

Data Sheet no. 1.23/1

Tunable Metal Tank Reactor, Types DERU / DER for Series Resonant Test Systems

1 Application

Tuneable metal tank reactors (Fig. 1) are used in resonant circuits for testing of medium and high-voltage cables according to IEC Standards 60502 and 60840. In combination with shielded test rooms ("Faraday cage"), the metal tank enables the optimum arrangement of the reactor outside the room with the bushing inside.

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 (Fig. 2, no 2). The cylindrical moving limb is radially laminated for minimum losses. A frequency-tuned motor drive allows the precise positioning of the moving limb via a special spindle. The necessary support (Fig. 2, no. 3) 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** (Fig. 2, no. 1) 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 one additional tap, the reactor is equipped with two bushings (Fig. 1, Fig. 4). In case of two additional taps, it is equipped with an off-load tap changer, which can be operated by hand or motor drive (Fig. 5).

The **cooling** depends on the power of the reactor. For low power a hermetically sealed tank with corrugated enough or they are equipped with cooling radiators. These types have also an oil conservator (Fig. 4 and 5).

The **exciter transformer** is 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 the help of a special off-load switch operated by hand or motor.

type	max. output voltage	power	taps	voltage at tap	current at tap	load range inclusive basic load			
						Cmin nF	Cmax nF	Cmin nF	Cmax nF
	kV	kVA		kV	A	50 Hz		60 Hz	
DER 300/50-35	50	300	1	50	6.0	19	382	16	318
			2	35	8.6	39	780	32	650
DER 1000/75-45	75	1000	1	75	13.3	28	566	24	472
			2	45	22.2	79	1572	66	1310
DER 1000/100-50	100	1000	1	100	10.0	16	318	13	265
			2	50	20.0	64	1273	53	1061
DER 2500/100-50	100	2500	1	100	25.0	40	796	33	663
			2	50	50.0	159	3183	133	2653
DER 2500/120-30	120	2500	1	120	20.8	28	553	23	461
			2	30	20.8	442	8842 1)	368	7368 1)
DER 2000/200-75	200	2000	1	200	10.0	8	159	7	133
			2	75	26.7	57	1132	47	943
DER 2500/200-100	200	2500	1	200	12.5	10	199	8	166
			2	100	25.0	40	796	33	663
DERU 2700/200-175-100									
	200	2700	1	200	13.5	11	215	9	179
			2	175	15.4	14	281	12	234
			3	100	27.0	43	859	36	716
DERU 2700/200-100-45	200	2700	1	200	13.5	11	215	9	179
			2	100	20.0	43	859 1)	36	716 1)
			3	45	30.0	212	4244 1)	177	3537 1)
DERU 3150/250-125-50	250	3150	1	250	12.5	8	160	7	134
			2	125	25.0	32	642	27	535
			3	50	25.0	201	4011 1)	167	33421)
DERU 4500/350-200-100	350	4500	1	350	12.9	6	117	5	97
			2	200	17.0	18	358 1)	15	298 1)
			3	100	20.0	72	1432 1)	60	1194 1)
DERU 6000/350-150-75	350	6000	1	350	17.1	8	156	6	130
			2	150	17.1	42	8491 1)	35	707 1)
			3	75	30.0	170	3395 1)	141	2829 1)

Remarks:

- 1) at reduced voltage to meet the rated current
- 2) 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	duty cycle 2)	design type	length	total length	width	height	weight		
							L1 mm	L2 mm	W mm
	h ON / h OFF / times per day								
DER 300/50-35	0,5/0,5/8	Fig. 3	1610	1610	950	2300	2450	910	
DER 1000/75-45	1/1/6	Fig. 4	1600	2300	1800	3200	5900	2300	
DER 1000/100-50	1/1/6	Fig. 4	1600	2300	1800	3200	5900	2300	
DER 2500/100-50	1/1/6	Fig. 4	1850	3150	1170	3450	8700	2800	
DER 2500/120-30	1/1/6	Fig. 4	1850	3150	1770	3450	8700	2800	
DER 2000/200-75	1/1/8	Fig. 4	2600	3850	2050	3800	13000	4200	
DER 2500/200-100	1/1/8	Fig. 4	2200	3850	2050	3800	13000	4200	
DERU 2700/200-175-100									
	1/1/8	Fig. 5	3200	5200	2250	3870	16000	6700	
DERU 2700/200-100-45									
	1/1/8	Fig. 5	3200	5200	2250	3870	16000	6700	
DERU 3150/250-125-50									
	1/1/8	Fig. 5	3500	5850	2250	3700	19500	8000	
DERU 4500/350-200-100									
	1/1/6	Fig. 5	3500	6850	2250	3850	22000	9000	
DERU 6000/350-150-75									
	1/1/6	Fig. 5	3800	6850	2250	4050	24700	10700	

Type designation: DER (U) a/b-c-d

- U - HV off load tap changer
- a - max. test power
- b - max. output voltage
- c - output voltage of tap 2
- d - output voltage of tap 3



Fig. 1: Tunable metal tank reactor

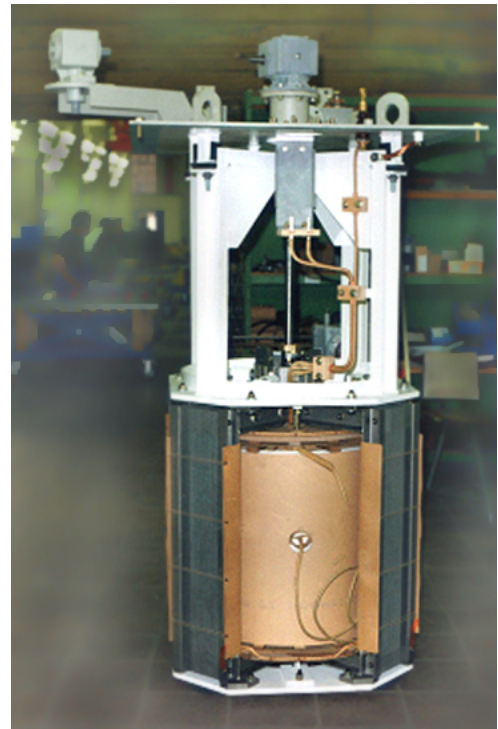


Fig. 2: Active part of tunable reactor
 1 – coil
 2 – return limb
 3 – support for spindle and drive

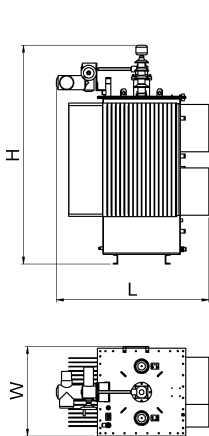


Fig. 3:
 Reactor with tank of
 corrugated walls

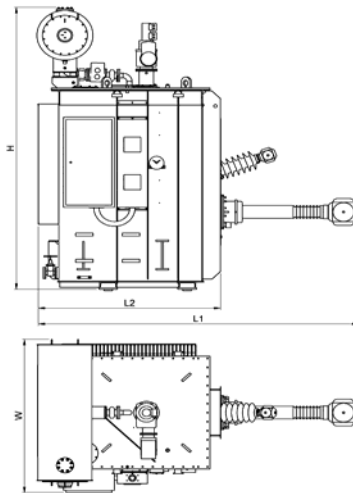


Fig. 4:
 Reactor with two bushings
 (one additional tap)

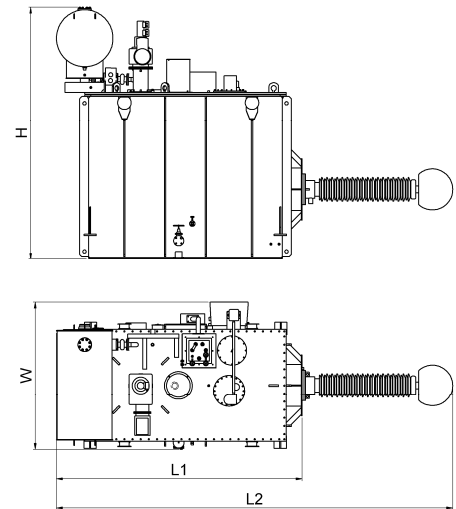


Fig. 5:
 Reactor with off-load tap changer
 (two additional taps)

For further information please contact:

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