

## INTRODUCTION

The Power Systems 44 kV MiniSub™ is the most compact system at this voltage available. Utilizing a deadfront termination and lightning arrester setup, it eliminates the line top or side style arrangements which have been previously available.

Dead front design means less maintenance.

The high voltage compartment does not require constant cleaning and is not affected by harsh environments.

Deadfront means no exposed live parts; this provides a higher degree of safety. Lower risk of arc flash – phase to phase or phase to ground.

The plug-in connection on the cables and lightning arrestors, allows for easy installation and replacement.

The 44kV MiniSub™ system is rated 600A, 1500MVA, 250 kV BIL.

Because it is a MiniSub™, it can be available with all features on the low voltage side as our previous units

- Main breakers
- Custom and Utility Metering
- Secondary distribution
- SCADA

And more. See our regular brochure for more info or visit: <http://www.powersystems.ca/>



## CABLE TERMINATION SYSTEM

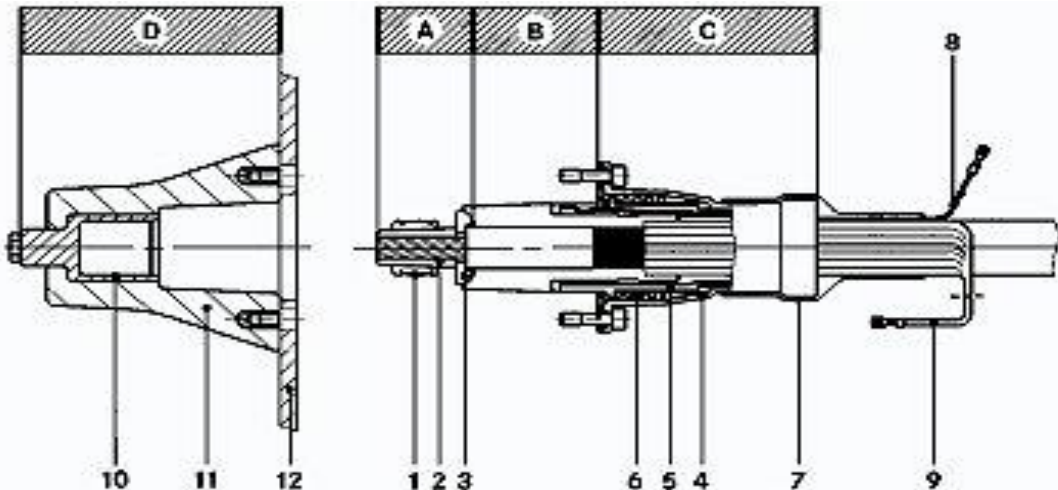
The cable termination systems include separable connectors and bushings in sizes 0, 1, 2 and 3. The separable connector is plugged into the bushing and bolted mechanically. The system must be de-energized when inserting or removing the connectors. The absence of voltage may be tested on the capacitive voltage tap integrated into the separable connector.

Special features of the cable termination *system*:

- metal-enclosed
  - fully-insulated W touch proof
  - free from arcing
  - high short-circuit protection
  - maintenance-free
  - fully submersible
  - for outdoor use
  - dirt proof
  - IP 66
  - up to 11 kV E Exe
- The contact parts are designed for stranded circular aluminum or copper conductors to DIN VDE 0295.
  - Separable connectors for stranded sector-shaped, solid sector-shaped or solid circular conductors are available upon request.
  - The insulating and field-controlling part is designed to fit all PVC- insulated cables.
  - Separable connectors can be installed on different types of plastic cables. To enable us to adjust the components to your specific requirements, kindly complete the "Form to determine Separable Connectors"



<p style="text-align: center;"><b><u>D Bushing</u></b></p> <p>10. female contact part 11. insulating bushing 12. housing</p>	<p style="text-align: center;"><b><u>A Contact System</u></b></p> <p>1. contact ring 2. tension cone 3. thrust piece</p>	<p style="text-align: center;"><b><u>B Insulating and field-controlling part</u></b></p>	<p style="text-align: center;"><b><u>C Housing</u></b></p> <p>4. bell flange 5. pressure sleeve 6. pressure spring 7. heat-shrink tubing 8. test lead 9. cable screen</p>



## Separable Connectors Size 0-3

### Technical data

Test Specification to DIN VDE 0278 Part 6 High-Current-Proof Design II Cable DIN VDE 0278 Part 629-1 test series D, Tab. 7 20,8 / 36 / 42 kV		Termination System type test, according to IEC 60 840 / 02.99 26 / 45 / 52 kV Size 3/S
Nominal current	IN (A)	1250
Max. operating voltage	UM (kV)	52
Rated power frequency withstand voltage	50 Hz/1 min (kV)	95
Rated lightning impulse withstand voltage (BIL)	1,2/50 $\mu$ s (kV)	250
Partial discharge	2 x U <sub>0</sub> (pC)	$\leq$ 10
D.C. voltage test	15 min 6 x U <sub>0</sub> (kV)	156
Rated short-time withstand current	0,5 sec (kA)	63
	1 sec (kA)	50
Rated impulse current	(kA)	150
Weight	ca. kg approx.kg	9,4

## Size classification list of Cable Connectors

Size	max. conductor diameter	max. cross section	min. $\phi$ over insulation	max. diameter over insulation	remarks
3	32,6 mm	630	31,6	47,1 mm	with voltage tap
3	32,6 mm	630	31,6	50,6 mm	without voltage tap



### Specifications

The Standards for surge arresters (DIN VDE 0675, Part 4/05.94 and IEC 99-4) are applicable to these devices. The dimensions of the plug-in termination system comply with EN 50180/EN 50181.

**Design** The live part consists of metal oxide resistors without spark gap. The resistors possess a high thermal stability ensured by suitable dimensioning. These live parts are enclosed by a silicone rubber jacket that provides insulation against the metal housing.

The corrosion-resistant aluminum housing renders the surge arrester intrinsically safe and thus assures optimal safety for operating personnel.

The metal housing provides a hermetic sealing of the live parts against environmental influences, such as moisture or pollution. The plug-in connector is designed to fit the inside cone plug-in termination system acc.

EN 50180/EN 50181. It is available in sizes 1, 2 and 3. The cable termination is attached via flange and is thus in conformity with the installation. The arrester is equipped with a corrosion-resistant fracture membrane that opens the arrester in case of an internal fault and allows for a defined axial pressure relief on the bottom of the arrester without any damage to the plug-in system.

## Lightning Arrestors

### Scope of Application

Surge arresters are used for the protection of metal-enclosed switchgear and transformers equipped with plug-in type bushings acc. EN 50180/EN 50181. The separable surge arrester is installed on the switchgear/transformer to prevent the intake of unduly high over-voltages. The surge arrester limits particularly those over-voltages that are produced by the reflection of traveling waves. When using these surge arresters for switchgear/transformers connected to the transmission line via a cable route, it is necessary to protect the transition between the cable and the transmission line with suitable arresters.

The capacity of protection is specially coordinated with the switchgear's resistance to surge voltages, considering at the same time the space arrangement and the level of electrical protection.

For distribution systems based on metal oxide resistors with plug-in type bushing size 1, 2 and 3 for rated voltages from 6 to 52 kV nominal discharge current 10 kA high-current impulse withstand 65 kA line discharge class 1 acc. DIN VDE 0675 part 4 and IEC 99-4, suitable for inside-cone termination system acc. EN 50180/ EN 50181



### Selection of the Rated Voltage

#### Selection Parameters

The selection of the rated voltage depends on the maximum operating voltage of the system as well as on the type of neutral point. The selection is done in accordance with the following table, for example:

$U_m = 24$  kV maximum permissible operating voltage of the installation (GIS/transformer).

Type of neutral point: insulated. According to the table below, the rated voltage of the arrester to be selected is

$U_r = 30$  kV.

Max. Operating Voltage $U_m$ (kV)	Rated Voltage, Insulated or Compensated		Rated Voltage, Solidly Earthed System (earth fault factor up to	
	$U_r$ (kV)	$U_c$ (kV)	$U_r$ (kV)	$U_c$ (kV)
7,2	9	7,2	7,2	6
12	15	12	12	9,5
14,5	9	15	15	12
17,5	22	17,5	18	14
24	30	24	24	19
36	45	36	36	29
42	52	42	42	33

With compensated or insulated systems, the continuous voltage  $U_c$  of the arrester must be equal to the maximum operating voltage  $U_m$ .

If the selected continuous voltage is too low, this can lead to a failure of the surge arrester.

## Technical Data

Protection Values of Surge Arresters

Rated voltage

Continuous operating voltage

Max. residual voltage

8/20:

Thermal energy discharge capacity

Rated lightning discharge

Current (peak value in kA, waveform)

$\mu$ s

High surge current (peak value in kA, waveform)

Long-wave surge current (peak value in A, rectangular wave)

Short-circuit strength (r.m.s. value in kA)

Ur: 6 kV ... 52 kV

Uc: 4,7 kV ... 42 kV

Ures at 10 kA,

18 kV ... 153 kV

2 kJ/kVrated

isN: 10 kA, 8/20

ish: 65 kA, 4/10  $\mu$ s

isl: 250 A; 2000  $\mu$ s

16 kA; 0,2 s



No	Size	Ur kV	Uc kV	Dimensions mm			Weight kG
				A	B	C	
827 510 150	1	15	12	435	320	76	3,5
827 510 240	1	24	19	565	450	76	5,0
827 510 300	1	30	24	565	450	76	5,0
827 520 060	2	6	4,7	435	320	76	3,5
827 520 072	2	7,2	6	435	320	76	3,5
827 520 150	2	15	12	435	320	76	3,5
827 520 240	2	24	19	565	450	76	5,0
827 520 300	2	30	24	565	450	76	5,0
827 524 360	2	36	29	760	645	120	11,2
827 524 450	2	45	36	760	645	120	11,2
827 534 360	3	36	29	830	680	110	12,5
827 534 450	3	45	36	830	680	110	12,5
827 534 520	3	52	42	830	680	110	12,5

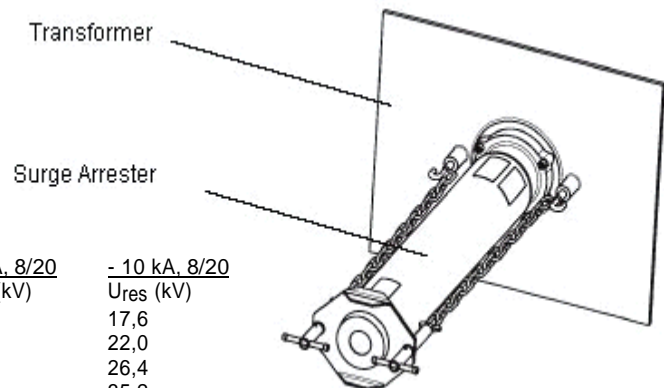
Other variants are available on inquiry.

Um = Max. operating voltage

Ur = Rated voltage of surge arrester

Uc = Max. continuous voltage of surge arrester

Rated Voltage	Max. Continuous Voltage	Max. Residual Voltage :		
Ur (kV)	Uc (kV)	- 1 kA, 8/20 Ures (kV)	- 5 kA, 8/20 Ures (kV)	- 10 kA, 8/20 Ures (kV)
6	4,7	13,9	16	17,6
7,2	6	17,4	20	22,0
9	7,2	20	24	26,4
12	9,5	27,8	32	35,2
15	12	34,8	40	44
18	14	41,6	48	52,7
19	15	45,1	52	57,1
22	17,5	52,1	60	66
24	19	55,5	64	70,3
30	24	69,4	80	87,9
36	29	83,3	96	105,5
45	36	104,2	120	131,9
52	42	120,7	139	152,7
65	52	150,9	174	190,45



## CABLE INTEGRATING VOLTAGE TESTING SYSTEM

The DSA-i3 integrated voltage testing system fulfills present day requirements for maintenance-free, cost-effective and reliable voltage indicating system, and meets the requirements specified in DIN VDE 0682, part 415, respectively IEC 61243-5.

It features a clear voltage display DSA-i3 (red LCD). It is also equipped with test sockets for phase comparison. A third socket permits the display itself to be easily checked for reliability.

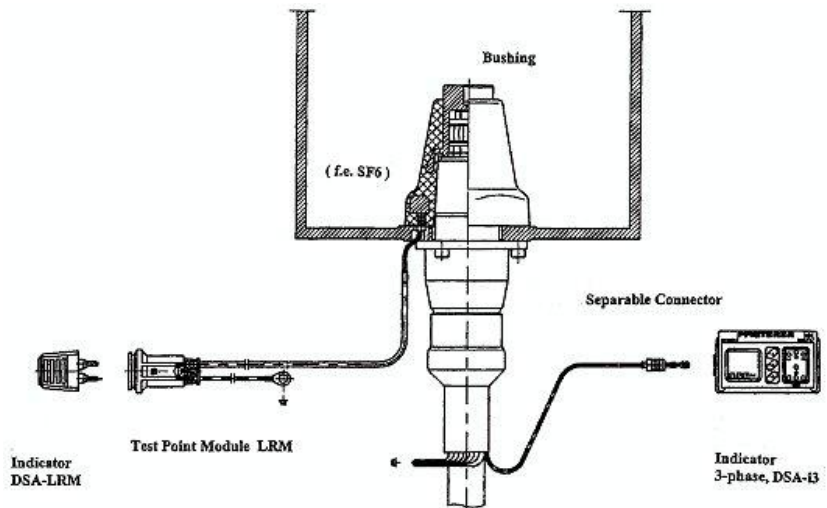


### Special Features

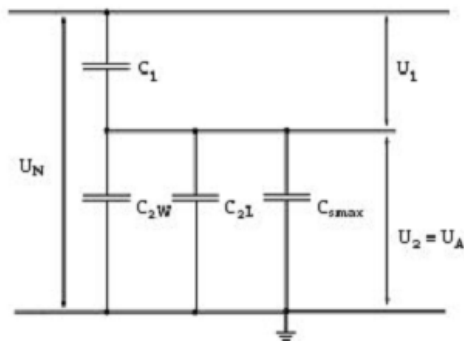
- No external power supply required*
- Integrated voltage limiting device*
- Easy installation*
- No in-service test required*

### Technical Data

- Nominal frequency 50 Hz / 60 Hz
- Threshold voltage 4...5 V
- Degree of protection IP 66
- Input impedance 2 MΩ
- Operating temperature -25° bis / to +55° C
- Dimensions: width/height/depth 96 x 48 x 30 mm



### Diagrammatic sketch of a capacitive voltage divider



**Balance plate bar capacitance (minimum):**  
 $C2Lmin = C1 \times 0,12 \times UN - 1 - C2W - 1592 \text{ pF } 5V$

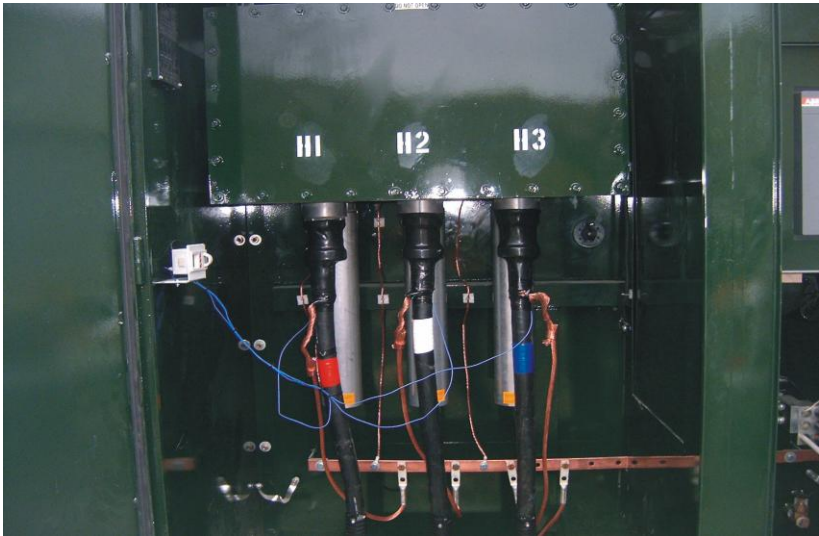
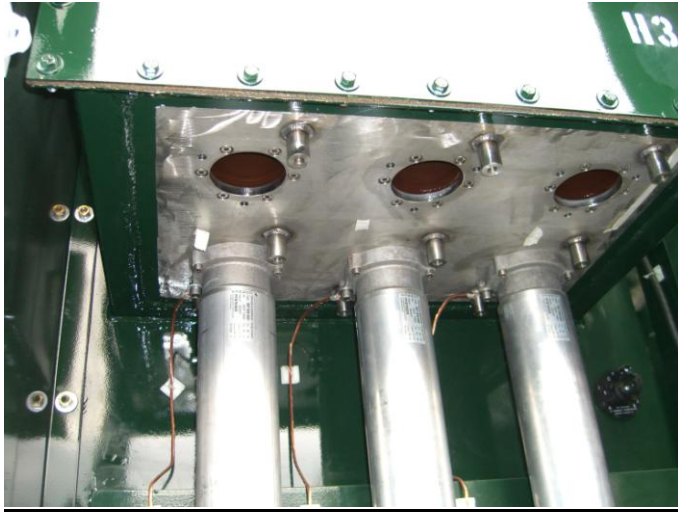
**Balance plate bar capacitance (maximum):**  
 $C2Lmax = C1 \times 0,4 \times UN - 1 - C2W - 1592 \text{ pF } 5V$

### *Accessories for DSI - i3*

*connection set*

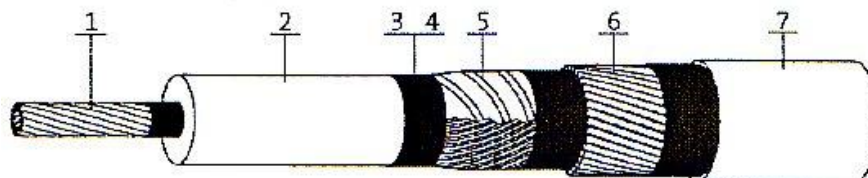
Accessories for DSI - i3 connection set			
Item no. 564 430 001 with plastic conductor type H07V-k1,5 		Angle plug	Var. 1
		Plug sleeve	Var. 2
		Flat connector	Var. 3
		Ring cable lug	Var. 4
		Plug sleeve	Var. 5
		Without connector	Var. 6

**SYSTEM MOUNTING PLATE**

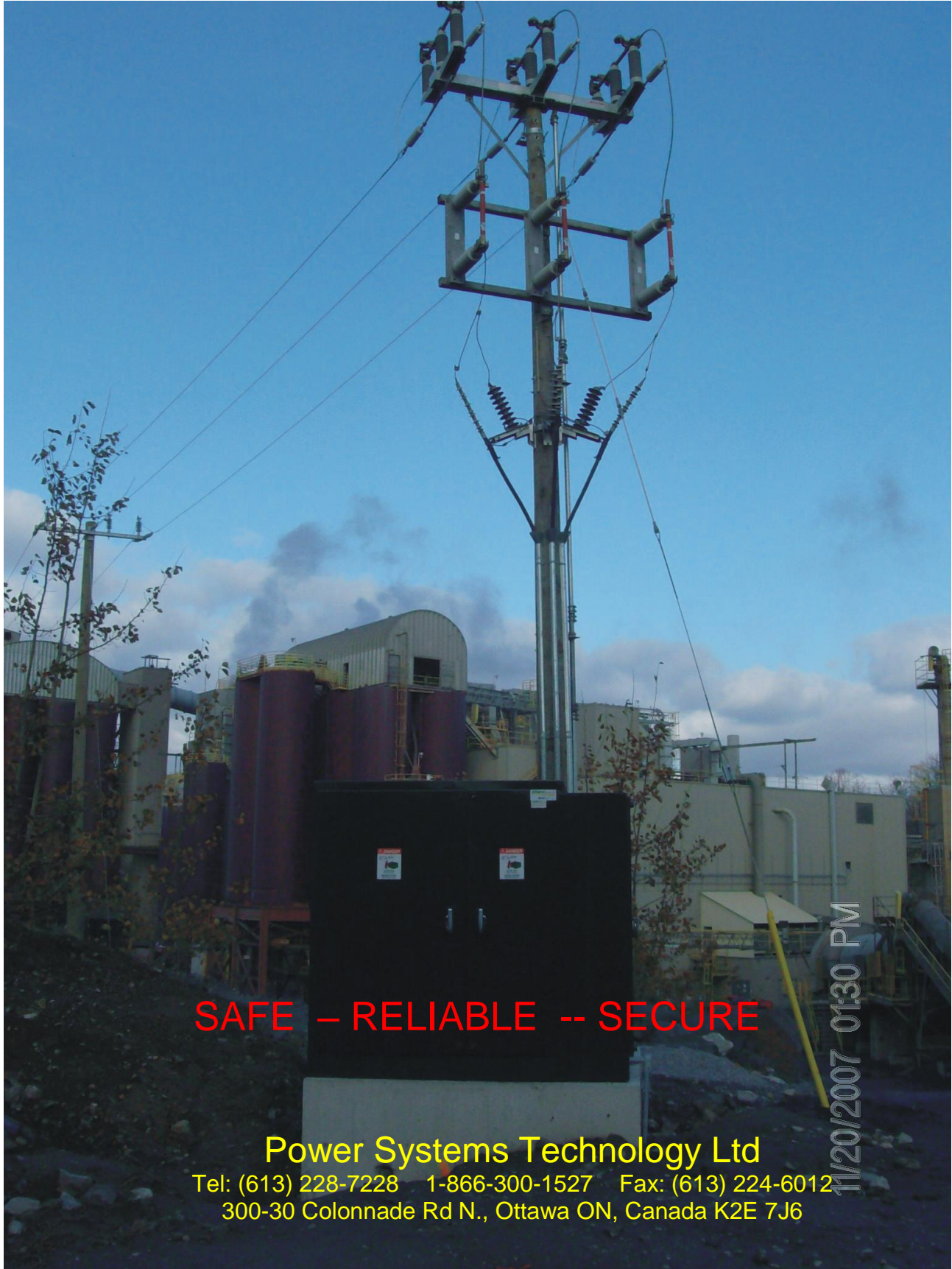


### Cable size to determine connector

<i>Company:</i>	<i>Name:</i>	<i>Date:</i>
<hr/>	<hr/>	<hr/>
<i>Tel:</i>	<i>Fax:</i>	<i>E-mail:</i>
<hr/>	<hr/>	<hr/>
<i>Cable manufacturer</i>	<i>Cable type:</i>	<i>Cross section</i>
<hr/>	<hr/>	<hr/>
<i>Maximum operating voltage:</i>	<i>Um</i> <i>kV</i>	
<i>Nominal voltage</i>	<i>Un</i> <i>kV</i>	
<i>Line to earth voltage</i>	<i>Uo</i> <i>kV</i>	
<hr/>	<hr/>	<hr/>
<i>Cable design:</i>	<i>Single core cable:</i>	<i>Super flexible cable:</i>
	<i>Three core cable:</i>	<i>Super flexible cable:</i>
<i>Application:</i>	<i>Above ground:</i>	<i>Soilproof:</i>
<i>Capacitive voltage tap:</i>	<i>Yes</i>	<i>No</i>
<i>Size of bushing: Size 0</i>	<i>Size 1                      Size 2</i>	<i>Size 3</i>
<i>Conductor shape:</i>	<i>Stranded circular:</i>	<i>RM</i>
	<i>Solid circular:</i>	<i>RE</i>
	<i>Stranded sector:</i>	<i>SM</i>
	<i>Solid sector:</i>	<i>SE</i>
	<i>Super flexible stranded:</i>	<i>RF</i>
<i>1. Diameter of conductor</i>		<i>mm</i>
<hr/>		<hr/>
<i>2. Diameter of insulation</i>	<i>PVC:    XLPE:    EPR:</i>	<i>mm</i>
<hr/>		<hr/>
<i>3. Diameter over outer semi-conductor layer</i>		<i>mm</i>
<hr/>		<hr/>
<i>4. Semi conductor layer</i>	<i>Graphite:    Fully bonded:</i>	<i>Easy strip:</i>
<i>5. Screen</i>	<i>Al:                      Cu:    Type:</i>	<i>Wires:                      Tape:</i>
<i>6. Armouring                      Yes:</i>	<i>Al:                                      Wire:</i>	<i>No:</i>
	<i>Cu:                                      Tape:</i>	
	<i>Pb:                                      Corrugated:</i>	
	<i>Steel</i>	
<i>Max. current over armouring:</i>		<i>Max                      A</i>
<hr/>		<hr/>
<i>7. Overall diameter</i>		<i>mm</i>
<hr/>		<hr/>







**SAFE – RELIABLE -- SECURE**

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