatory liability, e. g. under the German Product Liability Act („*Produkthaftungsgesetz*"), in the case of intent, gross negligence, injury of life, body or health, or breach of a condition which goes to the root of the contract („wesentliche Vertragspflichten"). However, Claims for Damages arising from a breach of a condition which goes to the root of the contract shall be limited to the foreseeable damage which is intrinsic to the contract, unless caused by intent or gross negligence or based on liability for injury of life, body or health. The above provision does not imply a change in the burden of proof to the detriment of the Purchaser.

3. To the extent that the Purchaser has a valid Claim for Damages according to this Art. XI, it shall be time-barred upon expiration of the limitation period applicable to Defects pursuant to Art. VIII No. 2. In the case of claims for damages under the German Product Liability Act, the statutory provisions governing limitation periods shall apply.

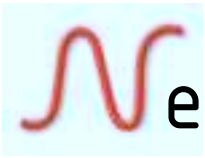
XII. VENUE AND APPLICABLE LAW

1. If the Purchaser is a businessperson, sole venue for all disputes arising directly or indirectly out of the contract shall be the Supplier's place of business. However, the Supplier may also bring an action at the Purchaser's place of business.

2. Legal relations existing in connection with this contract shall be governed by German substantive law, to the exclusion of the United Nations Convention on Contracts for the International Sale of Goods (CISG).

XIII. SEVERABILITY CLAUSE

The legal invalidity of one or more provisions of this contract shall in no way affect the validity of the remaining provisions. This shall not apply if it would be unreasonable for one of the parties to continue the contract.



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