SBSN

Line Traps: the best solution for PLC communication

Power Line Carrier systems have been for more than 30 years one of SELTA top products: the gathered know-how allowed the company designing high performing line traps, compliant with the latest IEC 353 recommendations and offer a wide range of inductances: current and voltage values are therefore available to be used in modern power systems having to cope with higher nominal and short circuit power levels with subsequent very severe mechanical forces in the main coil of the traps.

Power Line Carrier systems (PLC) are employed by the Utility Companies in many Countries as a main component of the communication systems. They are used to transmit different signals and for the usually required transmission functions, such as telephony, facsimile transmission, remote control, telegraphy, teleprotection and data.

The line traps confine the PLC signals to particular sections of the power lines and prevent their transmission towards unwanted directions, enabling therefore the re-use of frequency bands in a power network.

As far as line traps are installed in series and connected with the power line, they must be designed to withstand the maximum continuous current as well as any short circuit current on the line.

In order to not disturb the power transmission, the line trap impedance has to be negligible at the power frequency, but it must be relatively high over the frequency band appropriate to carrier transmission.

Therefore line traps allow maintaining defined attenuation and impedance properties of a PLC link in all operating conditions of the involved power network including the grounding of the power line at both ends.

Benefits

- loss reduction
- high mechanical strength
- high short-circuit withstand capability
- excellent cooling
- light weight

Main features

- High operational reliability thanks to high short circuit current withstand capacity
- Open structure for optimum cooling of the coil (→ longer life expectancy)
- All components of the main coil carrying the power current -including the H.V. terminals- are weld connected obtaining therefore corrosion free electrical connections
- A thermal compensation systems allows absorbing the mechanical stresses due to temperature variations
- Negligible inductance tolerances among identical types for an easier interchangeability
- High Q for broader usable bandwidth
- Low self-capacitance of the main coil with subsequent higher resonant frequencies. New tuning units, in case of frequency changes, can be installed without removing the trap or retesting it
- High pulse withstand of the tuning unit provides high operational reliability
- The small size reduces the forces acting on coupling capacitors/CVT/post insulators: it is easy to obtain the required clearances between the phases

- The reduced weight simplifies the installation
- Bird barriers prevent the intrusion of birds into the main coil. They consist of a temperature and UV resistant reinforced nylon grid.
- Corona caps are usually not required for system voltages up to 240kV.
- No maintenance is required.

Main coil

The main coil consists of one or more cylindrical windings - depending on the value of the nominal current-, concentrically located and electrically connected in parallel.
Each winding consists of an aluminium alloy section bar with a rectangular cross-section and with the shortest side parallel to the line trap axis , to guarantee high mechanical strength.
The turns are adequately separated from each other, to improve cooling and high frequency properties: the separators are made of impregnated sturdy fibres guaranteeing high insulation and mechanical strength.
The windings are terminated at both ends on a system of aluminium bars called “spiders”.
The sturdiness is obtained by means of one or more tie-rods or sturdy tape (according to the line trap type) clamped to the spider arms: each tie-rod is made by a standard insulator suitable for outdoor use.
With SELTA line traps it is possible to obtain exceptionally high levels of terminal pull, tensile strength, wind loading and seismic withstand.

Surge Arrester

One surge arrester is linked in parallel to the terminals of the main coil and to the tuning unit to protect them from transient overvoltages.
Its voltage rating has to be selected in order to not operate for the voltage due to the thermal short time current. The rated discharge current is 5 or 10 KA: more types can be supplied upon request.
The surge arrester is accessibly mounted inside the main coil and it is located near the tuning unit, to provide optimum protection.

Mounting

Suspension

All the line traps are equipped with an eye bolt fixed on the top spider having the following characteristics:

Line Trap weight Kg	Tensile strenght Kg	Height (h') mm	Eye Diam. mm
W≤240	1000	160	50
250≤W≤390	1600	200	60
400≤W≤750	2500	220	70

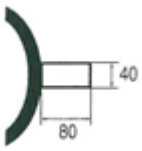
Pedestal

For pedestal mounting directly onto coupling capacitors, capacitors voltage transformers or station post insulators, the line traps are equipped with a pedestal made of antimagnetic material and electrically connected to the lower terminal.
The pedestals have adequate heights to prevent excessive heating of the coupling capacitor/CVT or post insulators fittings due to the magnetic field of the main coil.
Standard height (h") is 200 mm. Different pedestals heights and templates are available upon request to suit customer requirements.

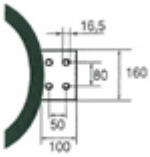
Connections

All the
The line traps are supplied with aluminium terminals:

Standard cylindrical shape
(for line traps up to I_N=1250A)



Standard rectangular shape
(for line traps with
$1600 \le I_N \le 3150A$)



The two terminals are welded on one arm of the top and bottom spiders and have radial orientation at 180°.

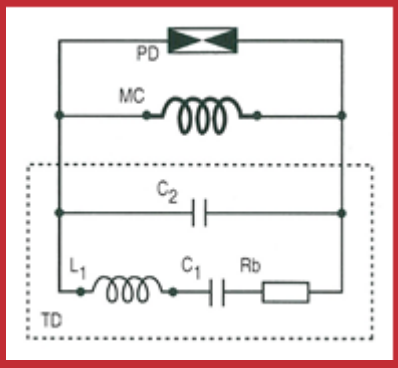
Technical features

IEC (50Hz)			L_N = 0.2mH					L_N = 0.5mH				
I_N	I_{KN}	I_{KM}	Type	U/U'	Φ	H	Weight	Type	U/U'	Φ	H	Poids
(A)	(kA)	(kA)	SBSN	(KV_{rms})	(mm)	(mm)	(Kg)	SBSN	(KV_{rms})	(mm)	(mm)	(Kg)
630	20	51	630/0.2	3/3.4	506	657	65	630/0.5	3/3.4	726	777	107
800	25	64	800/0.2	3/3.4	606	696	78	800/0.5	6/6.8	870	821	132
1000	31.5	80.3	1000/0.5	6/6.8	1010	847	228					
1250	40	102	1250/0.2	3/3.4	840	590	133	1250/0.5	6/6.8	800	989	240
2000	40	102						2000/0.5	6/6.8	1270	1407	410
2000	50	127.5	2000/0.2	3/3.4	1090	917	239					
2500	40	102						2500/0.5	6/6.8	1290	1458	530
3150	50	127.5	3150/0.2	3/3.4	1270	1349	393					
4000	63	204	4000/0.2	6/6.8	1480	1322	520					

LN Rated inductance of the main coil
IN Rated continuous current
IKN Short time current (1 sec.)
IKm Asymmetrical peak value (2,55 IKN)
U Surge arrester continuous service voltage
U' Surge arrester short time applicable voltage
(*) Other models can be designed on demand

Tuning device

SELTA line traps are generally supplied with parallel connected tuning devices making the attenuation and impedance characteristics of the power line independent of the switching conditions of the power networks.
Standard SELTA tuning devices are of the wideband type which are more common: single frequency and double frequency tuning devices are available upon request.
The tuning device consists of capacitors, low-inductive resistor and tuning inductors inserted into a plastic case suitable for outdoor service; tuning devices having fixed tuning or programmable tuning are available.

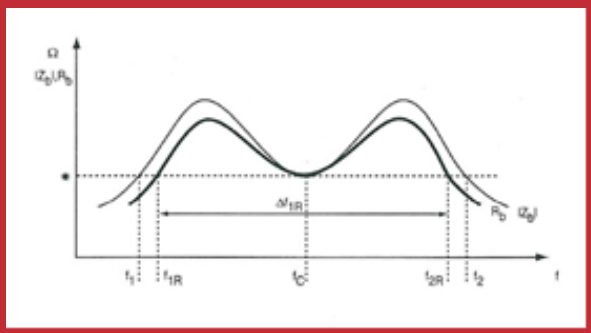


Circuit diagram of a band tuned line trap
MC Main Coil
PD Protective Device
TD Tuning Device

Impedance of band-tuned line trap

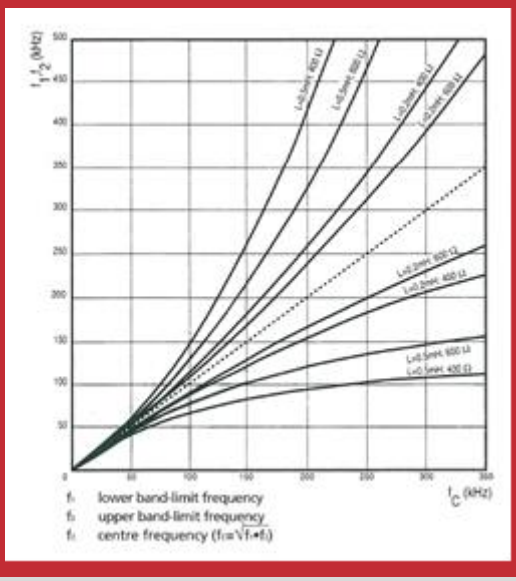
The blocking impedance Zb and its resistive component Rb characterize the blocking capabilities of the line trap.

f	carrier frequency
f_1, f_{1R}	lower band-limit frequency
f_C	centre frequency
f_2, f_{2R}	upper band-limit frequency
Δf_{1R}	bandwidth related to Rb
$\|Z_b\|$	absolute value of the blocking impendance Zb
R_B	resistive component of Zb
*	depends on line impedance



Bandwith of band-tuned line traps

It is related to the resistive component Rb of the blocking impedance.
The rated inductance LN of the main coil can be determined for a given frequency range.



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