

Arc Detection System



The arc detection system LBW is equipped with light-sensitive sensors which immediately detect the occurrence of internal arcs. This means that the effective duration of the arc is considerably shortened and the gas discharge from the switch unit is appropriately reduced.



Maximum possible staff protection due to fast disconnection after max. 1 ms reduces the load on the switchgear, decreases the gas discharge and minimises injuries.



Applications in:

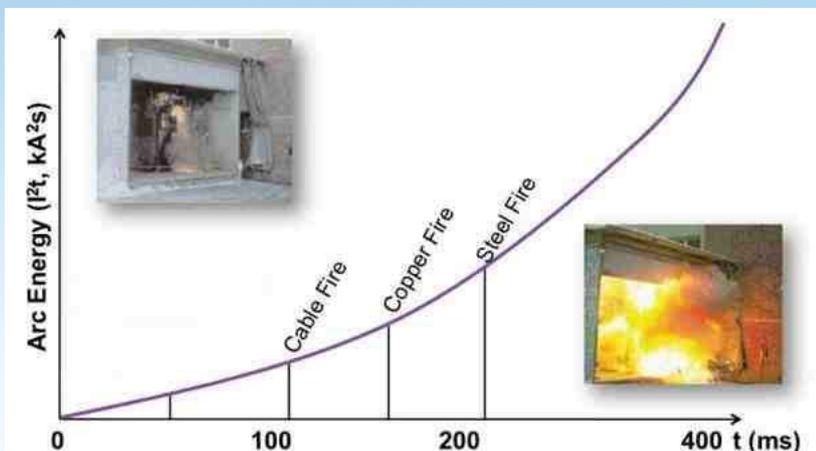
- medium voltage switch gears
- prevention of arcs in mining
- arc flash protection in wind turbines
- power stations and national power grids
- protection against injuries



LBW81



LBW21



LBW 81 Functionality

The solution for large systems covering up to:

Inputs: 28 optical sensor + 7 current + 1 voltage inputs

Outputs: 5 relay + 8 MOSFET + 4 optical outputs – all freely programmable

Very short tripping time, even <1 ms

- Fast MOSFET-outputs with varistor surge protection
- Fixed cycle time 0,5 ms
- Total Fault Clearing time depends on primary side switching device

Communication

- TCP/IP (Ethernet) communication
- Modbus TCP/IP or IEC61850 with Goose commands
- Fast Disturbance Recorder sample time of 2000 Hz (0,5 ms)
- Event log included. It can also be read by a web server

Touch screen colour display with screen saver

- Multi-languages (Unicode) with versatile set of fonts/languages
- Operator-safe read-only front display
- All necessary information shown automatically
- Simple control logic for the display

Wide range of time and current settings

- Current input: 5 A 1 A and 2 A possible

Includes optional multi-functional protection relay features.

Fully optical cables and sensors

- Safe technology does not conduct arc plasma (HV) into the relay
- If the arc destroys the optical cable, operation is still guaranteed
- Sensors can be installed into the HV live parts taking into account the adequate creepage distance

Adjustable light sensitivity for each light input (1-50 kLUX)

- Easy to install and retrofit
- Either DIN rail or door mounting
- Removable front panel frame

Power supply 24 - 48VDC (18-72VDC) with PoE or external power supply

- Redundant power supply is possible with PoE

Programming with MS Excel matrix

- Microsoft Excel file => No need for separate configuration programs
- No special training required
- All features are visible and printable
- Free user programmable names for messages events, alarms etc.



LBW 21 Functionality

Reliable, economical and easy to install arc protection system with 4 optical sensor inputs - 1 relay output

- Compact unit - arc fault detection
- Fast arc fault detection within 5ms
- Easy retrofit into existing switchgears and systems
- No configuration necessary - plug & play installation

- Easy installed without changes to the existing layout
- Flexible sensor configuration for any application
- Self-supervision of sensors and protection unit



Functionality overview

		Inputs				Outputs			
ARC	Multifunction	Optical	Analogue		Digital	MOSFET	Relay	Optical	
			Current	Voltage					
IEC61850-protocol									
LBW81-11	LBW81-31	12	4	1	6	2	1	4	
LBW81-12	LBW81-32	28	4	1	6	2	1	4	
LBW81-13	LBW81-33	28	7	1	6	8	5	4	
LBW81-14	LBW81-34	28	4	1	18	8	5	4	
ModBus TCP/IP-protocol									
LBW81-21	LBW81-41	12	4	1	6	2	1	4	
LBW81-22	LBW81-42	28	4	1	6	2	1	4	
LBW81-23	LBW81-43	28	7	1	6	8	5	4	
LBW81-24	LBW81-44	28	4	1	18	8	5	4	
LBW21		4					1		
LBW81 Arc Protection Relay (ARC): Standard relay features - LBW81-1x / LBW81-2x									
3I> & \mathcal{U}	51/AFD	Arc Protection, Light or Light and Current (Voltage also possible) L1-L6 and/or U/O							
U0>, U0>>	59 N	1-phase Overvoltage protection							
LBW81 Arc Protection Relay with Multifunctional Protection Relay features (Multifunction (MF)) - LBW81-3x/LBW81-4x									
3I> & \mathcal{U}	51/AFD	Arc Protection, Light or Light and Current (Voltage also possible) L1-L6 and/or U/O							
3I>, 3I>>, 3I>>>	50	3-phase Overcurrent relays, with constant-time					L1, L2, L3		
3I>, 3I>>, 3I>>>	50	3-phase Overcurrent relays, with constant-time					L4, L5, L6		(Only LBW81-33, -43)
3lth>	49	3-phase Thermal Overload/Current					L1, L2, L3		
3lth>	49	3-phase Thermal Overload/Current					L4, L5, L6		(Only LBW81-33, -43)
3lka>	51	3-phase Overcurrent relay with inverse-time (IEC60255-3)					L1, L2, L3		
3lka>	51	3-phase Overcurrent relay with inverse-time (IEC60255-3)					L4, L5, L6		(Only LBW81-33, -43)
3I0>, 3I0>>	50N	3-phase Earth-fault relay with constant time					L1, L2, L3		
3I0>, 3I0>>	50N	3-phase Earth-fault relay with constant time					L4, L5, L6		(Only LBW81-33, -43)
10φ>, 10φ>>	67N	Directional and Undirectional Sensitive Earth Fault function							
U0>, U0>>	59N	1-phase Overvoltage protection							
U0<, U0<<	27	1-phase Undervoltage protection							

ARC DETECTION SYSTEM FOR LV & MV SWITCHGEARS

What is an Arc fault & how will it form?

Arcing fault is short circuit via ionized gas (air) between one live part and ground or between live parts. High power arc-flash faults can be characterized as electrical explosions. They release large amounts of energy in the form of radiant heat, intense light, and high pressure waves. The temperature of the plasma can reach 20,000 K. The increase of the temperature expands the volume of the air causing a pressure wave. Because of the high temperature, circuit components can change physical state from solid to vapor. E.g. copper expands by a factor of 67,000 in vaporizing, which significantly increases the pressure. In addition to danger caused by radiation, heat and pressure wave, there may be shrapnel and toxic gases, causing additional personal hazard.

Why is the arc detection system necessary?

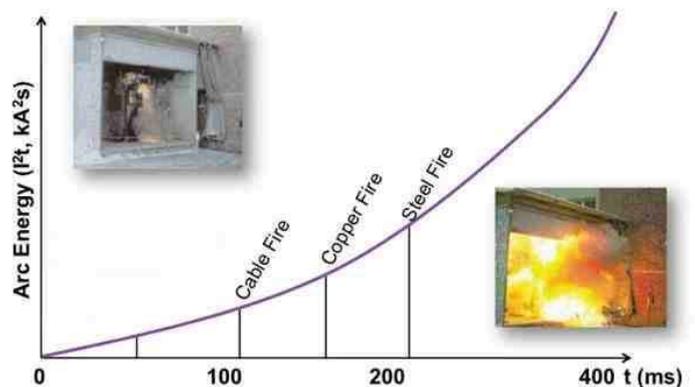
Majority of arc-flash faults in switchgear is caused by human errors. Entering into a live panel or field, careless use of tools or leaving temporary earth connected are common operating errors. Typical causes of arcing faults are loose connections, insufficient mechanical dimensioning, equipment malfunction, contamination or degradation of insulation, dust and animals. Arcing faults cause both personnel hazard and significant economic losses due to damage to equipment and interruption of processes. To reduce this arc hazards Arc Detection is necessary.

What is an Arc detection system?

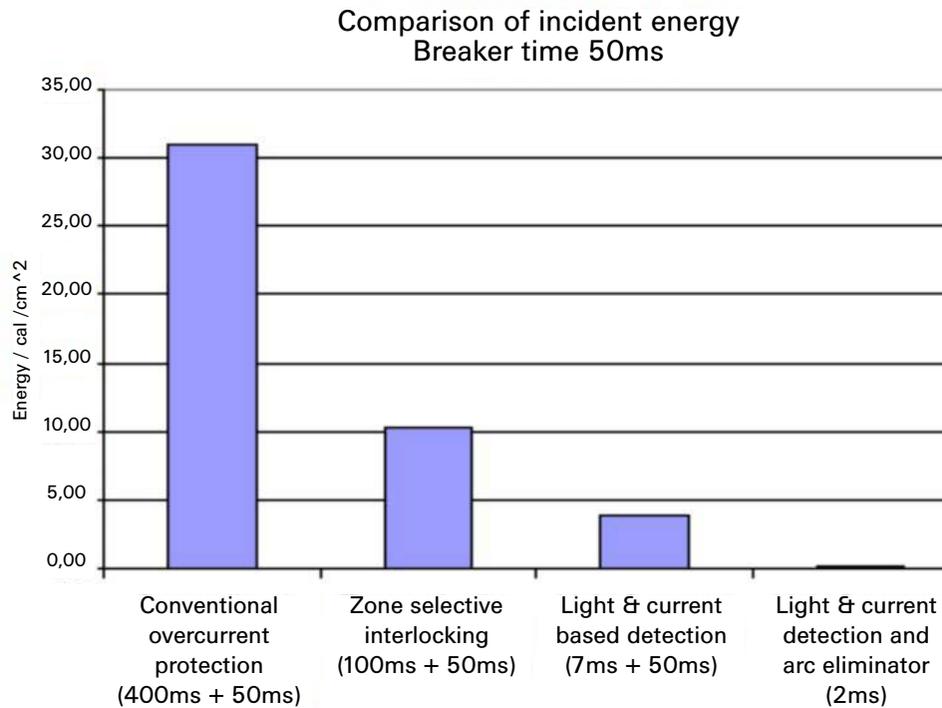
The arc detection system detects an arc fault in the electrical network (LV & MV switchboard) & gives trip command to open the breaker, it will reduce the collateral damages for switchgear & personal hazard.



1. Sensor in outgoing cable compartment
2. Sensor in busbar compartment
3. Sensor in circuit-breaker compartment
4. Arc detector fitted in relay cabinet



Comparison of incident energy of different protection methods



A rule of thumb is that fault has to be cleared at 50-100 msec at the latest. Below is the result of an 50kA arc test. Left with conventional overcurrent protection (500ms) right with Light & Current based protection (50ms).



Test result with 500ms arcing time



Test result with light and current based detection

According to comparison of incident energy of different protection methods & test results, optical sensor (Light & Current) based arc flash protection is clearing the fault in less time.

Examples for Sensor Placement

