

Datenblätter Mobile

1. Feldkabel

BRUmil

3_7_2

Flexible Mini FO cable, for harsh environments, with stainless steel loose tube for maximum 8 fibers and stainless steel armoring. Approved by NATO and armed forces.

Description

- Compact structure, low weight, high flexibility
- Central stainless steel loose tube with up to 8 fibers, single- or multimode
- Outer sheath, robust, halogen free
- High crush resistance
- High permissible tensile strength
- Longitudinally watertight
- Excellent rodent proof
- To brace with wedge clamps

Application

- Indoors and/or outdoors
- Rapid deployment in harsh environment
- Tactical military or civil applications: temporary robust communication lines and mobile applications with rodent danger

Accessories and Services (on request)

Pre-assembled cables with:

- Pre-assembling with military lens- or ferrule-connectors, delivered on various reels
- Adapting cables to standard connectors

Deployment aids

- Hand-reels, backpack- or vehicle reels
- Wedge clamps, masts etc.

Repair kits/Training

- Training for deployment, repair and cable testing

Engineering

- Solution engineering and system design

LLK-BML, patented



Technical data

Type	Max. no. of fibres units	Cable ø mm	Weight kg/km	Max. tensile strength short term N	Max. tensile strength long term N
BRUmil 1F	1	3.4	18	1000	750
BRUmil 2F	2	3.8	25	1900	1400
BRUmil 4F	4	3.8	25	1600	1100
BRUmil 8F	8	4.5	39	4000	2000

Type	Min. bending radius with tensile mm	Min. bending radius without tensile mm	Max. crush resistance N/cm
BRUmil 1F	15xD	10xD	2500
BRUmil 2F	15xD	10xD	1000
BRUmil 4F	15xD	10xD	800
BRUmil 8F	15xD	10xD	1300



BRUtough MINI

Non-metallic tactical field cable with tight buffered fibers for the harsh environment

Temperature range:

Operating temperature: -55...+85°C
Storage temperature: -70...+85°C
Installation temperature: ±0...+50°C



Application:

- Tactical field applications: temporary flexible robust communication lines and mobile applications
- Rapid deployment in harsh surroundings
- Indoor and outdoor
- Inside vehicles or shelters

Jacket color:

- Black, similar to RAL 9005

Standards:

- IEC 60794

Description:

- For direct connector assembling
- Easy to assemble
- Non-metallic cable
- Optimized for repeated cable winding
- High mechanical resistance
- Compact design, high flexibility
- Robust outer sheath
- Halogen free cable sheath
- Individual cable marking for easy identification and traceability on request

Accessories and Services offered:

- Pre-assembling with military lens- or butt joint connectors, delivered on various reels for easy deployment
- Adapting cables e.g. from bulkhead to LC, ST or any standard connectors
- Hand reels, backpack- or vehicle reels
- Deployment aids, like wedge clamps, masts etc.
- Training for deployment and cable testing
- Solution engineering and system design

Construction:

- Outer sheath PUR
- Aramid yarn strength members
- Helically stranded core for better flexibility and higher mechanical protection of the optical fibers
- 900 µm Colour coded Elastomeric tight buffered fibres
- Fibers with Acrylate primary coating for improved micro bending
- Labeling outer sheath on request



Technical data:

Type	No. of fibers, units	Cable ø mm	Weight kg/km	Max. tensile strength	
				short term N	long term N
BRUtough MINI 2F	2	3.4	10.0	1000	500

Type	Min. bending radius		Max. Crush resistance N/cm	Impact resistance (2.25 Nm, R = 25mm) Impacts	Repeated bending (100 N) Cycles
	with tensile mm	without tensile mm			
BRUtough 2F	50	25	100	20	2000

BRUtough

3_10_1

Description

- Non metallic cable
- For direct connector assembling
- Easy to assemble
- Compact design, high flexibility
- Outer sheath, robust, halogen free
- High mechanical protection
- Optimized for repeated cable winding
- Individual cable marking for easy identification and traceability on request

Application

- Indoors and/or outdoors
- Rapid deployment in harsh environment
- Tactical field applications: temporary flexible robust communication lines and mobile applications
- Inside vehicles or shelters

Accessories and Services (on request)

Pre-assembled cables with:

- Pre-assembling with military lens- or butt joint connectors, delivered on various reels for easy deployment
- Adapting cables e.g. from bulkhead to LC, ST or any standard connectors

Deployment aids

- Hand-reels, backpack- or vehicle reels
- Wedge clamps, masts etc.

Repair kits/Training

- Training for deployment, repair and cable testing

Engineering

- Solution engineering and system design



Technical data

Type	No of fibres units	Cable ø mm	Weight kg/km	Max. tensile strength short term N	Max. tensile strength long term N
BRUtough 2F	2	5.0	23.0	1800	600
BRUtough 4F	4	5.5	24.5	1800	600
BRUtough 8F	8	6.5	36.0	1800	600
BRUtough 12F	12	6.5	39.0	2100	700

Type	Min. bending radius with tensile mm	Min. bending radius without tensile mm	Max. crush resistance N/cm	Impact resistance Impacts	Repeated bending (100 N) Cycles
BRUtough 2F	50	25	150	100	2000
BRUtough 4F	55	30	150	100	2000
BRUtough 8F	65	40	150	100	2000
BRUtough 12F	65	40	150	100	2000

BRUcast

3_10_2

LLK_BCA

Rugged field cable with tight buffered fibers for the harsh environment of the broadcast industry

Application

- Robust communication links for the broadcast industry
- Blue colored cables and connectors are matching perfectly in color keying technique
- Indoor and outdoor
- Mobile applications
- Harsh environment
- Inside vehicles or buildings

Description

- For direct assembly of harsh environment and standard connectors
- High tensile strength
- Optimized for repeated cable bending
- Blue sheath for easier recognition
- Cable marking for easy identification and traceability
- Abrasion resistant robust outer sheath
- Halogen free outer sheath

Construction

- Outer sheath PUR
- Aramid strain relief
- Helically stranded core for better flexibility and higher mechanical protection of the optical fibers
- Dual layer reinforced tight buffered fibers

- Optical fibers with dual layer primary coating for improved micro bending
- Labeling outer sheath on request

Temperature range

Operating temperature: -40° ... +85°C
Storage temperature: -50° ... +85°C
Installation temperature: -5° ... +50°C

Jacket colour

Blue similar to RAL 5005

Standards

IEC 60794-1-2 optical fibres testing
IEC 60793

Accessories and Services offered

- Pre-assembling with military lens- or butt joint connectors, delivered on various reels for easy deployment
- Butt joint connectors also in blue color
- Adapting cables to standard connectors
- Hand reels, backpack- or vehicle reels
- Installation aids, like wedge clamps, masts etc.
- Training for deployment and cable testing



Technical data

Type	Fiber count	Cable ø mm	Weight kg/km	Max. tensile strength short term N	Max. tensile strength long term N
LLK-BCA 4F	4	6.5	34	2000	800
LLK-BCA 2F	2	6.0	29	2000	800

Type mm²	Min. bending radius with tensile load mm	Min. bending radius without tensile load mm	Max. crush resistance N/cm	Impact resistance Impacts	Repeated bending Cycles
LLK-BCA 4F	15xD	10xD	450	300	20000
LLK-BCA 2F	15xD	10xD	450	300	20000



BRUfield

Non-metallic mini tactical FO field cable for harsh environment use with strain bearing elements as armoring. Lightweight cable structure with a very small diameter enabling double the length of cable on the same reel than with standard non-metallic field cables

Application

- Tactical military and field applications where flexible robust communications lines are required
- Rapid deployment in harsh environment
- Indoor and outdoor

Description

- Non-metallic cable
- Central non-metallic loose tube construction for up to 4 fibers single-mode or multi-mode
- Higher crush resistance than other non-metallic field cables
- Higher tensile strength than other non-metallic field cables
- Longitudinally watertight
- Compact structure allowing larger quantities to be reeled on single drums
- Very low weight
- Robust sheath halogen-free

Construction

- Outer sheath constructed of either PE or PA sheath with extra abrasion resistance as requested
- Strain bearing elements for armoring and strain relief
- Gel filled non-metallic loose tube
- Up to 4 bend optimized fibers with primary coating
- Labeling on request, individual per reel

Temperature range

- Operating temperature -55 - +85
- Storage temperature -60 - +85

Jacket color

- Black similar to RAL 9005
- Labeling on request, individual per reel

Standards

- IEC 60794
- MIL-PRF-M85045

Remarks

Accessories offered

- Pre-assembly with military lens connectors
- Delivery on various reel sizes for easy deployment, as hand-reels, backpack or vehicle reels
- Adapting cables lens connector to standard connectors
- Deployment aids such as wedge clamps, masts, etc.
- Training for deployment, repair and testing
- Solution engineering and system design



Technical data:

Type	No. of Fiber	Cable mm	Weight kg/km	Max. tensile strength	
				short term N	long term N
BRUfield	1 to 4	3.8	13	1200	650

Type	Min. bending radius		Max. Crush resistance N/cm PE (PA)	Impact resistance Impacts	Repeated bending Cycles
	with tensile mm	without tensile mm			
BRUfield	15xD	10xD	200 (300)	40	2000

BRUpowerfield

3_10_8

Optimized Hybrid field cable for harsh environments, with reinforced loose tube that holds up to 4 fibers and two coaxial layers of electrical conductors for electrical power transmission.

Description

- Compact structure, low weight, high flexibility
- Outer sheath, robust, halogen free
- Good rodent protection
- High permissible tensile strength
- Excellent crush resistance

Application

- Indoors and/or outdoors
- Rapid deployment in harsh environment
- Tactical military or civil applications: temporary robust communication lines with power supplying to remote communication equipment
- Combination of power transmission and fiber-optic communication over long distances

Remarks

- When installing this cable, the appropriate installation and application guidelines should be respected and abided by. These guidelines and further questions can be obtained at the Brugg Cables Engineering Department.

Accessories and Services (on request)

Pre-assembled cables with:

- Adapting cables to standard connectors
- Pre-assembling with special hybrid military lens connectors, delivered on various reels for easy deployment

Deployment aids

- Hand-reels, backpack- or vehicle reels
- Wedge clamps, masts etc.

Repair kits/Training

- Training for deployment, repair and cable testing

Engineering

- Solution engineering and system design

LLK-BPML, patented



Technical data

Type	Cable ø mm	Weight kg/km	Electrical resistance ~Ω/km	Rated current A	operating voltage kV (AC)	operating voltage kV (DC)
LLK-BPF 4F	4.6	36	34	6	1.0	1.5

Type	Max. no. of fibres units	Min. bending radius with tensile mm	Min. bending radius without tensile mm	Max. tensile strength short term N	Max. tensile strength long term N	Max. crush resist- ance N/cm
LLK-BPF 4F	4	15xD	10xD	1500	1200	1000

BRUpowerfield slim

Hybrid tactical FO/Cu field cable for harsh environment use, with strain bearing elements as armoring. With its lightweight / low-volume cable structure for data and electrical power transmission it has outstanding characteristics.

Application

- Tactical military and field applications where flexible robust combined power and communication lines are required
- Rapid deployment in harsh environment
- Indoor and outdoor

Description

- FO-Cu-Hybrid-Cable for power and data transmission
- Central non-metallic loose tube construction for up to 4 fibers single-mode or multi-mode
- Isolated copper wires for up to 12 different electrical potentials
- Higher crush resistance than other non-metallic field cables
- Higher tensile strength than other non-metallic field cables
- Longitudinally watertight
- Compact structure allowing larger quantities per drum
- Very low weight
- Robust sheath halogen-free

Construction

- Outer sheath constructed of either PE or PA sheath with extra abrasion resistance as requested
- Strain bearing elements for armoring and strain relief
- 10 isolated copper wires 0.16mm²
- Gel filled non-metallic loose tube
- Up to 4 bend optimized fibers with primary coating

Temperature range

- Operating temperature -55 - +85
- Storage temperature -60 - +85

Jacket color

- Black similar to RAL 9005
- Labeling on request, individual per reel

Standards

- IEC 60794
- MIL-PRF-M85045

Power transmission;

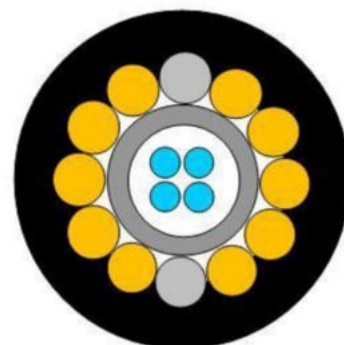
U_{max}: 1000VAC/1500VDC

Amperage max.: 6A

Remarks

Accessories offered

- Pre-assembly with military hybrid-lens-connectors
- Delivery on various reel sizes for easy deployment, as hand-reels, backpack or vehicle reels
- Adapting cables lens connector to standard connectors
- Deployment aids such as wedge clamps, masts, etc.
- Training for deployment, repair and testing
- Solution engineering and system design



Technical data:

Type	No. of Fiber	Electrical Characteristics Max. ratings	No of isol. Cu-wires 0.16mm ²	Cable Ø mm	Weight kg/km	Max. tensile strength	
						short term N	long term N
BRUpowerfield	1 to 4	1000VAC/1500VDC/6A	10-12	3.8	25	1000	400

Type	Min. bending radius		Max. Crush resistance N/cm PE (PA)	Impact resistance Impacts	Repeated bending Cycles
	with tensile mm	without tensile mm			
BRUpowerfield	15xD	10xD	200 (300)	10	2000

BRUpowermil

3_7_12

Description

- Compact design, low weight, high flexibility, small bending radius
- RoHS compliant
- Central stainless steel loose tube with 4 fibers, single- or multimode and two stranded coaxial copper wires
- Outer sheath, robust, halogen free
- High crush resistance
- High tensile strength
- Excellent rodent proof
- To brace with wedge clamps

Application

- Indoors and/or outdoors
- Rapid deployment in harsh environment
- Tactical military or civil applications: temporary robust communication lines with power supplying to remote communication equipment
- Combination of power transmission and fiber-optic communication over long distances

Remarks

- When installing this cable, the appropriate installation and application guidelines should be respected and abided by. These guidelines and further questions can be obtained at the Brugg Cables Engineering Department.

Accessories and Services (on request)

Pre-assembled cables with:

- Adapting cables to standard connectors
- Pre-assembling with special hybrid military lens connectors, delivered on various reels for easy deployment

Deployment aids

- Hand-reels, backpack- or vehicle reels
- Wedge clamps, masts etc.

Repair kits/Training

- Training for deployment, repair and cable testing

Engineering

- Solution engineering and system design

LLK-BPML, patented



Technical data

Type	Cable ø mm	Weight kg/km	Electrical resistance ~Ω/km	Rated current A	operating voltage kV (AC)	operating voltage kV (DC)
LLK-BPML-4F	5.8	68	22	13	1.0	1.5

Type	Max. no. of fibres units	Min. bending radius with tensile mm	Min. bending radius without tensile mm	Max. tensile strength short term N	Max. tensile strength long term N	Max. crush resistance N/cm
LLK-BPML-4F	4	15xD	10xD	2800	1750	1000



Datenblätter Mobile

2. Verlegezubehör

Additional deployment aids for tactical field cables

The ideal tools for deploying tactical fiber-optic field cables, easy and quick guidance of the cable on the ground or for spanning over obstacles, like rivers, streets etc.

Applications:

- These deployment aids are used to fix the cable at permanent constructions such as buildings, onto trees or other suitable objects for guiding it over masts or for on the ground, e.g. protecting the cable at a street crossing.

The following deployment aids are the perfect tools:

- Cable shoes:
 - The heavy weight cable shoes are used as fixing tool for guiding the cable over the ground where no objects are available for fixation. It can be anchored with nails or tent pegs on the ground. On request the cable shoe is also available with strong magnets to attach it to any steel surface or object
- Tree hooks
 - Guiding the cable over inaccessible areas and objects the right type of tree hook would bypass the obstacles. It can be setup and removed by our telescopic hook
- Telescopic hook/fork
 - Wherever you approach inaccessible areas the telescopic hook extends your action-range for mounting and fitting deployment aids and setup of the cable into the correct position
- Telescopic pole
 - Crossing a river, a ditch or flyover a street on up to 6m height, the telescopic pole is the solution when other objects are missing. The ground-anchor with 4 guy ropes are the correct fittings for stability and are included in the set. Together with our wedge clamps it is the perfect deployment tool
- Floor ducts
 - Even if strong armored Brugg cables are in operation it extends its lifecycle by protecting it with floor ducts. Especially inside camps or by crossing streets with different cables our floor ducts provide multi channels for various cables and can be chained up

Description:

- Cable shoes:
 - Heavy weight (1.2 kg) for self fixation on the ground
 - On request available with magnets
- Tree hook:
 - Various designs
- Telescopic pole / hook:
 - Material: Aluminum / color: green
 - Pole length: 4 elements of 1.2 m for up to 5.5 m
 - Pole weight: 7.8 kg
 - Hook length: 3 elements of 1.2 m for up to 4.5 m
 - Hook weight: 4.9 kg
- Floor duct:
 - Material: PU (Polyurethan)
 - Length: 1 m per element / weight: 5 kg
 - Color: black / yellow



Cable shoe



Tree hook



Telescopic hook/fork



Telescopic pole



Floor duct

Wedge-clamps, deployment aid for tactical field cables

The ideal aid for deploying tactical fiber-optic field cables, easy and quick fixation of the cable on the ground or for spanning over obstacles, like rivers, streets etc.

Application

- This tool is used as a deployment-aid to fix the cable at permanent constructions such as buildings, at a mast, at the ground, at trees or any other suitable objects.
- In following situations the wedge clamps are the perfect aid:
 - To hold the cable at the ground.
 - To lead a change of direction
 - To make a span e.g. from building to building, from mast to mast or from tree to tree.

Description

- Plastic body containing two wedges to hold the cable.
- Stainless steel springs
- For different cable types and diameters, wedge clamps are available with different clamping jaws
- The clamping jaws are in different colors for different cable types and diameter
- The design is easy to use and robust for harsh environment

Environmental Performance

Operating temperature: -40°...+70°C
MIL-STD-810F-501.II

Storage temperature: -60°...+85°C
MIL-STD-810F-502.I

Free Fall at - 60°C: 26 falls from 1.2 m height
MIL-STD-810F-516.5-IV

Weathering: 1000 h, 0.5 W/m² @ 340 nm
ISO 4892-2A

Dimensions

l x h x d: 150 x 35 x 60 mm

Weight: 0.09 kg



Colored clamping jaws for different cables



Wedge clamp in operation



Technical data

Type	Suitable for Cable Type	Cable ø	Sheath material	Mechanical Performance	Mechanical Performance
Color-Code				Retention force over full operation temp. range -40°...+70°C	Max. retention force at 22°C
	mm	mm	mm	N	N
Black Jaws	BRUmil FO-cable 1..4F	3.3...4.0	PA jacket	800	1100
Brown Jaws	BRUmil FO-cable 8F	4.4...5.0	PA jacket	600	1000
Green Jaws	BRUpowermil hybrid 4F + 2el.	5.6...6.0	PA jacket	450	650
Red Jaws	BRUtough 2..4F non-metallic cable	5.0...5.8	PUR jacket	180	300

Datenblätter Mobile

3. Rollen und Zubehör

Vehicle Reels

The easy perfect system for deployment of medium to long cable lengths

Applications:

- Cable assembly – ready for operation
- Fast cable deployment in various landscapes from vehicles
- Increased cable length compared to the hand reels or back-pack reels
- Use of full or partial cable length
- Outdoors

Description:

- Winding frame in aluminum, colored green for mounting on a vehicle, excluding reel, including
 - Accessory bag with crank for rewinding
 - Deploying handle for lifting reel in- and out of winding frame or for hand deploying at for vehicle impassable ground
- Various reels of different diameter have the following features:
 - All reels with extensible axle for easy storage
 - Reels have separate connector compartment
 - Protective sheath covering the cable and two Velcro belts protecting the cable ends with its connectors

- Reel delivered made ready to use with cable and connectors
- Number of winding frames compared to the number of reels is depending on the application

Material:

- Winding frame in aluminum, colored green
- Reels in aluminum, colored green, with rubber edges

Color:

- Green, similar to RAL 6031

Accessories offered:

- Preassembling with military lens- or butt joint connectors
- Adapting cables, e.g. from bulkhead to LC, ST or any standard connectors
- Hand-reels or backpack reels
- Deployment aids, like wedge clamps, masts etc.
- Training for deployment, repair and cable testing in the field
- Solution engineering and system design
- Tactical Cable Measuring Case to localize exactly the defective spot
- Tactical Cable Repair Kit for fusion splice in the workshop or the Field Repair Kit for mechanical splice technique



Reel with deploying handle and cable protective sheath



Reel on winding frame with accessory bag and cable protective sheath

Dimensions Winding Frame without Reel:

	Width mm	Height mm	Depth mm	Weight kg
Winding frame	440	325	440	3.3
Handle	405	335		0.4

Dimensions Reels:

Type	External mm	Core mm	Width of Main Winch mm	Width of Flange mm	Weight kg
Nato-310	310	160	250	40	3.1
Nato-380	380	160	250 or 230	40 or 60	4.1
Nato-470	470	160	250	40	5.0
Nato-520	520	160	250	40	6.0

Maximum Cable Length for the different Brugg Fiber-optic Cables and the respective Weight including Reel:

Type	BRUmil 1F		BRUfield ¹ 1-4 F BRUmil 2-4 F		BRUmil 8F		BRUpowermil		BRUtough	
	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg
Nato-310	800	18	600	12.7 ¹ / 18.1	450	21	260	21	300	11
Nato-380	1300	28	1000	20.1 ¹ / 29.1	750	34	450	36	500	17
Nato-470	2250	46	1800	33.8 ¹ / 50.0	1300	56	750	58	850	26
Nato-520	2850	58	2300	42.8 ¹ / 63.5	1620	70	950	73	1000	33

* Length given for manual loose rewinding. Machine winded the capacity is approximately 25% higher.

Backpack

The ergonomic system for deployment of short to medium cable lengths

Applications:

- Cable assembly – ready for operation
- Laying cable in various landscapes by a team of two soldiers
- Increased cable length carried by an individual soldier
- Used as caddy over pavement with bigger trolley-wheels
- Use of full or partial cable length
- Outdoors

Description:

- Backpack frame in aluminum, anodized green color, equipped with handbrakes, excluding reel, including
 - Accessory bag with crank for rewinding
- Reel with the following features:
 - Extensible axle for easy storage
 - Separate connector compartment
 - Protective sheath covering the cable and two Velcro belts protecting the cable ends with its connectors
 - Reel delivered made ready to use with cable and connectors
- Number of backpack frames compared to the number of reels is depending on the application

Material:

- Backpack frame in aluminum, anodized green colored
- Accessories bag in canvas
- Reels in aluminum, colored green, with rubber edges

Color:

- Green, similar to RAL 6031

Accessories offered:

- Preassembling with military lens- or butt joint connectors
- Adapting cables, e.g. from bulkhead to LC, ST or any standard connectors
- Vehicle reels and winding frames or hand reels
- Deployment aids, like wedge clamps, masts etc.
- Training for deployment, repair and cable testing in the field
- Solution engineering and system design
- Tactical Cable Measuring Case to localize exactly the defective spot
- Tactical Cable Repair Kit for fusion splice in the workshop or the Field Repair Kit for mechanical splice technique



Backpack frame



Reel with extensible axle

Dimensions Backpack Frame without Reel:

	Width mm	Height mm	Depth mm	Weight kg
Backpack	430	885	340	7.0

Dimensions Reel:

Type	External mm	Core mm	Width of Main Winch mm	Width of Flange mm	Weight kg
Nato-380	380	160	250 or 230	40 or 60	4.1

Other reel sizes on request

Maximum Cable Length for the different Brugg Fiber-optic Cables and the respective Weight including Reel:

Type	BRUmil 1F		BRUfield ¹ 1-4 F BRUmil 2-4 F		BRUmil 8F		BRUpowermil		BRUtough	
	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg
Nato-380	1300	28	1000	20.1 ¹ / 29.1	750	34	450	36	500	17

* Length given for manual loose rewinding. Machine winded the capacity is approximately 25% higher.

Hand Reels Steel or Elastomer

The easy and perfect drums for short cable length

Applications:

- Cable assembly – ready for operation
- Laying cable for short distances
- Hand carried to place of deployment
- Use of full or partial cable length
- Out- or indoors

Description:

- Hand reels are available either in steel, galvanized and green colored or in black elastomer
- Reel has the following features:
 - Separate connector compartment
 - The carrying handle design prevents the cable from being taken off of the reels sideways
 - Steel reel has folding handle for rewinding and two Velcro belts to protect connectors
 - Elastomer reel uses rubber bands for securing connectors
- Hand reels delivered made ready to use with cable and connectors

Material:

- Steel reel: Steel galvanized, green colored, similar to RAL 6031
- Elastomer reel: Plastic in black color

Accessories offered:

- Preassembling with military lens- or butt joint connectors
- Adapting cables, e.g. from bulkhead to LC, ST or any standard connectors
- Vehicle reels and winding frames or backpack reels
- Deployment aids, like wedge clamps, masts etc.
- Training for deployment, repair and cable testing in the field
- Solution engineering and system design
- Tactical Cable Measuring Case to localize exactly the defective spot
- Tactical Cable Repair Kit for fusion splice in the workshop or the Field Repair Kit for mechanical splice technique



Hand reel steel



Hand reel elastomer

Dimensions overall, Frame including Reel:

	Width / mm	Height / mm	Depth / mm	Weight / kg
Steel small HR300	320	390	250	6.1
Steel large HR 350	335	440	260	8.6
Plast small HR 310	310	370	240	2.5
Plast medium HR 380	380	485	320	4.6
Plast large HR 450	450	555	310	6.7

Dimensions Reel:

Type	External mm	Core mm	Width of Main Winch mm	Width of Flange mm	Color
Steel small HR300	300	85	110	45	green
Steel large HR 350	350	160	110	45	green
Plast small HR 310	310	190	120	40	black
Plast medium HR 380	380	235	160	45	black
Plast large HR 450	450	295	170	45	black

Maximum Cable Length for the different Brugg Fiber-optic Cables and the respective Weight complete:

Type	BRUmil 1F		BRUfield ¹ 1-4 F BRUmil 2-4 F		BRUmil 8F		BRUpowermil		BRUtough	
Type	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg	Length m*	Weight kg
Steel small HR300	400	13.5	340	11.6 ¹ / 14.5	200	14.0	140	16.0	150	10.0
Steel large HR350	500	17.5	400	15.0 ¹ / 18.5	230	17.5	160	19.5	180	13.0
Plast small HR310	300	8.0	250	6.5 ¹ / 9.0	180	9.0	100	9.5	120	5.5
Plast medium HR380	600	15.5	450	11.8 ¹ / 16.0	350	18.5	200	18.0	220	10.0
Plast large HR450	800	21.0	600	16.3 ¹ / 22.0	450	24.0	260	24.5	300	14.0

* Length given for manual loose rewinding. Machine winded the capacity is approximately 25% higher.

Vehicle Reel extra large XXL

The easy perfect system for extra long cable lengths, up to several kilometers

Application

- Cable assembly – ready for operation
- Fast cable deployment in various landscapes from vehicles
- Extra large cable length compared to the other reels
- Use of full or partial cable length
- Outdoors

Description

- Winding frame in steel, colored black for mounting on a vehicle, excluding reel, including
 - Accessory bag with crank for rewinding
 - Suitable for reels up to 86 cm diameter
- Reel has the following features:
 - Reel has fix axle
 - Reel has separate connector compartment
 - Two Velcro belts protecting the cable ends and its connectors
 - Reel delivered made ready to use with cable and connectors
 - Each reel is delivered on its winding frame, in a wooden box
 - Winding frame together with the reel can be lifted by a fork lift to the vehicle
- Winding frame in steel, colored black
- Reels in steel, colored black, with rubber edges

- Preassembling with military lens- or butt joint connectors
- Adapting cables, e.g. from bulkhead to LC, ST or any standard connectors
- Hand-reels or back-pack reels
- Deployment aids, like wedge clamps, masts etc.
- Training for deployment, repair and cable testing in the field
- Solution engineering and system design
- Tactical Cable Measuring Case to localize exactly the defective spot
- Tactical Cable Repair Kit for fusion splice in the workshop or the Field Repair Kit for mechanical splice technique



Winding frame, including reel with 5 km BRUtough cable

Color

black

Dimensions Frame without Reel

Type	Width mm	Height mm	Depth mm	Weight kg
Winding frame XXL, incl. crank	786	580	500	22

Dimensions Reel

Type	External Ø mm	Core Ø mm	Width of Main Winch mm	Width of Flange mm	Weight kg
Reel XXL-550	550	240	500	40	25
Reel XXL-715	715	240	500	40	34
Reel XXL-800	800	240	500	40	39

Maximum Cable Length for the different Brugg Fiber-optic Cables and the respective Weight complete

Type	BRUmil 2-4 F Length ¹ m	BRUmil 2-4 F Weight kg	BRUmil 8 F Length ¹ m	BRUmil 8 F Weight kg	BRUpower- mil Length ¹ m	BRUpower- mil Weight kg	BRUtough Length ¹ m	BRUtough Weight kg
Reel XXL-550	4550	139	3200	152	1900	155	2200	80
Reel XXL-715	8500	250	6000	270	3700	286	4100	138
Reel XXL-800	11000	315	8000	352	4800	367	5200	172

¹ Length given for manual loose rewinding. Machine wound the capacity is approximately 25% higher.

Datenblätter Mobile

4. Unterhalt & Reparatur

Cleaning Set for tactical expanded beam connectors

The Solifos Cleaning Set is equipped with all the necessary tools to clean the tactical fiber optical expanded beam connectors in the field.

Application

- Tactical military and field cable assemblies with military expanded beam connectors
- In harsh environment
- Indoor and outdoor

Description

Coated textile bag contains:

- bottles for water, air and alcohol
- Q-tips
- Wooden toothpicks

Construction

- The textile bag is coated to be resistant against water, dust and chemicals
- The bottles are designed to be refilled
- The boxes for Y-tips and wooden sticks can be refilled.

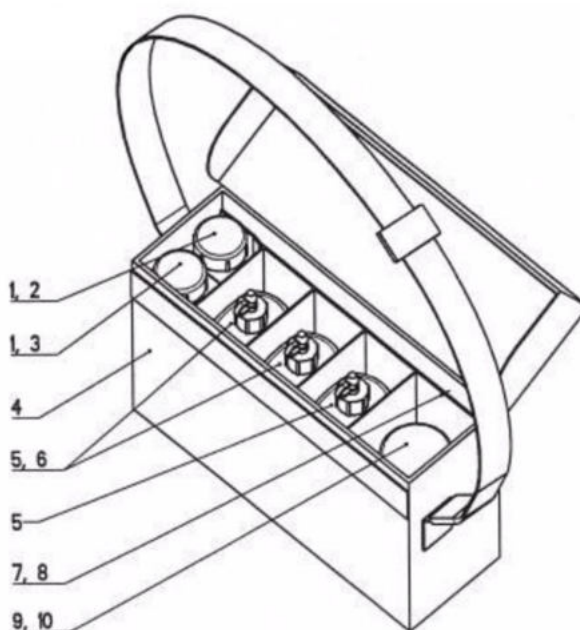
Temperature range

- Operating temperature 0 - +85
- Storage temperature -60 - +85

Remarks

Consumables:

- Water
- Alcohol
- Q-tips
- Wooden toothpicks



Material list

	Article-no.	Description
1,2	02246	Container with toothpicks
1,3	02246	Container with Q-tips
4	02376	Material bag
5/6	02248	Spray bottles for air and water
7/8	02249	Material list and users manual
9/10	02245	Bottle to be filled up with ethyl, cleaning alcohol

BRUMIL 880 – Tactical Cable Repair Kit

The fusion-splice kit for repairing broken tactical fiber-optic cables BRUmil, or the dielectric cables BRUfield and BRUtough as well as the hybrid cable BRUpowermil in the workshop. The flexible repair tube allows the cable to be easily re-wound onto the drum.

Application:

- Quick repair of broken fiber-optic cables in the workshop or in the field (under protection)
- Repaired cables have a minimum of additional losses in attenuation
- Original cable tensile load applicable after repair

Construction:

- The tactical cable repair kit is a hard cover case, dust and water resistant containing all necessary tools and parts for the fusion splicing of singlemode or multimode fiber cables, either for the armored metal cable BRUmil or for the dielectric cables BRUfield and BRUtough
- For the BRUpowermil hybrid cable a special splicing case is also available (additional tools and consumable items)

Optical:

- For up to 4 splices single or multimode
- Insertion loss: 9/125 fiber at 1310 or 1550 nm, 50/250 fiber, typical 0.2 dB

Protection tube:

Dimensions Ø 20 mm, L 500 mm (Fittings Ø 28 mm)
Weight 0.35 kg
Water protection IP 67 (24 h @ 5000 mm)

Temperature range:

- Operation: -10°...+50° C
- Storage -40°...+60° C

Environmental Conditions:

- Hard cover case class IP64
- Built in pressure relief valve for air transport

Dimensions:

Size 650 x 510 x 242 mm
Weight approx. 14 kg

Optional Accessories and Service offered:

- Spare Parts Set of consumable items
- Tactical Cable Measuring Case to localize exactly the defective spot
- Emergency Field Repair Kit for mechanical splice in the field
- Training for deployment, repair and cable testing in the field and in the workshop
- Solution engineering and system design



Inventory:

Consumable items

- Protection sleeve for BRUmil, BRUfield and/or BRUtough
- Splice crimp set for BRUmil, BRUfield and/or BRUtough
- Splicer spare parts set
- Alcohol and cleaning wipes

Tools:

- Fusion splicer
- Precision cleaver
- Charger
- AC Adapter
- Mains adapter for splicer
- Diagonal cutters
- Cable cutter
- Stainless steel tube cutter for BRUmil
- Fiber stripping tool
- BRUfield, BRUtough stripping tool
- Kevlar scissors
- Knife
- Crimping tool
- Adjustable wrenches
- Combination pliers
- Allen key
- Replacement blades
- Ruler (Metric & Imperial)
- Marker
- Manual with splicing instructions & kit key

BRUMIL 860 – Emergency Field Repair Kit

The emergency kit for quick repairs of broken tactical fiber optical cables in the field. Usable for single or multimode fiber cables with up to four fibers

Application:

- In the case where fiber optic cables are broken, the Emergency Field Repair Kit allows the quick repair of fibers with mechanical splice technique.
- Results in low additional losses.
- Fast and reliable cable repair within 20 to 30 minutes (1 to 4 fibers)
- Original cable tensile load applicable after repair
- For further rewinding and usage on a reel the cable should be repaired with the fusion splice case in the workshop after current operation

Construction:

- The field repair kit is a hard cover case, dust and water resistant containing all necessary tools for mechanical splicing of singlemode or multimode fiber cables, either for armored metal cable BRUmil or for the dielectric cables BRUfield or BRUtough

Optical:

- For up to 4 splices single or multimode
- Insertion loss 9/125 fiber at 1310 or 1550 nm, 50/125 fiber at 850 or 1300 nm, typical 0.5 dB

Protection tube:

- Dimensions \varnothing 50 mm, L 22.5 cm
- Weight 0.55 kg
- Water protection IP 67 (24 h @ 5000 mm)

Temperature range:

- Operation -55°...+85° C
MIL-STD-810F-501.4

Environmental Conditions:

- Hard cover case class IP64

Dimensions:

- Size 470 x 357 x 178 mm
- Weight approx. 6.5 kg

Optional Accessories and Service offered:

- Spare Parts Set of consumable items
- Tactical Cable Measuring Case to localize exactly the defective spot
- Tactical Cable Repair Kit for fusion splice in the workshop
- Training for deployment, repair and cable testing in the field
- Solution engineering and system design



Inventory:

Consumable items

- 2 protection tubes complete
- Mechanical splices
- Cleaning towels
- MINIGRIP size 4
- Replacement blades
- 1 mm protection tube
- 0.5 mm protection tube
- Klüber Staburags compound
- Repair manual

Tools:

- Splice cassette
- Installation tool
- Allen key 3 mm
- Water resistant stylus
- Side cutting pliers
- Stripping tool
- Scissors
- Universal pliers 160 mm
- Stainless steel tube cutter
- Cleaving tool S-315
- Ruler 300 mm

Datenblätter Mobile

5. Messtechnik

BRUMIL 840 – Optical LED-Tester for military lens connectors

The ideally customized Tactical Optical LED-Tester for military lens connectors performs critical tasks for maintaining tactical fiber-optic networks in operations by testing existing cable sets and localizing damages to patch cords, adapting cables etc.

Application:

- Checking/testing tactical fiber-optic networks or part of it, e.g. cable assemblies with military lens connectors, adapting cables etc.
- Testing of the cable assemblies before and after an operation
- Ensures success of following mission
- Limits faulty connections to a minimum
- Keeps the cable assemblies ready for operation
- Localizing of a faulty fiber-optic cable to replace or to repair immediately with the Emergency Field Repair Kit (BRUMIL 860) or the Tactical Cable Repair Kit (BRUMIL 880)

Advantages of Optical LED-Tester

- Compact and lightweight design
- Simple optical fault locator
- Locating of unwanted fiber crossing
- Simple one-button operation
- High visibility of the color LED light
- Simple handling
- Reliable construction for harsh environment
- Easy cleaning with water and isopropyl alcohol
- Additional LED-Tester with any other connector interface available on request

Construction:

- Hard lightweight metal housing IP 54
- Fully compatible with original lens connector insert
- A1 = red
- B1 = green
- A2 = yellow
- B2 = blue

Optional Accessories and Service offered:

- Textile bag
- Easy cleaning set
- Training for deployment, repair and cable testing in the field and in the workshop
- Emergency Field Repair Kit (BRUMIL 860) for mechanical splice in the field
- Tactical Cable Repair Kit (BRUMIL 880) for fusion splice in the workshop
- Solution engineering and system design

Optical:

- Testing single or multimode fibers

Temperature range:

- Operation: -20°...+50° C
- Storage: -20°...+60° C
- Humidity: 95%, non condensing



Power:

- Batteries: 3x LR03-AAA
- Battery life time: up to 5 hours with standard batteries

Dimensions

HMA compatible LED Tester

- Size l x d: 157 x Ø27mm
- Weight: approx. 160 g

TFOCA compatible LED Tester

- Size l x d: 170 x Ø38mm
- Weight: approx. 300 g

EUROCOM compatible LED Tester

- Size l x d: 185 x Ø58mm
- Weight: approx. 525 g

BRUMIL 820 – Power Meter Measuring Case

The ideally customized Power Meter Measuring Case is a cost effective test kit designed for performing insertion loss measurements on both single-mode as well as multimode fiber optic links. These tasks are critical for maintaining tactical fiber-optic networks in operations by testing existing cable sets and localizing damages to patch cords, adapting cables etc.

Application:

- Checking/testing tactical fiber-optic networks or part of it, e.g. cable assemblies with military lens connectors, adapting cables etc.
- Measurement of cable assemblies before and after an operation.
- Ensures to initiate the next mission successfully.
- Limits faulty connections to a minimum.
- Keeps the cable assemblies ready for operation.
- Makes sure that an optimum number of reliable cable assemblies are available for the next operation.

Advantages of the Power Meter Measuring Case:

- Compact and highly integrated results in lightweight, compact and flexible design.
- Simple operation provides simple functionality.
- Modularly built connector boxes, which can be fitted according to customer's requirements. (Expanded beam and/or physical contact connectors)

Construction:

- Hard cover case IP 64
- Compact Palm sized, rugged and lightweight instruments.
- Power measurements in dB/m or μW ; insertion loss in dB.
- Reference power level storage.
- Large LCD with backlight.
- Automatic power-off function.
- Battery level display.
- Connector panel adapted to customer's requirement and application.
- Special adapting cables, if needed.
- Cleaning tissues.
- Elix clean with isopropyl alcohol. (Travel safe)
- Separate module for different connectors.

Optional Accessories and Service offered:

- Training for deployment, repair and cable testing in the field and in the workshop.
- Emergency Field Repair Kit for mechanical splice in the field.
- Tactical Cable Repair Kit for fusion splice in the workshop.
- Solution engineering and system design.



Optical:

- Measuring single or multimode fibers.
- Wavelengths: 850, 980, 1300, 1310, 1490, 1550 and 1625 nm.
- Data storage for up to 100 results.

Power Supply:

- AC Power: via micro USB
- Automatic shutdown after 20 minutes.
- Battery type: 2 x AA
- Battery life: Power Meter ≥ 200 h
Light Source >30 h (MM) / 80 h (SM)

Temperature range:

- Operation: -10°C ... $+60^{\circ}\text{C}$
- Storage: -40°C ... $+70^{\circ}\text{C}$

Dimensions

- Size l/w/h: 470 x 357 x 178 mm
- Weight: approx. 6.5 kg

BRUMIL 810 – Tactical Cable Measuring Case

The ideally customized Tactical Cable Measuring Case performs critical tasks for maintaining tactical fiber-optic networks in operations by testing existing cable sets and localizing damages to patch cords, adapting cables etc.

Application:

- Checking/testing tactical fiber-optic networks or part of it, e.g. cable assemblies with military lens connectors, adapting cables etc.
- Measurement of the cable assemblies before and after an operation
 - ensures to initiate the next mission successful
 - limits faulty connections to a minimum
 - keeps the cable assemblies ready for operation
- Localizing the failure of a fiber-optic cable to repairing immediately with the Emergency Field Repair Case or the Fusion Splice Case
- An optimum of reliable cable assemblies are available for the next operation

Advantages Optical Time-Domain Reflectometer (OTDR):

- Compact and highly integrated results in lightweight, compact and flexible design
- Simple optical fault locator
- Advanced Optical Time Domain Reflectometer OTDR
- On board "Connection Checker" (optional VFL, power meter, continuous wave light source and video inspection probe, keyboard and mouse)
- Programmable macros for measuring fixed fiber/cable lengths
- Simple one-button operation provides full OTDR functionality
- Internal memory for 1000 test results
- High visibility TFT color display 8.4 "

Construction:

- Hard cover case IP 64
- Compact OTDR measuring device with power cord, USB connection cable, AC/DC power supply
- Connector panel adapted to customer's requirement and application
- Special adapting cables, if needed
- Cleaning cube with 200 tissues
- Elix clean with isopropyl alcohol

Optional Accessories and Service offered:

- Training for deployment, repair and cable testing in the field and in the workshop
- Emergency Field Repair Kit for mechanical splice in the field
- Tactical Cable Repair Kit for fusion splice in the workshop
- Solution engineering and system design



Optical:

- Measuring single or multimode fibers
- Wavelengths 850, 1310 and 1550 nm

Power Supply for OTDR:

- Input: 100-240VAC 50-60 Hz
- Output: 19 V DC 3.1 A
- Battery life time: up to 11 hours with standard display

Temperature range:

- Operation: -20°...+50° C
- Storage: -20°...+60° C
- Humidity: 95%, non condensing

Dimensions

- Size l/w/h: 650 x 510 x 242 mm
- Weight: approx. 15 kg

Datenblätter Mobile

6. EMC, EMI, EMP Schutzelemente für Verträglichkeit und Filter gegen Emissionen

BRUMIL 21X – Surge-Protector RJ-45 100BaseT Family

The efficient devices to protect equipment against the effects of LEMP (Lightning Electromagnetic Pulses)

Application

- The BRUMIL 21X family is specially designed for faultless data transfer within Ethernet Cat 5 computer networks
- These products effectively protect the inputs of commercial network devices against damages caused by surge effects
- Used in:
 - TCP/IP WAN/LAN networks.
 - Harsh environment
 - Outdoor
 - Military

Description

- These Surge Protection Devices are multi-stage protection devices according to IEC 61643-21:2000.
- The models BRUGG MILLE 212 and 215 are specifically designed for applications with Power over Ethernet (PoE).

Technical Data

Characteristics Impedance: 100 Ohm

Insertion loss: typ. 0.4 dB (at 100 MHz)
Attenuation crosstalk ratio (ACR)

typ. 23.2 dB (at 100 MHz)
Dual next crosstalk

> 24 dB (at 100 MHz)
Nominal current I_N

300 mA
Max. discharge current I_{max} (8/20 μ s)

2 kA
Parasitic capacity C

< 47 pF
Response time tA

< 25 ns

Standards

Category tested according

IEC 61423-21:2000, A2, B2, C2, C3, D1

Temperature range

Operating temperature: -40 ... +80°C

Environment IP Protection

BRUMIL 210

IP-65 (prot. cap or plugged)
BRUMIL 212

IP-65 (prot. cap or plugged)
BRUMIL 212

IP-54 (built-in)



BRUMIL 210



BRUMIL 212



BRUMIL 215

Technical data

Type	Bitrate	Input / Output mm	Number of pro- tected pairs	Nominal voltage U_N V	Voltage protection level at I_N V	Voltage protection at 1 kV/us V
BRUMIL 210	10/100BaseTX	RJ45 / RJ45	1 x 2	6	25	< 10
BRUMIL 212	10/100/1000BaseTX	RJ45 / RJ45	1 x 4	60	82	78
BRUMIL 215	10/100/1000BaseTX	12 x RJ45 / M50	12 x 2	60	82	78

BRUMIL 220– EMP Protector RJ45-1000 Mbit/s

The efficient devices to protect equipment against the effects of EMP (Electromagnetic Pulses)

- Combined Lightning and HEMP and IEMI-Protection for all four wire pairs of an Ethernet cable, not for PoE
- Protects Ethernet connection for 10 /100/1000 Mbit/s
- Combination of non-linear high surge current components and linear filter components.
- Galvanic insulation between protected and unprotected side results in low protection levels.
- Metallic case for installation directly into shielding wall (Single Point Entry) as feed-through filter
- RJ45 jackets on both ends make installation easy
- Designed to protect against short-time and intermediate-time threats as defined in MIL-STD-188-125
- High quality components make this a very reliable and long-life product

Description:

- The BRUMIL 220 Surge Protection Device is a combined surge protection device which protects reliably against various transient overvoltages (such as lightning and HEMP) and simultaneously filters high frequency disturbances.
- Transient overvoltages in wiring can be generated by various disturbances: switching transients, lightning surges, electrostatic discharge (ESD) or HEMP (High-altitude Electromagnetic Pulse). HEMP is created by a nuclear explosion outside of the atmosphere. Often the general term EMP (Electromagnetic Pulse) is used, or NEMP (Nuclear Electromagnetic Pulse), or LEMP (for Lightning EMP). HPEM (high power electromagnetic) considers all kinds of high power transients, including IEMI-disturbances (Intentional Electro Magnetic Interference).
- The BRUMIL 220 Surge Protection Device consists of several well-coordinated protection stages, which reliably and effectively protect sensitive electronics against all kinds of HPEM disturbances.
- The BRUMIL 220 EMP Protector RJ45-1000 is threat-level tested against EMP according to **MIL-STD-188-125**, short pulse and intermediate pulse



Applications:

- The BRUMIL 220 is designed to safely protect Ethernet equipment and cabling with data rates of 10/100/1000 Mbit/s against transient over voltages caused by lightning, HEMP or IEMI. This version cannot be used in applications with PoE or PoE+ (Power over Ethernet). A special protection design results in very low residual voltages, which are low enough to protect any commercial of the shelf equipment from damage.
- HEMP-Filters are high-frequency components and shall be installed accordingly for best performance. An installation as feed-through filter directly into a shielding wall results in best protection performance. Over voltages and interference currents will flow to the shielding wall and electronic equipment in the shielded room is well protected.
- Please make sure, that all wires entering a protected volume have to be protected accordingly. Doing so reliably protects even commercial of the shelf (COTS) electronics of critical infrastructure.

Dimensions:

- Total length: 118mm (without patch cable)
- Diameter: M32x1.5mm thread

BRUMIL 220 – EMP Protector RJ45-1000

Max. operating voltage peak signal	±2V	Voltage between wire pairs 1-2, 3-6, wire pair 4-5 and 7-8
Data rate	10/100/1000 Mbit/s	Ethernet, Fast Ethernet Gigabit-Ethernet as per IEEE 802.3
Max. surge current I_{Max}	10 kA *)	Each wire to ground/case, shape 8/20 μ s, at least 1 pulse
Max. lightning impulse current I_{imp}	2 kA *)	Each wire to ground/case, shape 10/350 μ s, at least 1 pulse
DC resistance input – output	Open circuit	Input / output isolated > 500VDC
Residual voltage common mode	< 20 V	Pair to ground/case, pulse 4kV/2kA according to IEC61000-4-5
Residual voltage differential mode	< 20 V	Between pair, pulse 4kV /2kA according to IEC61000-4-5
Connection terminals	RJ45 shielded	Use of shielded cables recommended
Case material	Metal	Stainless steel, EMC-Locknuts brass nickel plated
Max. allowed installation torque	20Nm	Not to be exceeded under all circumstances
Dimensions	Ø 32x118mm	2 nuts M32x1.5 for feed-through installation
Weight	Approx. 290g	Incl. 2 nuts

*) Surge current > 2kA (8/20 μ s) per wire may damage RJ45 contacts

BRUMIL 230 – EMP Protector RJ45-1000 Mbit/s including PoE+

The efficient devices to protect equipment against the effects of EMP (Electromagnetic Pulses)

- Combined Lightning and HEMP and IEMI-Protection for all four wire pairs of an Ethernet cable, works also with PoE+ (up to 60 Watts)
- Protects Ethernet connection for 10 /100/1000 Mbit/s
- Combination of non-linear high surge current components and linear filter components provide low protection levels.
- Metallic case for installation directly into shielding wall (Single Point Entry) as feed-through filter
- RJ45 jackets on both ends make installation easy
- Designed to protect against short-time and intermediate-time threats as defined in MIL-STD-188-125
- High quality components make this a very reliable and long-life product

Description:

- The BRUMIL 230 Surge Protection Device is a combined surge protection device which protects reliably against various transient overvoltages (such as lightning and HEMP) and simultaneously filters high frequency disturbances.
- Transient overvoltages in wiring can be generated by various disturbances: switching transients, lightning surges, electrostatic discharge (ESD) or HEMP (High-altitude Electromagnetic Pulse). HEMP is created by a nuclear explosion outside of the atmosphere. Often the general term EMP (Electromagnetic Pulse) is used, or NEMP (Nuclear Electromagnetic Pulse), or LEMP (for Lightning EMP). HPEM (high power electromagnetic) considers all kinds of high power transients, including IEMI-disturbances (Intentional Electro Magnetic Interference).
- The BRUMIL 230 Surge Protection Device consists of several well-coordinated protection stages, which reliably and effectively protect sensitive electronics against all kinds of HPEM disturbances.
- The BRUMIL 230 EMP Protector RJ45-1000 is threat-level tested against EMP according to **MIL-STD-188-125**, short pulse and intermediate pulse



Applications:

- The BRUMIL 230 is designed to safely protect Ethernet equipment and cabling with data rates of 10/100/1000 Mbit/s and superimposed PoE+ power supply (Power over Ethernet plus) according to IEEE 802.3at against transient over voltages caused by lightning, HEMP or IEMI. A special protection design results in very low residual voltages, which are low enough to protect any commercial of the shelf equipment from damage.
- HEMP-Filters are high-frequency components and shall be installed accordingly for best performance. An installation as feed-through filter directly into a shielding wall results in best protection performance. Over voltages and interference currents will flow to the shielding wall and electronic equipment in the shielded room is well protected.
- Please make sure, that all wires entering a protected volume have to be protected accordingly. This will reliably protect even commercial of the shelf (COTS) electronics of critical infrastructure.

Dimensions:

- Total length: 118mm (without patch cable)
- Diameter: M32x1.5mm thread

BRUMIL 230 – EMP Protector RJ45-1000 PoE+

Max. operating voltage peak signal	±2V	Voltage between wire pairs 1-2, 3-6, wire pair 4-5 and 7-8
Max DC-power transmission	60W	PoE+ supply according to IEEE 802.3at using all 4 wire pairs
Data rate	10/100/1000 Mbit/s	Ethernet, Fast Ethernet Gb/s-Ethernet as per IEEE 802.3
Max. surge current I _{Max}	10 kA *)	Each wire to ground/case, shape 8/20 µs, at least 1 pulse
Max. lightning impulse current I _{imp}	2 kA *)	Each wire to ground/case, shape 10/350 µs, at least 1 pulse
DC resistance input – output	<3 Ohm	Each wire pair
Residual voltage common mode	< 100 V	Pair to ground/case, pulse 4kV/2kA according to IEC61000-4-5
Residual voltage differential mode	< 100 V	Between pair, pulse 4kV /2kA according to IEC61000-4-5
Connection terminals both ends	RJ45 shielded	Use of shielded cables recommended
Case material	Metal	Stainless steel, EMC-Locknuts brass nickel plated
Max. allowed installation torque	20Nm	Not to be exceeded under all circumstances
Dimensions	Ø 32x118mm	2 nuts M32x1.5 for feed-through installation
Weight	Approx. 300g	Incl. 2 EMC-Locknuts

*) Surge current > 2kA (8/20 µs) per wire may damage RJ45 contacts

Datenblätter Mobile

7. Systeme

BRUMIL 110 – Motorized-XXL-Winding-Frame

For long distance applications, the Motorized-XXL-Winding-Frame makes the deployment of tactical FO cables easy. It is a hardened device designed for outdoor, in rough environments as well as for indoor workshops.

Applications:

- Temporary long distance tactical FO-cables between military checkpoints, command posts and head quarters or between control centers, sensors and actors, in harsh environmental conditions
- For tactical fiber optic cable e.g. with military lens connectors.
- For indoor and outdoor use, on a vehicle or in a workshop
- Easy integration and operation

Description:

- The Motorized-XXL-Winding-Frame is specially designed for deployment of very long tactical FO communication lines.
- The Winding-Frame can be mounted on a vehicle e.g. on the back of a truck or off-road-vehicle for the deployment in the field.
- The Motorized-XXL-Winding-Frame is especially designed for the use in harsh environmental conditions.
- There are 230VAC power supply connections to drive the motor directly by an AC mains connection or an additional DC-to-AC-inverter is connected to the onboard 24VDC power of the vehicle to provide the required AC-power to the motor drive.
- The standard configuration includes the following modular components:
 - XXL-Winding-Frame
 - XXL-Reel (e.g. 800mm)
 - XXL-Motor-Drive
 - DC-to-AC-Inverter (24VDC to 230VAC)
- The maximal cable length is 10km (e.g. BRUmil or BRUfield cable 3.8mm)

Technical data:

Power supply:

- AC power: 230 VAC +/- 10% / 50Hz
- DC power: 22 ... 29.5 VDC
- Max. power consumption: 800W
- Typical peak consumption: 400W
- Typical average consumption 150 W (deployment)

Power cords with special ruggedized connectors (IP68)

Connections:

- 24VDC (APP SPEC PakTM High Power Inline Receptacle)
- 230VAC (Binder 693 Series 3P+PE)



Control functions:

- Joystick switch: forwards
- Joystick switch: backwards
- Potentiometer: speed
- Emergency stop button

Environmental conditions:

Operation:	-10 ... +55° C
Storage:	-40 ... +70° C
Humidity:	5 ... 95% relative humidity, non-condensing
Immersion Protection:	IP 65 (standard)

Dimensions:

Width x High x Depth:	1250 x 950x 810mm
Weight Motor-Drive:	approx. 40 kg
Weight Winding-Frame:	approx. 22 kg
Weight XXL-800-reel:	approx. 39 kg

Options:

The Motorized-XXL-Winding-Frame can be customized according to specific requirements and customer's needs, e.g. different size, further accessories, further environmental standards etc.

Extended Temperature range: -25...+60°C

Supported Standards:

- CE
- EN61000-6-1, EN61000-6-2, EN55011
- IP65

BRUMIL 450 – Data- and Power-Distributor

The BRUMIL 450 is for data and power connection. It includes a ruggedized IP65 construction and connectors. The connection to the server is based on a tactical FO-cable (e.g. BRUmil, BRUfield, BRUtouhg...) or an FO-Cu-hybrid-cable (e.g. BRUpowermil or BRUpowerfield)

Data- Power-Distributor

Application:

- Distribution of data and power. (Ethernet 100BaseT and 230VAC)
- Compatible to networking components, like the optical media converter and the remote power supply. Can be adapted to COTS based LAN devices easily.

Construction:

Connection bar:

- 6-8 RJ-45 Ethernet connections
- 2 sockets 230 VAC
- Internal 10/100/1000BaseT switch with 1000BaseFX FO-connection to the server.
- Hybrid connecting cable for data and power
- Over current protection
- LED-indication for data traffic and power presence.
- Receptacle for daisy chaining of more than one BRUMIL450

Hybrid FO+Cu-Connecting Cable BRUpowermil or BRUpowerfield

- 4 fiber optic channels, either single or multimode for FO-Ethernet.
- 2 power conductors (1.6mm² resp. 1.0mm²)
- Connector ruggedized, fully sealed hermaphroditic construction

Special Options (tailor made):

- PoIP for 10/100BaseT
- PoIP for 10/100/1000BaseT
- WAP-Module for wireless extension
- SIP-VoIP-manager (soft PBX on embedded PC).
- Connections for analog telephone to VoIP (e.g. 2 FXS and 2 FXO connections)
- Connections for ISDN telephone to VoIP (e.g. 2 FXS and 2 FXO connections)

Technical Data:

Electrical Power:

- Voltage 230 VAC
- Current FO+Cu-Cable 6A (short term 13 A)

Data at FO+Cu-Connecting Cable:

- 4 Fibers 9/125 single mode, 1310 or 1550 nm
- e.g. 1000BaseLX

Ethernet connections:

- 6-8x RJ-45 10/100/1000BaseT

Temperature range:

- Operation: -40°...+70° C
MIL-STD-810F-501.II
- Storage: -60°...+85° C
MIL-STD-810F-502.I

Environmental Conditions:

- Immersion prot. IP65 closed connector caps or connectors inserted.



Cu-Hybrid-Connector



Hybrid Connector for optical- and power connection

BRUMIL 451 OMC – Optical Media Converter

The Optical Media Converter is a media converter for easy conversion from fiber based to copper based Ethernet and opposite. A hardened device designed for indoor and outdoor applications in rough environments. Two media converters can expand an Ethernet link over long distances

Applications:

- Temporary long distance Ethernet-data-links e.g. between military checkpoints, command posts and headquarters in harsh environmental conditions
- Expanding an Ethernet connection over long distance with tactical fiber optical cable
- For tactical fiber-optic cable e.g. with military lens connectors.
- For indoor and outdoor use
- Easy integration & operation

Description:

- The OMC is equipped to cover FO/electrical-media-converter function for TCP/IP protocols. The function is used to extend the data transmission of an Ethernet channel by fiber optical lines. The OMC is especially designed for the use in harsh environmental conditions. At the front panel there are MIL-grade connectors available to interface with tactical optical-fiber-cable, copper-data-cable and power connections (AC or DC or both).
- The standard configuration includes one HMA compatible optical interface and one electrical MIL-grade-RJ-45-interface (10/100/1000BaseT) for bit rates up to 1 Gb/s, with automatic sensing. Crossed or uncrossed wire cables are detected automatically by the OMC. The FO-interface is fixed to 1Gb/s bit rate
- The maximal cable length at the optical single mode interfaces is 10km (depending on the number of connectors in the line) and 100m at the Cu-data-interfaces

Technical data:

Power supply:
 AC power: 100 ... 240 VAC / 50...60 Hz +/- 10%
 DC power: 12 ... 45 VDC on (optional)
 DC and AC power (one interface for both, DC or AC is automatically selected by the connecting cable type). This is an optional feature.
 Power consumption: approx. 10W
 Power cord with special ruggedized connector

Connections:

Ethernet port RJ-45
 Port with auto-sensing 10/100/1000 BaseT
 Fiber port 1000 Base-LX, single mode, 1310 nm
 Fiber port 1000 Base-FX multi mode 1300 nm (option).
 Expanded beam bulkhead (HMA compatible) with two lenses for two optical fibers.
 A1=Rx; B1=Tx



Textile bag:

The textile bag is containing the media converter box to protect it during transportation and operation against shock and the effects of sun exposure. Side bags are made for grounding tools and adapting cables.

Environmental conditions:

Operation:	-37 ... +49° C
Storage:	-40 ... +85° C
Humidity:	5 ... 95% relative humidity, non-condensing
Immersion Protection:	IP 54 (standard)
Upgradeable up to:	IP 67 (optional)

Dimensions:

Width x High x Depth:	220 x 110 x 210 mm
(AC and DC option)	220 x 110 x 250 mm
Weight:	3.0 kg

Options:

The OMC can be customized according to specific requirements and customer's needs, e.g. for multimode cables or for other fiber-optic connectors. A special version would be possible as repeater with two fiber-optic interfaces and two copper-data interfaces.

and further accessories. A customized textile bag may contain customer specific accessories.

Extended Temperature range: -40...+60°C

Supported Standards:

IEEE 802.3 for 10BaseT
 IEEE 802.3u for 100BaseT(X) and 100BaseFX
 IEEE 802.3ab for 1000BaseT(X)
 IEEE 802.3z for 1000BaseSX/LX/LHX/ZX/EZX
 IEEE 802.3x for Flow Control

BRUMIL 310 Fuel Cell

Fuel cells are alternative power generators and transform chemical energy directly into electrical energy, with no intermediate steps, no moving parts, and with no significant loss in energy. This makes it a particularly independent and efficient source of power. Brugg Cables fuel cells are integrated in especially rugged cases for off-grid and mobile applications. It can be combined with other power sources such as batteries and solar panels.

Application:

The ruggedized BRUMIL 310 Fuel Cells are used in tactical missions to get independent power to supply the communication equipment and other on-board devices such as navigation and night-vision systems wherever you operate. Integrated into tactical vehicles, in communication shelters or in the tents of command posts in the field, BRUMIL 310 Fuel Cells provides without requiring any user intervention, fully automatically, and reliably the necessary power. Regardless of weather and climate conditions the fuel cell operates quietly and generates continuously power for mobile equipment. It can even be used buried underground, non-detectable.

Description:

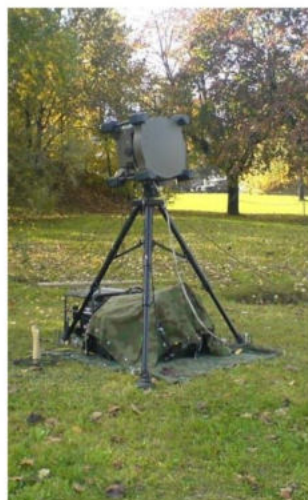
- Reliable power source with long autonomy
- Safe operation
- Lightweight, compact design
- Quiet and Emission-Free – non-detectable

Technical Data:

- Max. Power: 90W, 12V / 24V DC, other
- Temperature Range: -40°C to 50°C
- Altitude: up to 4000 m aSL
- Dimensions: depend on customer requirements and electric capacity (shown example with solar-panel: w/d/h: 825x605x580mm)
- Weight: (shown example with solar-panel: approx. 25kg without fuel tank)
- Autonomy 10L tank: approx. 100h@90W continuous

Options:

- Lightning Protection
- Tracking device
- Remote Monitoring
- Snow Filter



Microwave powered by fuel cell



Example of BRUMIL 310 Fuel Cell with integrated solar panel



Communication vehicle supported by fuel cells

BRUMIL 350 Remote Power Supply AC (for AC in and AC out)

The BRUMIL 350 is transporting power and data through the BRUpowermil cable, a hybrid cable with copper conductors and fibers, to remote equipment over medium to long distances.

The Hybrid Mains and Optical Transmission Unit RPS (Remote Power Supply) feeds remote equipment with signal and power through a single hybrid cable. Application scope includes remote operation and mains supply of transmitter stations and other communication equipment. The RPS minimizes the effort for installations and simplifies the outdoor cabling.

Functionality

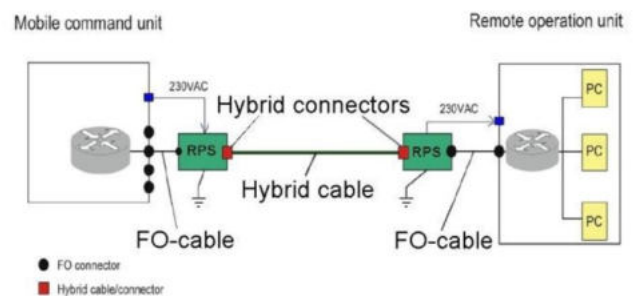
The RPS offers high data rate transmission and mains supply through a single hybrid cable. The hybrid cable comprises a high voltage power transmission cable and four single-mode optical fibers in a compact and lightweight construction. It terminates with a highly integrated, hybrid connector for simple mounting. This significantly reduces cabling complexity and installation time compared to traditional solutions where independent cables have to be installed for mains and data transmission. Furthermore, the RPS allows for replacement of remote power generators leading to improved reliability, reduced maintenance effort, reduced emissions and thus improved target protection. Sophisticated provisions such as electronic transmission monitoring protect the equipment in cases of damage and guarantee safe and reliable operation. Four single-mode fiber connections provide high capacity data transmission channels, suited for setting up general purpose remote data networks, for feeding remote transmitter stations with signal and for remote operation of equipment.

Crucial advantages in the deployment

- High economy owing to smaller initial and operation costs
- Rapid availability of the current supply owing to simplest installation by personnel
- High mobility owing to small dimensions and limited weight (installation of the cable with e.g. back-pack frame or vehicle winding frame)
- Maintenance- and pollution free operation (no fuel supply and noise generation as with generators)
- High security against electrical accidents (all-insulated, CE certified)
- High reliability owing to durable, harsh-environment-suited execution (high mechanical firmness, weather-proof, simple maintenance)
- High working reliability (constantly regulated supply voltage, permanent system monitoring device)



RPS: Identical units at supply side and remote side



Typical RPS configuration: Ad-hoc connection between a mobile command unit ('supply side') and a remote operation unit ('remote side').

Operational Principle:

The one-phase supply voltage (230 VAC) is transformed to the 1'000 VAC level and transmitted with low loss of voltage, via the specially designed hybrid cable **BRUpowermil** of **Brugg Cables**, installed between isolated primary and secondary transformers. Two coaxial copper conductors are for power transmission and the implemented four optical fibers enable simultaneous end-to-end signal transmissions, e.g. fast Ethernet used for telephony, data transfer, video/audio, etc. via different standard interfaces.

BRUMIL 351 Remote Power Supply DC (for AC in and AC or DC out)

The BRUMIL 351 is transporting power and data through the BRUpowermil cable, a hybrid cable with copper conductors and fibers, to remote equipment over medium to long distances.

The BRUMIL 350 Hybrid Mains and Optical Transmission Unit RPS (Remote Power Supply) feeds remote equipment with signal and power through a single hybrid cable. Application scope includes remote operation and mains supply of transmitter stations and other communication equipment. The RPS minimizes the effort for installations and operation and offers a very low volume and low weight solution.

Applications:

Typical RPS configuration: Ad-hoc connection between a mobile command unit ('supply side') and a remote operation unit ('remote side'), as sensors or actors (e.g. remote radar stations, UAV-base stations, remote microwave, or weapon systems)

Functionality

The RPS offers high data rate transmission and mains supply through a single hybrid cable. The hybrid cable comprises a high voltage power transmission cable and four single-mode optical fibers in a compact and lightweight construction. It terminates with a highly integrated, hybrid connector for simple mounting. This significantly reduces cabling complexity and installation time compared to traditional solutions where independent cables have to be installed for mains and data transmission. Furthermore, the RPS allows for replacement of remote power generators leading to improved reliability, reduced maintenance effort and no on site man power during operation, reduced emissions and thus improved target protection. Sophisticated provisions such as electronic transmission monitoring protect the equipment in cases of damage and guarantee safe and reliable operation. Four single-mode fiber connections provide high capacity data transmission channels, suited for setting up general purpose remote data networks, for feeding remote transmitter stations with signal and for remote operation of equipment.

Crucial advantages in the deployment

- High economically solution, due to smaller initial and operation costs
- Rapid availability of the current supply owing to simplest installation by personnel
- High mobility since its small dimensions and limited weight (installation of the cable with e.g. back-pack frame or vehicle winding frame)
- Maintenance- and pollution free operation (no fuel supply and no noise and heat emissions as with generators)
- High security against electrical accidents (all-insulated, CE certified)
- High reliability due to very durable and harsh-environment-suited design (high mechanical firmness, weather-proof, simple maintenance)
- High working reliability (constantly regulated supply voltage, permanent system monitoring device)



RPS-Master-Unit for near end and RPS-Slave-Unit for remote end are of the same size and type of case. Available as field case in protection bag or as 19" rack-mounting version.

Operational Principle:

The one-phase supply voltage (230 VAC) is transformed to the 1'500 VDC level and transmitted with low loss of voltage, via the specially designed hybrid cable **BRUpowermil of Brugg Cables**, installed between isolated primary and secondary transformers. Two coaxial copper conductors are for power transmission and the implemented four optical fibers enable simultaneous end-to-end signal transmissions, e.g. fast Ethernet used for telephony, data transfer, video/audio, etc. via different standard interfaces.

Variants:

Power input	Power output		
230 VAC	230 VAC	24 VDC	48VDC
3x400 VAC	230 VAC	24 VDC	48VDC

Type Identification:

BRUMIL 350 input power/output power
Example: 400V input, 48V output = BRUMIL 350 400/48

Datenblätter Mobile

8. Information

Leistungsgrenzen Hybridkabel

Kabellängen und Leistungen von BRUpowermil und BRUpowerfield bei verschiedenen Betriebsspannungen

	Cable diameter	Cross section	Loop resistance / km			Weight / km		
BRUpowermil	5.8 mm	1.6 mm ²	22 Ohm			69 kg		
Voltage on the hybrid cable	1500 VDC							
Length of the line	500 m	1'000 m	2'000 m	3000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	16'000 W	14'000 W	9'000 W	6'000 W	3'600 W	1'800 W	900 W	450 W
Voltage on the hybrid cable	1000 VAC							
Length of the line	500 m	1'000 m	2'000 m	3000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	8'400 W	6'800 W	4'000 W	2'500 W	1'500 W			
Voltage on the hybrid cable	400 VAC							
Length of the line	500 m	1'000 m	2'000 m	3'000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	2'400 W	1'200 W	600 W	300 W				
Voltage on the hybrid cable	230 VAC							
Length of the line	500 m	1'000 m	2'000 m	3'000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	800 W	400 W	200 W					

	Cable diameter	Cross section	Loop resistance / km			Weight / km		
BRUpowerfield	4.6mm	1.0 mm ²	34 Ohm			36 kg		
Voltage on the hybrid cable	1500 VDC							
Length of the line	500 m	1'000 m	2'000 m	3000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	12'000 W	10'000 W	5'500 W	3'500 W	2'000 W	1'000 W	500 W	350 W
Voltage on the hybrid cable	1000 VAC							
Length of the line	500 m	1'000 m	2'000 m	3000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	7'000 W	5'000 W	2'500 W	1'500 W	1'000 W			
Voltage on the hybrid cable	400 VAC							
Length of the line	500 m	1'000 m	2'000 m	3'000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	1'500 W	750 W	375 W	250 W				
Voltage on the hybrid cable	230 VAC							
Length of the line	500 m	1'000 m	2'000 m	3'000 m	5'000 m	10'000 m	20'000 m	30'000 m
Maximum remote power at the far end	500 W	250 W	125 W					