Data Sheet no. 1.24/1

Tunable Metal Tank Reactor, type DER for Series and Parallel Resonant Test Systems

1 Application

For testing of capacitive test objects of high or unstable losses, e.g. rotating machines, for tests at capacitors in a wide range of capacitances or for their dynamic tests, the reactor of a resonant test system needs a special design and sometimes separate extensions by HV transformers or reactors (Fig. 1). Usually such reactors should be applicable for both, parallel and series resonance.
HIGHVOLT supplies also tuneable reactors for those special applications. The reactors described in this Data Sheet should be understood as examples. Any special application needs the clarification of the specification of the tunable reactor between the customer and HIGHVOLT.

2 Principle

The inductance of the reactor can be varied by an adjustable gap in the magnetic core. This gap is arranged inside the reactor coil, and its width can be tuned. Consequently also the inductance is adjustable, approximately in a range 1:20 which means that also the capacitive load, mainly the test object capacitance, varies in that range.

3 Design

The **magnetic core** is a so-called “plunger” type with one moving limb in its centre surrounded by four return limbs with the related yokes. The cylindrical moving limb is radically laminated for minimum losses. A frequency-tuned motor drive allows the precise positioning of the moving limb via a special spindle. The necessary support for the spindle is arranged on the core itself. This frame of high mechanical stability guarantees both, a stable gap (this means a stable inductance and consequently a stable voltage) and low acoustic noise.

The **oil-immersed coil** has layer type windings and paper insulated screening electrodes for the control of the electric field. Taps at the winding allow the adaptation to larger test object capacitances at lower test voltages. In case of additional taps, the reactor is equipped with additional bushings.

The **cooling** depends on the power of the reactor. For low power a hermetically sealed tank with corrugated walls is applied (Fig. 2). For larger reactors of higher power whether the areas of the metal tank are large enough or they are equipped with cooling radiators (Fig. 3). These types have also an oil conservator .

The **exciter transformer** is separate, this means not incorporated in the tank of the reactor. Its voltage, power and number of the taps are selected according to the characteristics of the load (capacitance and losses of the cable under test). Depending on the test object parameters the appropriate tap of the exciter transformer must be connected to that of the HV reactor by hand. For **parallel resonant mode** the reactor is equipped with a separate exciter winding.

type	max. output voltage	power	taps	voltage at tap	current at tap	frequen-cy	load range inclusive basic load		duty cycle
	V	S		V	I	f	Cmin	Cmax	min ON / min OFF
	kV	kVA		kV	A	Hz	nF	nF	/ times per day
DER 300/30	30	300	1	30	10	50	53	1060	5`/5` 25xper day
DER 350/50-30	50	350	1 2	50 30	3,96 11,7	50	22 60	440 1200	5`/5` 25xper day
DER 640/40	40	640	1	40	16	50	64	1270	3`/5` 3xper day
DER 3150/50-25	50	3150	1 2	50 25	63 126	50	201 800	4010 16000	((1´/5`)6x) 4h OFF) 3x per day
DER 5000/6	50	5000	1	6	833	50	22100	442000	0,25´ / 2´ 450x per day
DER 6800/50-40-30-20	50	5000	1 2 3 4	50 40 30 20	100 125 167 250	50	318 495 880 1985	6360 9900 17600 39700	cycle test acc. IEC 60143

Remarks:

Other duty cycles as described in the table at rated values on request.

General parameters:

- acoustic noise level:
  < 85 dB(A) (at a distance of 4 m)
- mineral transformer oil according IEC 60296
- colour of tank:
  RAL7032 "pebble grey"

- max. ambient temperature:
  + 40 °C for operation
  + 50 °C for storage and transportation
- min. ambient temperature:
  + 5 °C for operation
  - 10 °C for storage and transportation
- Relative humidity:
  < 90 % (without condensation)

type	design type	type of resonant circuit	length	width	height	weight		application
		P = Parallel S =Series	L mm	W mm	H mm	total kg	oil kg	
DER 300/30	Fig. 2	P/S	1650	770	1900	1850	650	generator testing
DER 350/50-30	Fig. 2	P/S	1650	770	2000	1850	650	generator testing
DER 640/40	Fig. 2	P/S	1550	1550	2000	2900	1100	generator/ transformer testing
DER 3150/50-25	Fig. 2	P	1950	1200	2050	3900	1450	generator/ transformer testing
DER 5000/6	Fig. 3	S	2100	1550	2900	5500	1300	capacitor testing
DER 6800/50-40-30-20	Fig. 3	S	2700	2500	3700	9800	2900	capacitor testing

Type designation: DER a/b-c-d-…

a - max. test power
b - max. output voltage of tap 1
c - output voltage of tap 2
d - output voltage of tap 3

Fig. 1:
Tunable metal tank reactor extended by a fixed reactor

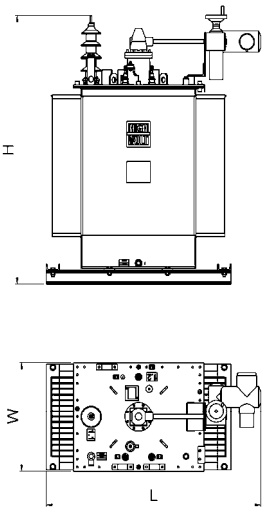

Fig. 2: Reactor with tank of corrugated wall

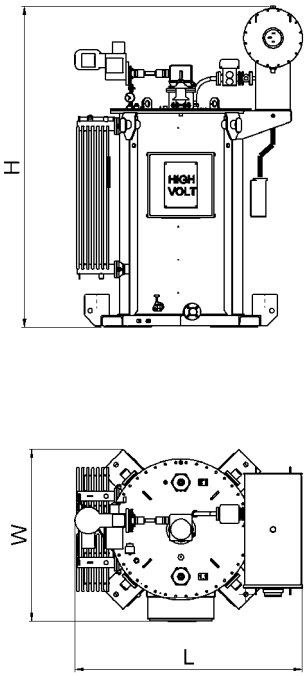

Fig. 3: Reactor with radiators, oil conservators and

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