



ARC FAULT - MINIMIZE DAMAGE



ELECTRICAL COMPONENTS

Every year, arc fault cause severe personal injury, heavy damage to installations and thus high production downtime costs. Even in the most modern switchgear assemblies, the risk of arc fault cannot be completely ruled out. These arc faults can be caused by several things. DEHNshort quickly and reliably quenches arc faults. Thanks to this quick arc fault quenching, only a small portion of the destructive energy is released. With proven arc fault quenching times of less than 2 milliseconds, DEHNshort is one of the quickest protection systems on the market.

DEHN short is sold only through authorized dealers. CUBIC has tested DEHNshort in the modular system and is therefore an exclusive distributor.

Arc fault protection system DEHNshort

Arc faults can be caused by incorrect work on switchgear assemblies, contaminants, foreign objects or ingress of animals in the switchgear assembly. Within a few milliseconds, high amounts of energy are released, generating heat, a pressure wave and toxic gases similar to an explosion.

DEHNshort is a modular arc fault protection system which detects arc faults with the help of current and light sensors. Thanks to its short response time of a few milliseconds, the incident energy is reduced to a minimum. DEHNshort takes protection of persons and systems to another level and by far exceeds the requirements of the currently applicable IEC/TR 61641* standard.

DETECTION

The current transformers at the infeed detect the overcurrent resulting from the arc fault and transmit this information to the relevant detection device. Depending on the application, fibre optic and optoelectronic point sensors are available.

EVALUATION

In the detection devices the sensor signals are converted into digital information and are linked together logically. If all arc fault detection criteria are fulfilled, quenching and disconnection commands are issued. The short-circuiters are immediately activated via fibre optic cables, the shunt releases via relay contacts. LEDs indicate the current status of the system. Since the detection devices are integrated in the assembly door, the system status can also be evaluated if the assembly door is closed.

ARC FAULT QUENCHING

In order to quench the arc fault as quickly as possible, the detecting device activates the relevant short-circuiter. The current commutates from the arc fault to the low-impedance bolted short-circuit of the two short-circuiters and the voltage drops, thus quenching the arc fault. Power thyristors ensure short commutation times which cannot be achieved by previous solutions.

DISCONNECTION

At the same time as the short-circuiters, the detection devices transmit a trip command to the shunt releases of all incoming circuit breakers via floating relay contact and disconnect the part of the switchgear assembly where the arc fault occurred.

RECOMMISSIONING

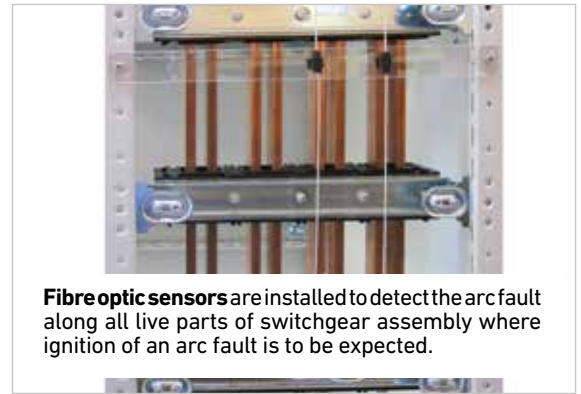
The switchgear assembly can be recommissioned after the fault has been rectified, the short-circuiters have been replaced and the arc fault protection system has been reset.

TESTED IN THE CUBIC MODULAR SYSTEM

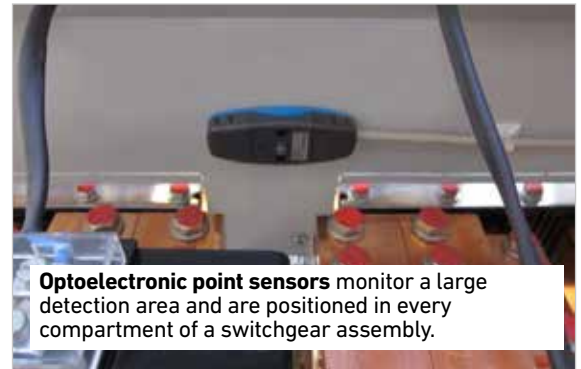
Together with DEHN, CUBIC has successfully tested the DEHNshort system in the modular system. The tests include short circuit tests up to 80 kA acc. to IEC 61439, where DEHNshort should not detect the flash of light that comes when a short-circuit protection device disconnects. The system is also tested by arc faults at 10 and 80 kA, where especially small arcs often can be lengthy and destructive, as the short-circuit protection devices do not necessarily detect such a low current as an error, and consequently does not disconnect.

The modular system was IP54 during the tests and DEHNshorts rapid disconnection means that the degree of protection is not impaired by the arc fault.

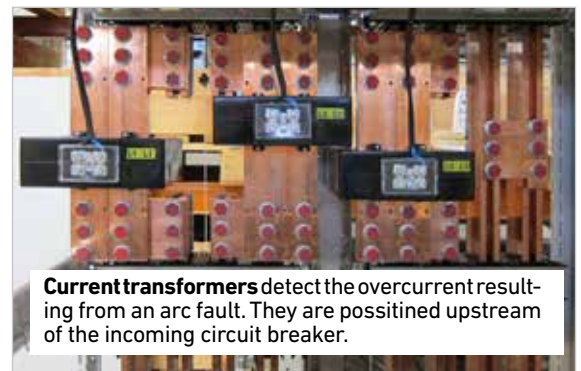
*IEC/TR 61641 Regulates the prerequisites for testing the arc fault resistance of low-voltage switchgear assembly with the aim of ensuring the protection of persons and systems.



Fibre optic sensors are installed to detect the arc fault along all live parts of switchgear assembly where ignition of an arc fault is to be expected.



Optoelectronic point sensors monitor a large detection area and are positioned in every compartment of a switchgear assembly.



Current transformers detect the overcurrent resulting from an arc fault. They are positioned upstream of the incoming circuit breaker.

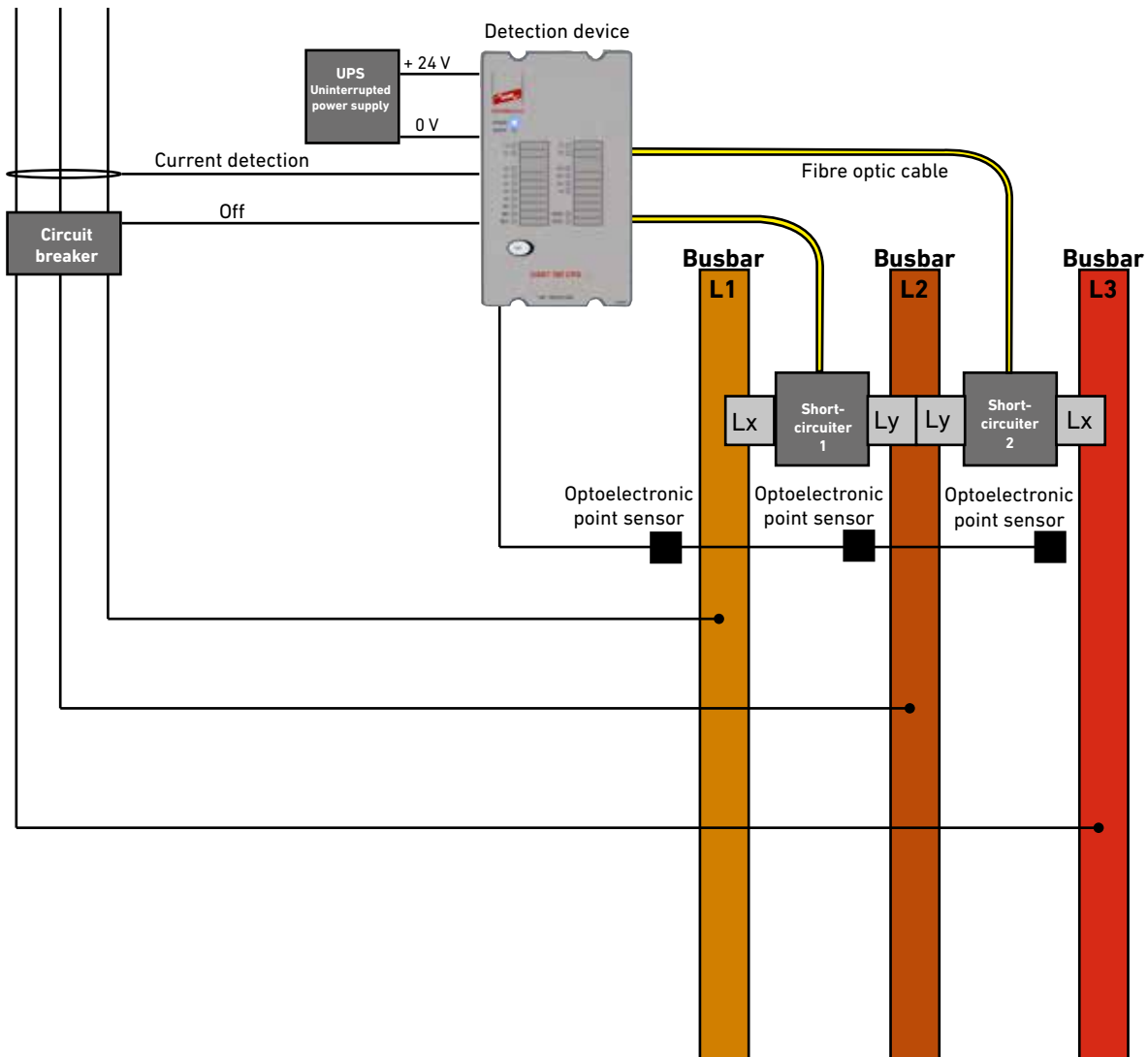


Detection devices are installed at the front of the switchgear assembly and LEDs indicate the current status of the system.



Short-circuiters are preferably positioned in the vicinity of the supply switch.

SUPPLY FROM THE TRANSFORMER



The overcurrent and light emission resulting from an arc fault are detected with the help of current transformers and sensors. The current transformers are situated upstream of the incoming circuit breaker and have to be protection transformers to reliably exclude saturation effects. To detect the light, either optoelectronic of fibre optic sensors are used. The sensor signals are linked logically in the electronic detection devices and immediately activate the short-circuiters and all incoming circuit breakers in arc fault situations. The short-circuit leads to a voltage drop and quenches

the arc fault within a millisecond. The resulting short-circuit current activates the incoming circuit breakers.

If selectivity is insured by time grading, the trip command activates the shunt releases to quickly disconnect the part of the switchgear assembly where the arc fault occurred. The switchgear assembly can be recommissioned after the arc fault has been rectified, the short-circuiters have been replaced and the arc fault protection system has been reset.

Arc faults - Total loss of switchgear assemblies!

Arc faults may result in catastrophic damages to both switchgear assemblies and humans. Besides, there may be operational loss to critical production processes, which at breakdown are forced to downtime.

Arc faults often cause fire. As a fire often occurs at places hard to reach, e.g. on top of wind turbines, it is impossible for the firefighter to put it out, and therefore a complete replacement of the turbine may be necessary.

In the below-mentioned examples of segments the highest possible operational reliability is required, and power failure is therefore unacceptable, just as personal protection is an important factor everywhere.

With CUBIC's protection system DEHNshort the risk of fire and power failure is reduced, and the best possible personal protection is achieved.

DEHNshort arc fault protection

DEHNshort electric arc supervision may be carried out at various solutions:

1. Surveillance of electric arc by means of optoelectronic point sensors and declutching by means of incoming circuit breaker.
2. Surveillance of electric arc by means of fibre optic sensors and declutching by means of incoming circuit breaker.
3. Surveillance of electric arc by means of optoelectronic point sensors, current by means of current transformers and declutching by means of incoming circuit breaker.
4. Surveillance of electric arc by means of fibre optic sensors, current by means of current transformers and declutching by means of incoming circuit breaker.
5. Surveillance of arc fault by means of optoelectronic point sensors, current by means of current transformers and declutching by means of incoming circuit breaker and short-circuiter unit.
6. Surveillance of arc fault by means of fibre optic sensors, current by means of current transformers and declutching by means of incoming circuit breakers and short-circuiter unit.
7. A combination of the above and the opportunity of division into zones and declutching of switches ahead, e.g. high voltage breakers.

The picture shows a current transformer field just before a planned arc fault test. A copper wire to start the arc is mounted.



The picture shows a current transformer field after the arc fault test, where a short-circuiter unit is applied to interrupt the arc fault, and surveillance of the arc fault by means of fibre optic sensors and optoelectronic point sensors.

The copper wire is burned off, but there is no damage to the copper, merely a little soot on the metal surfaces, which should be cleaned.

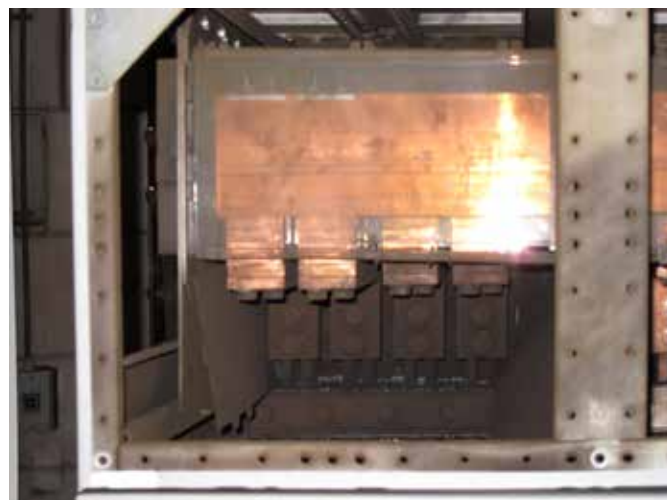


The picture shows a field with FIB covering (Fully Insulated Busbar) in the top of the field.

An arc fault test without DEHNshort is made, the arc fault has moved up inside the panel, but has been stopped by the FIB covering.

The copper under the FIB covering is not sooty, but the rest of the panel is heavily sooted.

In the part of the panel, where the arc fault has started, the copper has been damaged, and should be replaced.



DSRT DD CPS CURRENT AND LIGHT DETECTION DEVICE

- Connection of two short-circuiters
- Connection of four sensor channels (including up to three optoelectronic point sensors each)
- LEDs for status indication
- Four tripping relays
- Bidirectional exchange of sensor signals
- Connection of three current transformers
- One self-monitoring relay



Type	Control voltage	Type No.
DSRT DD CPS BACA	18 - 72 V DC	3804-0020
DSRT DD CPS AACA	80-265 V AC/DC	3804-0021

DSRT DD PS LIGHT DETECTION DEVICE (detection via optoelectronic point sensors)

- Connection of two short-circuiters
- Connection of four sensor channels (including up to three optoelectronic point sensors each)
- LEDs for status indication
- Four tripping relays
- Bidirectional exchange of sensor signals
- One self-monitoring relay



Type	Control voltage	Type No.
DSRT DD PS BACA	18 - 72 V DC	3804-0022
DSRT DD PS AACA	80-265 V AC/DC	3804-0023

DSRT DD FS LIGHT DETECTION DEVICE (detection via fibre optic sensors)

- Connection of three fibre optic sensors
- LEDs for status indication
- Four tripping relays
- Bidirectional exchange of sensor signals
- One self-monitoring relay



Type	Control voltage	Type No.
DSRT DD FS BAAA	18 - 72 V DC	3804-0024
DSRT DD FS AAAA	80-265 V AC/DC	3804-0025

DSRT PS OPTOELECTRONIC POINT SENSOR

- Continuous self-monitoring
- Easy installation
- Monitoring of one compartment
- Max. three sensors per channel in series



Typ	Artikel nr.
DSRT PS	3804-0030

DSRT QD SHORT-CIRCUITER UNIT

- Generation of a two-pole short-circuit
- Short-circuit strength up to 690V AC/100 kA/300 ms
- Compact design
- Activation via fibre optic cables



Type	Type No.	
DSRT QD II	3804-0100	690V AC/100 kA/300 ms

DEHNBLOC MAXI S

- Lightning current arrester



Type	Type No.
DBM 1 255 S	3804-0002

DSRT LWL U FIBRE OPTIC CONVERTER

- Can be used as interface converter between external detection devices and DSRT QD short-circuiter units
- Activation at 24 V DC
- Activation by two short-circuiters via DSRT LWL fibre optic cables



Type	Type No.
DSRT LWL U	3804-0010

DSRT FS FIBRE OPTIC SENSOR

- Continuous self-monitoring
- One sensor per panel and busbar
- Intensive to extraneous light
- Numerous prewired sensor lengths



Type	Type No.
DSRT FS 8	3804-0040
DSRT FS 10	3804-0041
DSRT FS 12	3804-0042
DSRT FS 15	3804-0043

HOLDER FOR FIBER CLIPS

Type	Type No.
2M (S2000)	4702-2002
3M (S2000)	4702-2003
2M (S7000)	4702-7002
3M (S7000)	4702-7003
4M (S7000)	4702-7004



DEHNSHORT FASTENERS CLIPS, D 8MM L 20MM (1 SET=50 PCS.)

Type	Type No.
DSRT FC	3804-0051



DEHNSHORT FOAM D 8MM L 20MM (1 SET = 50 PCS.)

Type	Type No.
DSRT FC	3804-0050



DSRT LWL FIBRE OPTIC CABEL, SET = 2 PCS.

- Connection between detection devices and short-circuiters
- Prewired cable lengths
- Insensitive to EMC interference



Fasteners clips

Type	Type No.
DSRT LWL 0.75	3804-0011
DSRT LWL 2.00	3804-0012
DSRT LWL 4.00	3804-0013
DSRT LWL 8.00	3804-0014

CABLE LIYCY 2X0,75 100M

- Signal wire



Type	Type No.
DSRT FC	3806-0001

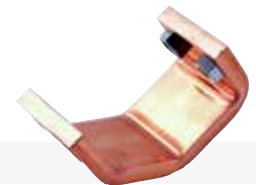
PROTECTION CURRENT TRANSFORMER

Type	Type No.
N50/10 1000/5A 5VA 10P10	3805-0001
LBU 2000/5A 5VA 10P10	3805-0002
H100/30 3000/5A 5VA 10P10	3805-0003
A180R 4000/5A, 5VA 10P10	3805-0004



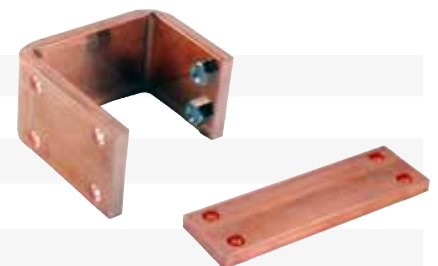
CONNECTIONS FROM S2000 (2-10xXX) TO SHORT-CIRCUIT UNIT

Type	Type No.
DEHNshort connection, single S2000. L1, L2 & L3, QD I	0879-0100
DEHNshort connection, single S2000. L1, L2 & L3, QD II	0879-1000



CONNECTIONS FROM DOUBLE S2000 (2//2-10xXX) TO SHORT-CIRCUIT UNIT

Type	Type No.
DEHNshort connection, double S2000. L1, L2 & L3, QD I	0879-0200
DEHNshort connection, double S2000. shared, QD I	0879-0201
DEHNshort connection, double S2000. L1, & L3, QD II	0879-2000
DEHNshort connection, double S2000. L2, QD II	0879-2200
DEHNshort connection, double S2000. shared, QD II	0879-2100

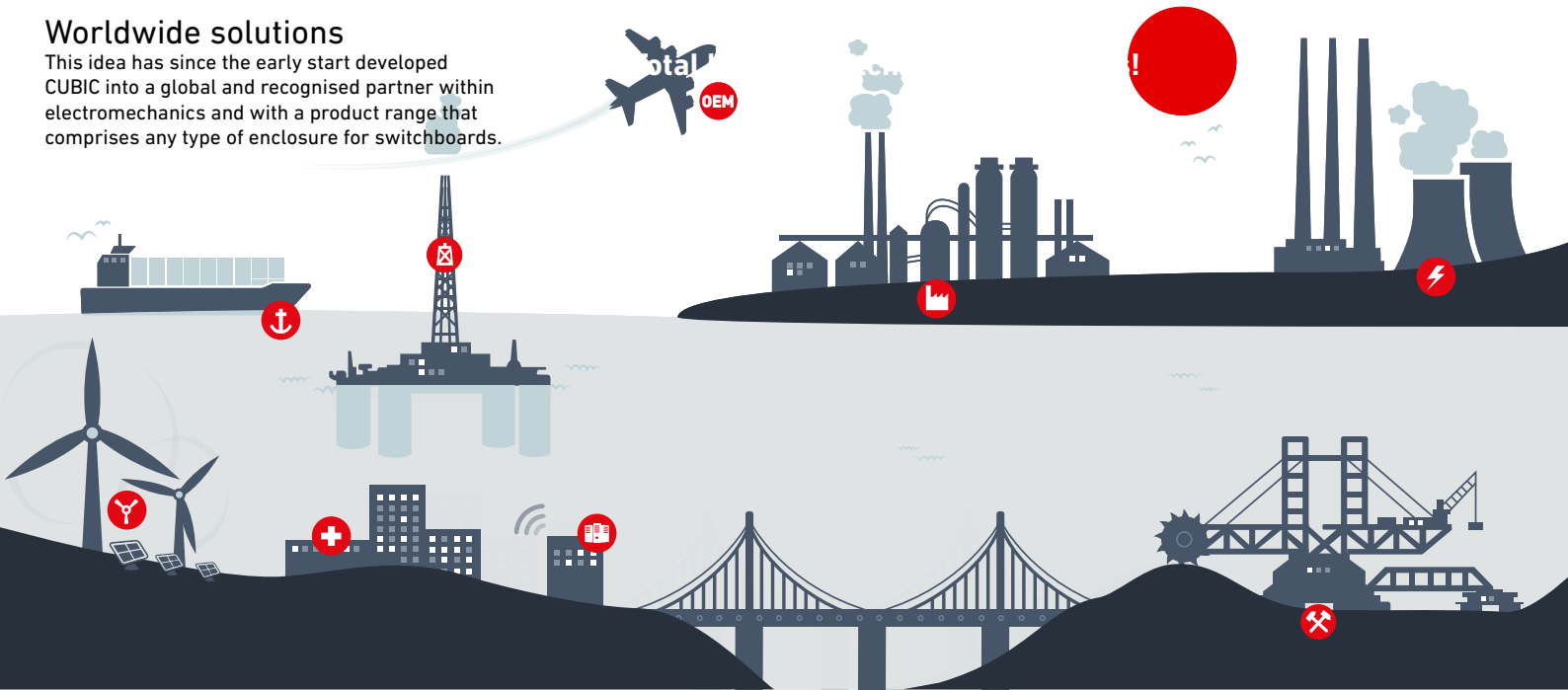


CONNECTION FROM QUADRUPLE S2000 (4//2-10xXX) TO SHORT-CIRCUIT UNIT

Type	Type No.
DEHNshort connection, quadruple S2000. L1, L2 & L3, QD II	0879-3000
DEHNshort connection, quadruple S2000. shared, QD II	0879-3100

Worldwide solutions

This idea has since the early start developed CUBIC into a global and recognised partner within electromechanics and with a product range that comprises any type of enclosure for switchboards.



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