

Smart outdoor load disconnecter Fla 15/6400 AE

three-pole design
rated voltage 25 kV
rated current 630 A



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ISO 9001
ISO 14001
BUREAU VERITAS
Certification



Smart-type outdoor design Fla 15/6400 AE load disconnectors

The Fla 15/6400 AE outdoor load disconnectors for vertical mounting render it possible to minimize the power outage and the subsequent damages caused by the interruption of power supply in electric power networks. These switching devices are the continuation of the well-proven Fla 15/6410 SA load disconnectors that since many years can be found in outdoor MV power lines where they excel thanks to their high reliability and operational safety. The Fla 15/6400 AE load disconnectors are equipped with energy charging drive mechanism and an electronic system which provides for tripping of the load disconnector during the no-voltage period which follows after unsuccessful repeated closing. In such a way the defective part of the power line gets disconnected and the subsequent repeated closing activates only the non-defective part of the line. This significantly reduces the duration of failure on the sound parts of the power line. The activation of the electronic system and the automatic tripping can be announced via the GSM network, in form of an SMS message or by a direct call on specified phone numbers.

Load disconnectors satisfy standards EN 62271-1 and EN 62271-103. Used insulators satisfy the fourth grade of contamination area.

The easy and rugged design of the load disconnectors has proven oneself excellently in various climates.

The basic welded frame is made of open steel profiles that guarantee perfect surface protection from corrosion caused by heat zinc coating that can

The construction of the load disconnectors, the quality level of material used and care exercised in the production process, which is governed by the principles of the ISO 9001:2000 standard, is a guarantee for low operation and maintenance costs in the future.

Under normal operating conditions it is not necessary for the load disconnectors to undergo a preventive maintenance during the period of twenty years. The electronic modules guaranteed to be maintenance free for 4-years long period.

be controlled on all places. Heat zinc coating protects the shafts of the load disconnectors mounted in bronze bearings as well as all other steel components.

The switching takes place in proven and tightly closed arc quenching chamber filled with Shell transformer. Each arc quenching chamber contains about 0.5 l of oil.

With regard to this fact, Fla type load disconnectors meet the extreme environmental requirements.

All current conduction components are made of silver plated electrolytical copper and constitute a loop less current conduction path.

The cross-section of the conductors on the current conduction path is sufficiently dimensioned. Appropriate contact pressures of the stainless steel springs ensure optimum prerequisites for faultless switching even after many years of the load disconnector operation under extreme operating conditions as well as under rime.

The load disconnectors are delivered with insulators made of a cycloaliphatic resin.

The load disconnectors can be provided with encased auxiliary switches (IP 44 protection) installed directly on the frame of the device ensuring thus reliable switching-on and switching-off signalling.

The values of the short-circuit resistance are kept so as to ensure an adequately large reserve.

Technical data

Rated voltage	U_r	kV	25
rated current	I_r	A	630
rated short-time current	I_k	kA	20
rated peak withstand current	I_p	kA	50
rated making current	I_{ma}	kA ¹⁾	10
rated breaking current – $\cos \phi 0,7$	I_{load}	A	630
rated breaking current of closed loop	I_{loop}	A	400
rated breaking current off unloaded transformer	I_{nitr}	A	53
rated breaking current when switching - off unloaded cables	I_{cc}	A	20
rated breaking current of the earth fault	I_{ef1}	A	56

¹⁾ At a sufficiently quick hand control.

Withstand voltages

rated short-time withstand power frequency voltage / 1min. to be applied in both dry and wet environmental conditions

against the earth, across the poles and between disconnected contacts	kV	50
across the isolating distance	kV	60

rated lightning pulse withstand voltage

against the earth, across the poles and between disconnected contacts	kV	125
across the isolating distance	kV	145

Climatic conditions

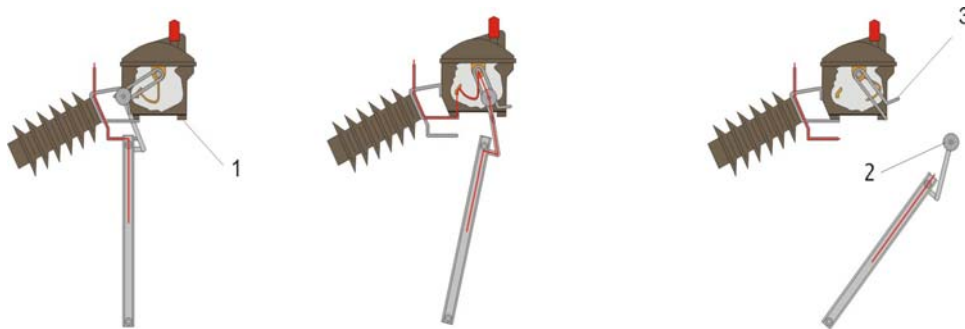
highest temperature	°C	+ 40
lowest temperature	°C	- 30
highest relative humidity	%	100
highest wind pressure	Pa (m/s)	700 (34)
admissible hoar frost	mm	6
typical altitude	m a. s.	up to 1000

Usages in higher altitudes please consult with producer.

Function description

Tried and tested oil extinguishing chambers, parallelly connected to the main circuit, are provided with a quick-action switching mechanism. The extinguishing chambers are of an adequately sturdy

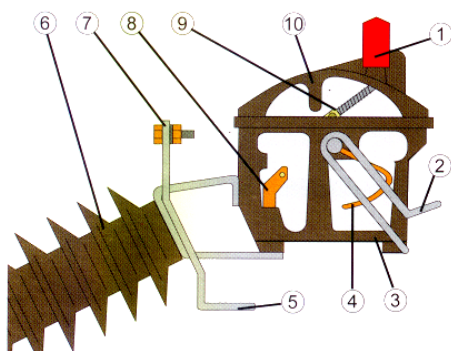
structure ensuring that their tightness remains undamaged even under extreme service conditions. Each extinguishing chamber is filled with a quantity of about 0,5 l of Shell Diala D or Shell Fluid 4600 oil.



The above drawings show the current flow during switching in switched-on position, intermediate position and switched-off position of the disconnector. The contact arm mounted on the pendulum bearing is provided, on its end, with two rollers (2) their concave sides being inwards oriented. The extinguishing chamber (1) is controlled by the stainless-steel forked contact (3). When controlling the switch, the roller both during switching-on and switching-off positively entrains

the fork. The snap-action mechanism connected with the said fork acts on the contact system inside the chamber and closes or opens immediately the contacts of the extinguishing chamber independently on the speed of the hand control. When switching-off, first of all the main contacts are opened and only after having achieved the safety switching-off distance the contact system inside the extinguishing chamber is opened by the snap-action mechanism.

Sectional view of the extinguishing chamber



1. closure of the filling opening with the gauge and the air release valve
2. control lever (made of stainless steel)
3. bottom part of the extinguishing chamber (sectional view)
4. contact rod
5. main contact
6. supporting insulator
7. connecting clamp with a screw
8. auxiliary contact
9. snap-action mechanism
10. upper part of the extinguishing chamber (sectional view)

Manipulation of the Fla 15/6400 AE load disconnectors

The energy charging mechanism is designed in a way that control forces, exercised by this mechanism during normal operating manipulations without the use of automatic system, are identical with those necessary to control the switch without automatics. If automatic tripping of the load disconnector occurs, the hand operated drive lever remains in the closed switching position. If we put the drive handle into opened switching position, the

energy necessary for further automatic tripping starts to be charged and in such a way prepares the load disconnector for another automatic tripping.

The tripping period for automatic tripping depends on the load disconnector temperature and moves within the range of 2 to 6 seconds, for temperatures of +40°C to -35°C, respectively.

Function of the electronic modules of the Fla 15/6400 AE load disconnectors

When the current flowing through the MV conductor exceeds the set up current value, the activation of the sensor of repeated closing takes place. From that moment on the sensor expects the arrival of another short-circuit impulse, which should take place within a time interval of 0.3 to 3 seconds following the first one. If this second short-circuit impulse does not arrive, the sensor will reset itself (be brought into its original state) after 3 seconds. If during this interval the second short-circuit impulse does arrive (i.e. in case of unsuccessful repeated closing), a coder will be activated and a digital command issued by a transmitter is sent during a subsequent period of 0.9 to 1.5 sec. to a receiver. After decoding this command a power impulse is sent out that brings the servomechanism in motion.

The sending of the tripping command is conditional on the error state, which has to persist. If during the waiting time for the second short-circuit impulse the defect-free state resumes, which can be evidenced on a flow of current of less than the short-circuit value set up (up to 325 A), the sensor will be

immediately reset and the tripping command will not be issued.

The sensor of repeated closing is active only after the passage of the short-circuit current. At normal current flowing through the MV conductor the sensor internal circuits are voltage-free. This fact increases the reliability of the functioning.

The command information is coded as a 12-bit address, which provides for high resistance of this radio path to interferences and tampering.

On request the system can be equipped with GSM module, capable of sending information about the load disconnector switching state as an SMS message or dialling a phone number. In such a way the operator is informed about electronically activated tripping of the load disconnector. The electronic module can be installed at later times as a part of the system retrofit.

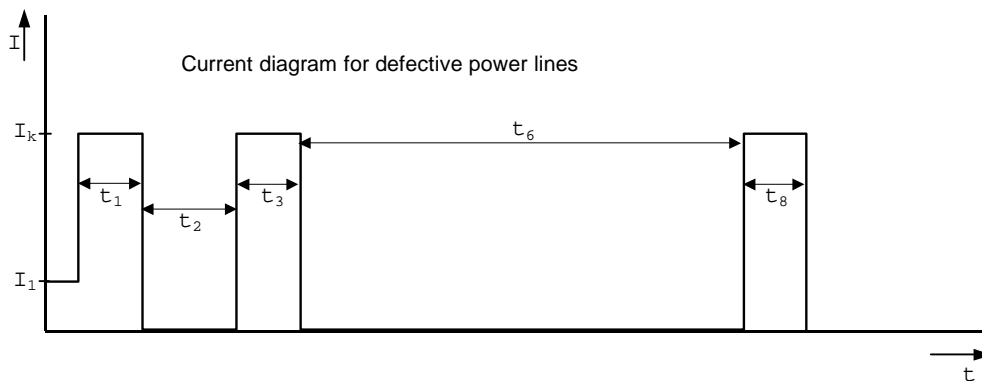
Because of using high quality industrial alkali (iron) cells and due to a highly limited current consumption the replacement of the battery is to take place as late as after 4 years.

The Z6a sensor	
Line diameter, at the highest	21 mm
Accuracy of short-circuit current measurement	325 A \pm 7% (300 – 350 A)
Temperature dependence	\pm 0.1 A / K
Highest permanent load	250 A
Short-time overloading	20 kA / 1 s
Operating temperature range	-30 - +65 °C
Power supply	by current flowing through the MV conductor
Duration of the short-circuit current impulse	t_1 80 – 300 ms
Period of the occurrence of first repeated closing	t_2 0.3 – 3 s
Period of command transmission after the first repeated closing	t_v 0.9 – 1.5 s
Blocking of command transmission by steady current flow	I_o 10 A
Dimensions/weight	110x55x120 mm / 0.5 kg
Protection degree	IP 65
Address protected by	12-bit code
Radius of reach	10 m, at least
The R6a receiver	
Receiver power supply	6.0 V/0.8 mA (3.8 to 6.5 V)
Operation period until the powering battery replacement	4 years
Servomechanism power supply	15 V
Impulse for servomechanism	0.5 s / approx. 3 A Q=1.5 As
Number of tripping operations powered by the cell	500
Operating temperature range	-30°C to +65 °C
Dimensions/ weight	70x50x25 mm / 0.15 kg
Protection degree	IP 54

If another engineering parameters are required, contact the manufacturer.

Standard time characteristics

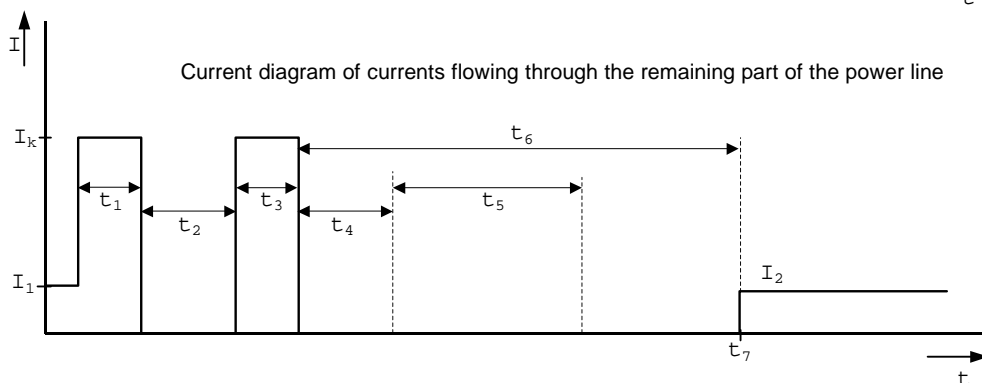
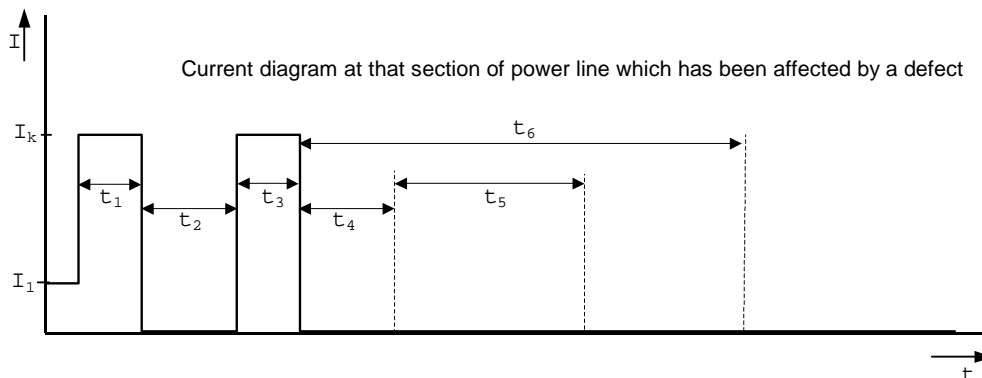
Power line without a built-in Fla 15/6400 AE load disconnector



Note: I_1 current value prior the failure
 I_k short-circuit current

Typical values: $t_1 = 80 - 300$ ms first short-circuit impulse
 $t_2 = 0.3 - 3$ s non-voltage period until the arrival of the first repeated closing
 $t_3 = 80 - 300$ ms second short-circuit impulse – unsuccessful first repeated closing
 $t_6 = 20$ s - 3 min non-voltage period until the arrival of the second repeated closing
 $t_8 = 80 - 300$ ms third short-circuit impulse – unsuccessful second repeated closing. Now the whole power line shall be disconnected until the identification or remedy of the failure

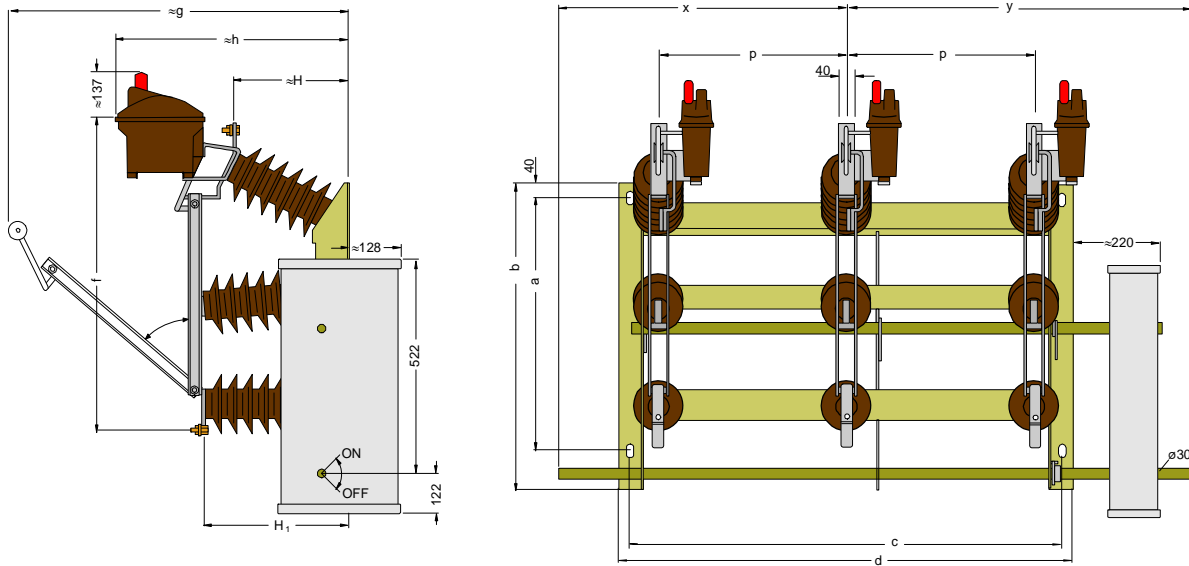
Power line with built-in Fla 15/6400 AE load disconnector



Note: I_1 current value prior the failure
 I_2 current value after renewed power delivery
 I_k short-circuit current

Typical values: $t_1 = 80 - 300$ ms the first short-circuit impulse
 $t_2 = 0.3 - 3$ s non-voltage period until the first repeated closing
 $t_3 = 80 - 300$ ms second short-circuit impulse – unsuccessful first repeated closing
 $t_4 = 0.9 - 1.5$ s period until the transmission of the tripping command
 $t_5 = 2 - 6$ s own tripping time of the load disconnector
 $t_6 = 20$ s - 3 min. non-voltage period until the second repeated closing
 t_7 time moment of power resumption to the not affected section of power line

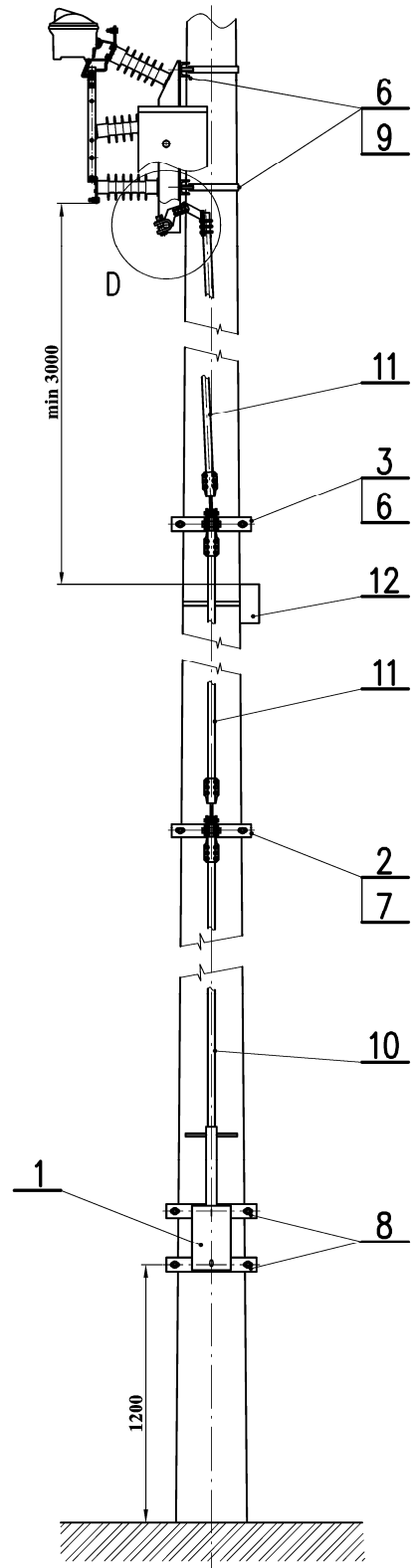
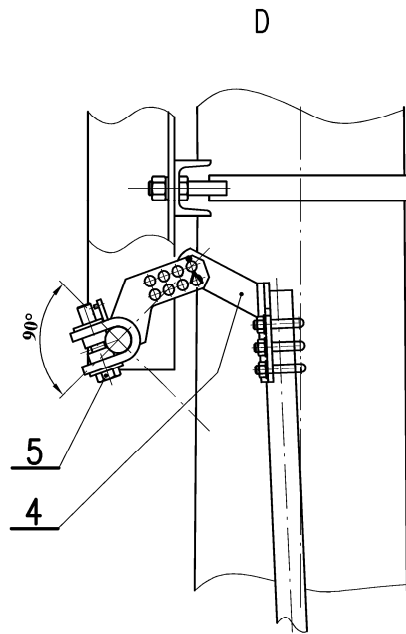
Three-pole outdoor load disconnectors Fla 15/6400 AE



Rated voltage kV	Rated current A	a	b	c	d	f	≈ g	≈ h	≈ H	H ₁	p	x	y	Weight approx kg
25	630	550	800	1150	1210	793	905	620	311	392	500	800	915	125

On request the load disconnectors may be completed with: auxiliary switches.

Arrangement of actuator



- 1 Manual, case-type drive mechanism
- 2 Inter-bearing
- 3 Inter-bearing with joint sleeve
- 4 Clamping terminal
- 5 Cut-in lever
- 6 R130 sleeve
- 7 R155 sleeve
- 8 R178 sleeve
- 9 Console
- 10 Pipe 1" 2000 Z
- 11 Pipe 1" 2500
- 12 Box of the E6a radio receiver