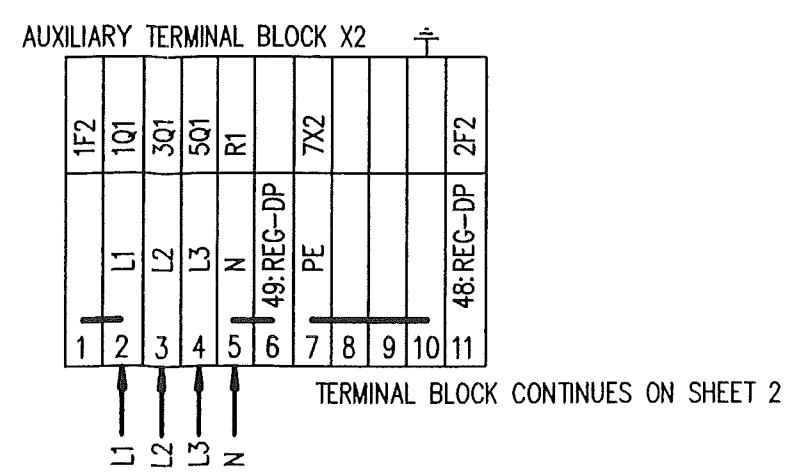


\* CONNECTION POINT OF THE PROTECTIVE INTERCONNECTION SYSTEM ON THE PETERSEN COIL





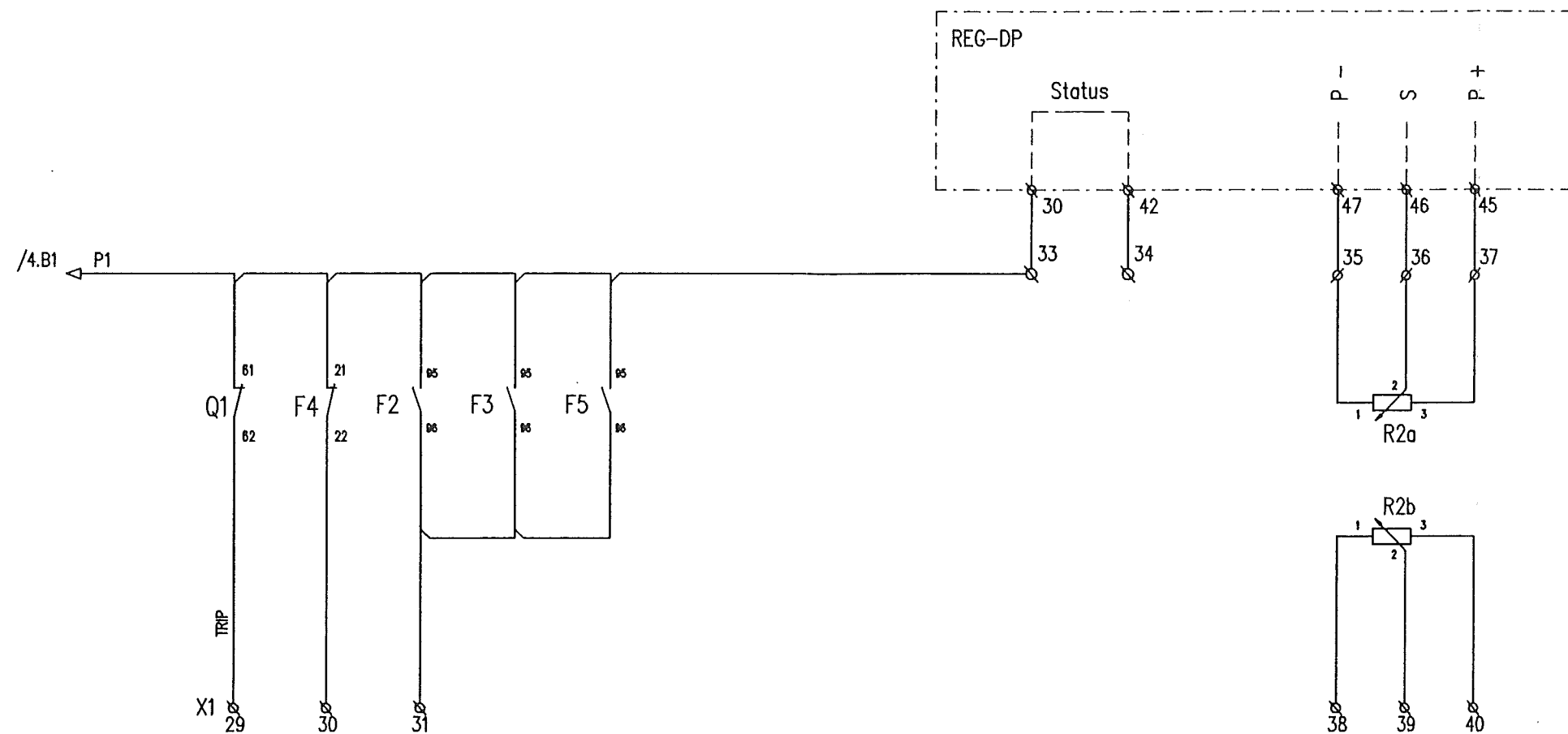






LEGEND:

B1	THERMOSTAT	F5	CIRCUIT BREAKER 2A	R2a,R2b	POTENTIOMETER 2x200 Ohm	T2	VOLTAGE MEASURING WINDING 100V
B2	THERMOMETER MESSKO	F6	BUCHHOLZ RELAY	REG-DP	AUTOMATIC CONTROLLER	T4	SECONDARY WINDING
B4	RESISTANCE THERMOMETER Pt100	G1	OIL LEVEL GAUGE	S3	PUSH BUTTON "RAISE"	X1	MAIN TERMINAL BLOCK
Q1	CIRCUIT BREAKER 2.5-4A	K1,K2	CONTACTOR	S4	PUSH BUTTON "LOWER"	X2	AUXILIARY TERMINAL BLOCK
F2	CIRCUIT BREAKER 0,6A	K4	PHASE SEQUENCE RELAY	S5	SAFETY SWITCH		
F3	CIRCUIT BREAKER 2A	M	MOTOR	S6,S7	LIMIT SWITCH		
F4	CIRCUIT BREAKER 4A	R1,R1.1	HEATER	T1	CURRENT TRANSFORMER		

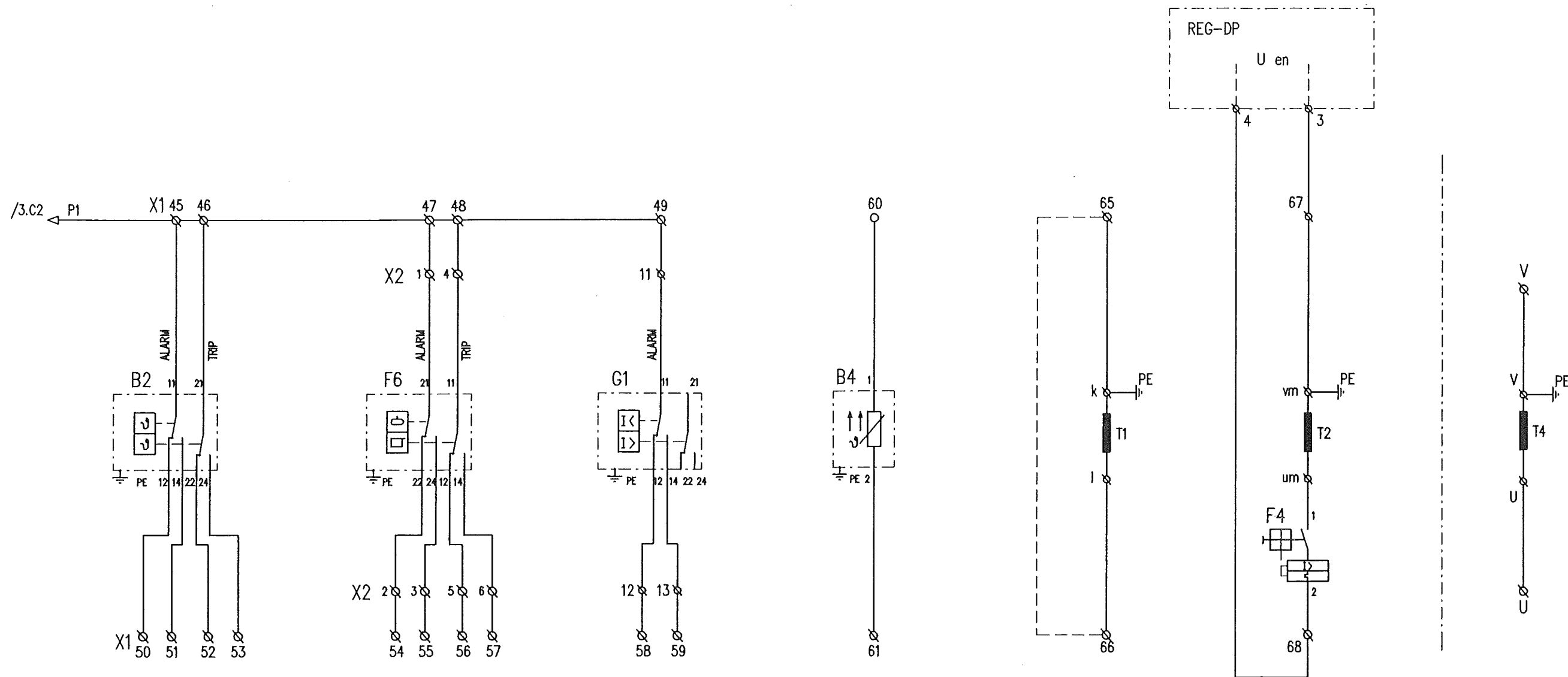


TERMINAL BLOCK X1


TERMINAL BLOCK CONTINUES ON SHEET 4

			DATE	14.3.2005	US STEEL KOŠICE 50. 3023 01 6,3 kV SUBSTATION T80		WIRING DIAGRAM	3-219282		
			DRAWN	Gazda						
1	WIRING	9.5.2005	GA	VERIFIED				Maňhal		
NR.	MODIFICATION	DATE	NAME		ORIGINAL	REPLACEMENT		025.011551-6501		SHEET 3
										4





TERMINAL BLOCK X1 (21F6) (11F6) (11G1)

				11B2	21B2	1X2	4X2	11X2	12B2	14B2	22B2	24B2
41	42	43	44	45	46	47	48	49	50	51	52	53

(22F6) (24F6) (12F6) (14F6) (12G1) (14G1)

2X2	3X2	5X2	6X2	12X2	13X2	1B4	2B4				k: T1	l: T1	vm: T2	2F4
54	55	56	57	58	59	60	61	62	63	64	65	66	67	68

TERMINAL BLOCK X2

	21F6	22F6	24F6	11F6	12F6	14F6	PE: B2	PE: F6	PE: G1	PE: M	11G1	12G1	14G1		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

			DATE	14.3.2005
			DRAWN	Gazda
			VERIFIED	Maňhal
1	WIRING	9.5.2005	GA	
NR.	MODIFICATION	DATE	NAME	

US STEEL KOŠICE	
50. 3023 01	
6,3 kV SUBSTATION T80	
ORIGINAL	REPLACEMENT



WIRING DIAGRAM

3-219282

025.011551-6501

SHEET 4  
4



CONNEX-Trafo-Anschlussteile,  
gerade, bis 24 kV

Der Einbau der Trafoanschlussteile erfolgt anstelle der DIN-Porzellandurchführungen auf der Mittelspannungsseite.

Um der Beschaffenheit des Transformators Rechnung zu tragen, ist das in den Traforaum hineinragende Isolierteil (Maß  $l_1$  und  $l_2$ ) in verschiedenen Längen lieferbar. Die Kabel werden mit metallgekapsteten CONNEX-Kabelanschlussteilen angeschlossen.

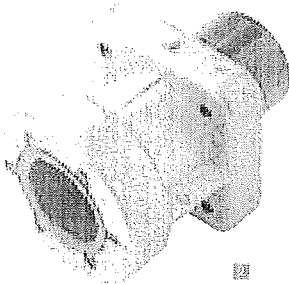
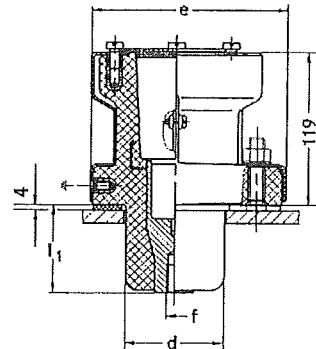
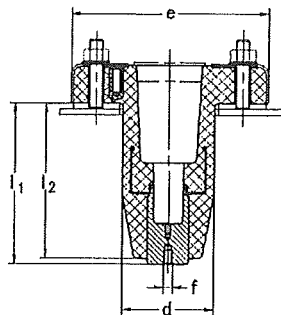
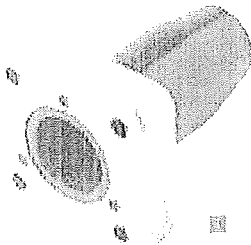
Auf der 0,4 kV Seite stehen entsprechende Isolierhauben zur Verfügung, die einen vollkommenen Berührungsschutz bieten.

CONNEX Transformer Bushings,  
Straight up to 24 kV

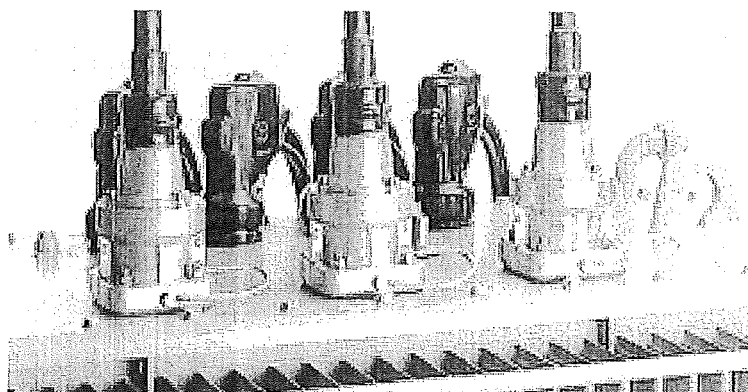
These transformer bushings are installed on the medium-voltage side in place of DIN porcelain bushings.

To fit different transformer designs, the insulating part projecting into the transformer (dimension  $l_1$  and  $l_2$ ) is available in various lengths. The cables are connected with metal-enclosed CONNEX separable connectors.

For the 0.4 kV side, appropriate insulating covers are available which provide complete protection against electric-shock hazard.



Nr.	Größe	Maße mm		Anschluß- Gewinde		Nenn- Strom	Gewicht ca. kg
No.	Size	Dimensions mm		Threaded Connection		Nominal Current	Weight approx. kg
		$l_1$	$l_2$	d	e	f	$I_N/A$
827 115 004	0	133	128	74	127	M8	250
827 115 002	0	178	173	77	127	M8	250
827 158 001	0	68	-	75	130	M12	250
827 159 001	1	68	-	75	130	M12	630





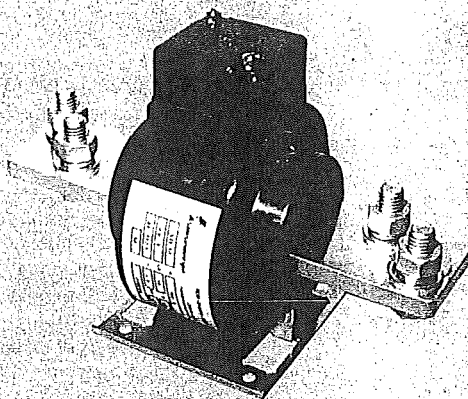
**MĚŘICÍ TRANSFORMÁTOR PROUDU NÍZKÉHO  
NAPĚTÍ do 0,6 kV PRO VNITŘNÍ MONTÁŽ  
ROZSAH PRIMÁRNÍCH PROUDŮ 10 až 1500 A**

**CURRENT INSTRUMENT TRANSFORMER  
FOR INDOOR INSTALLATION  
up to 0.6 kV 10 up to 1500 A**

TYP  
**STE 10**  
TYPE

Schváleno ČMI Praha i pro účtování spotřeby elektrické  
energie Stanovené měřidlo - úřední značka typu  
TCM - 212/94 - 1808

Certified by ČMI (Czech Institute of Metrology) for charging for  
electrical energy - certification mark of this type  
TCM - 212/94 - 1808



#### POPIS

Transformátory jsou vyráběny s toroidním jádrem vinutým z vysoce jakostního feromagnetického materiálu s orientovanou krystalickou strukturou. Vnější plášť zhotovený z izolační hmoty umožňuje zmenšení přeskokových vzdáleností a tvoří funkční a estetický celek. Vyrábí se normálně s podstavcem, který je možno snadno odstranit, a je tak umožněna montáž na jakémkoliv místě sestavy.

#### KONSTRUKCE

Sekundární i primární vinutí je odděleno vysoce jakostním izolačním materiálem. Jednoduchým proražením tenké stěny víka svorkovnice je umožněno připojení vodičů z kterékoliv strany.

#### CHARAKTERISTIKY

- vysoká přesnost
- mechanická pevnost vůči nárazům
- montáž v jakékoliv poloze
- možnost plombování sekundárních vedení

#### POUŽITÍ

Zabudovává se do elektrických rozvodných zařízení pro vnitřní montáž. Slouží k připojení ampérmetrů, proudových měřicích obvodů, jističů a dalších měřicích přístrojů.

#### UPOZORNĚNÍ

Transformátor se nikdy nesmí uvádět do provozu s otevřenými (volnými) sekundárními svorkami, protože může dojít ke vzniku nebezpečného napětí a vážnému poškození izolace.

#### ZKOUŠENÍ

Typové zkoušky byly provedeny podle norem JUS, IEC, ČSN. Každý transformátor je ve výrobním závodě pečlivě zkoušen. Na požádání je možno předložit zkušební protokol.

#### DESCRIPTION

The transformers are manufactured with a toroidal core made of high quality magnetic sheet with grain oriented crystal line structure. The insulated casing allows for reduced spark-up distances and forms a functional and aesthetic unit. They are normally manufactured with a base which can be easily removed so their mounting on any place in the cubicle is possible.

#### CONSTRUCTION

The secondary and primary windings are insulated from each other by high quality insulation material. The conductors are accessible from all sides by simple breaking of thin cover of terminal box wall.

#### CHARACTERISTICS

- high accuracy class
- mechanical durability to shocks
- can be mounted in any position
- possibility of plumbing the secondary connections

#### APPLICATION

They are incorporated in the electrical switch gears for indoor installation. They are used for the connection of ammeters and current circuits of meters, protective and other measuring devices.

#### HANDLING

The transformer should never be left in operation with the secondary connection open as the hazardous voltage and serious damaging of transformer insulation can occur.

#### TESTING

Type tests are performed according to JUS, IEC, ČSN standards. Each transformer is thoroughly tested in the factory. The factory test certificate is provided on request.

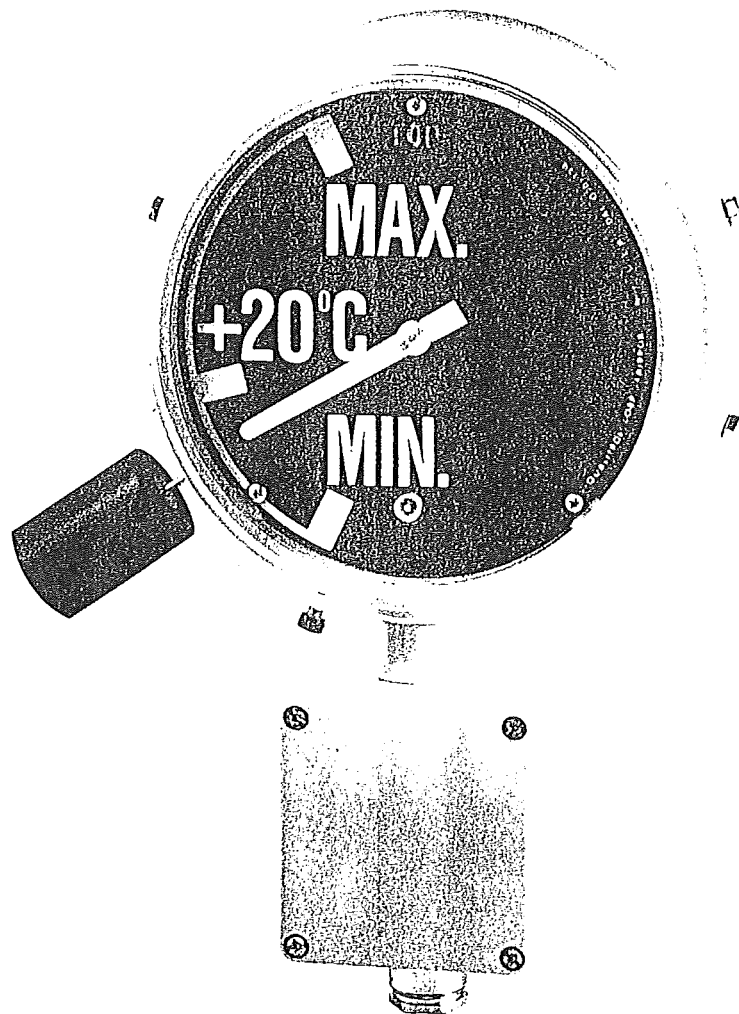




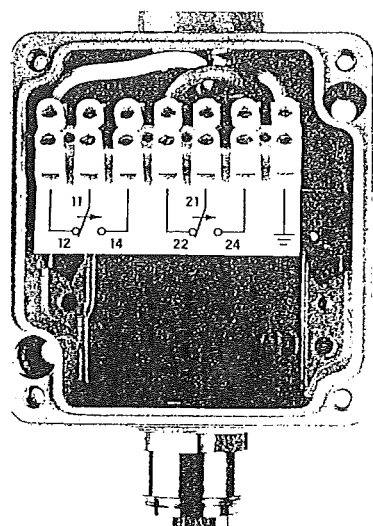
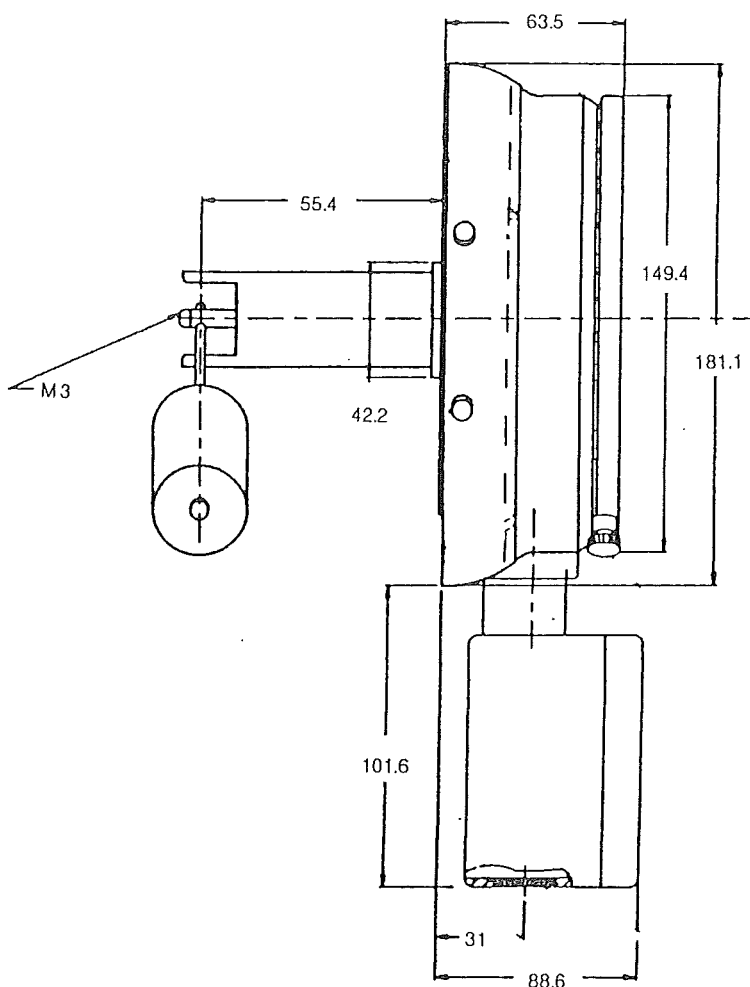


Füllstandsanzeiger  
Serie 032 Hebelantrieb  
und 042 Getriebeausführung  
mit Klemmen-Anschluss

Liquid Level Gauges  
Series 032 Lever Drive  
and 042 Gear Drive  
with Terminal Box







## Aufbau

QualiTROL-Füllstandsanzeiger mit Klemmenkasten unterscheiden sich von den bisher bewährten Geräten mit Steckanschluß nur durch den Klemmenkasten an der Stelle, wo Sie in der Vergangenheit den Stecker gewöhnt waren. Die Ausführung mit Stecker bleibt auch weiterhin in unserem Lieferprogramm.

Die Funktion ist völlig identisch; alle Einzelteile, mit Ausnahme des Steckers, wurden beibehalten. Nur die Gesamthöhe des Anzeigteils einschließlich Klemmenkasten hat sich gegenüber den bisher gebräuchlichen Füllstandsanzeigern auf 282,7 mm erhöht, bleibt aber für alle Anzeiger der Serie 032.. mit Hebelantrieb und der Serie 042.. mit Getriebe gleich.

Der Klemmenkasten entspricht IP 55 und ist aus Aluminium. Im Inneren befindet sich eine vierpolige Klemmenleiste für Füllstandsanzeiger mit einem Schaltkontakt bzw. eine siebenpolige Klemmenleiste für Füllstandsanzeiger mit zwei Schaltkontakten. Die Klemmenleiste ist für Kabelquerschnitte bis 2,5 mm<sup>2</sup> ausgelegt. Die Kontaktbelegung ist nach DIN gekennzeichnet, wobei die Klemmen 11, 12 und 14 immer den niedrigsten Schalterpunkt kennzeichnen. Der Klemmenkasten ist für eine Kabelverschraubung PG 16 vorbereitet.

## Design and Construction

The new QualiTROL liquid level gauges with terminal boxes differ from the design you have been accustomed to for the past 50 years only in replacing the connector by a terminal box.

The function and characteristic maintain unchanged. All components, excluding the connector, are identical. Attaching the terminal box caused an increase in the overall height of the instrument to 282,7 mm, all other dimensions remain unchanged. These dimensions apply for both series 032.. lever drive and series 042.. gear drive liquid level gauges.

The terminal box made of aluminium alloy is weatherproof according to IP 55. It is equipped with a four-pole terminal for liquid level gauges with one contact respectively with seven poles for gauges with two switches. Each terminal allows wires up to 2,5 mm<sup>2</sup>. The terminals are marked in accordance to DIN, the terminals 11, 12 and 14 identify always the switch, which will respond at the lowest level. The bottom of the terminal box is provided with a PG 16 thread for cable gland.

QualiTROL will continue to supply liquid level gauges with both electric wiring systems.

# QUALITROL®

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Änderungen entsprechend dem techn. Fortschritt behalten wir uns vor. 6/99  
Technical data subject to change without notice. 6/99



# Liquid Level Gauges

## Series 026 and 032 - Lever Drive

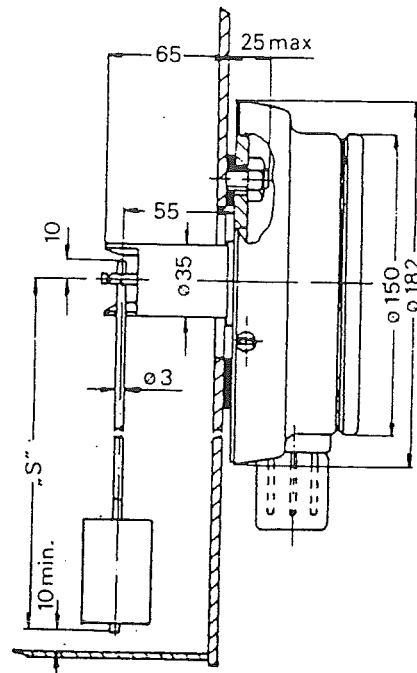
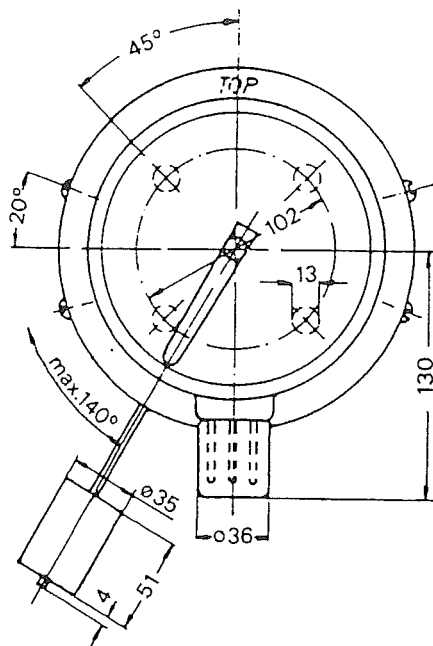
## Series 012 and 042 - Gear Drive

### Lever Drive

no switch  
026-003-01

with 1 switch  
032-003-01

with 2 switches  
032-004-01

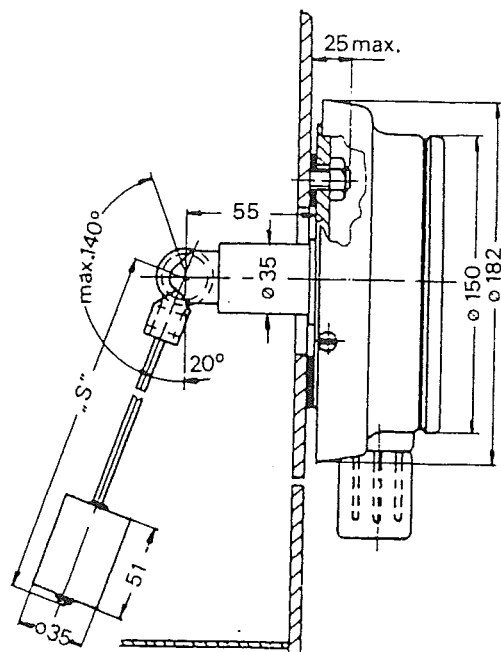
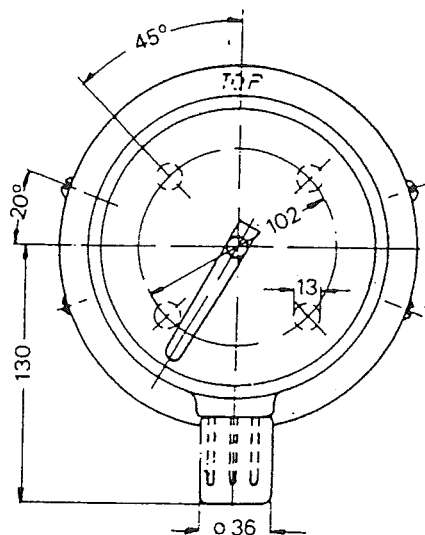


### Gear Drive 2:1 Ratio

no switch  
012-003-01

with 1 switch  
042-001-01

with 2 switches  
042-014-01



**QualiTROL**

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Ifach 1165  
D-53558 Geisenheim/Rhein  
Telefon: (06722) 6066-67 Telex: 42 115  
Telefax: (06722) 5881

Various patents applied for respect registered.  
Technical data subject to change



## Mounting

A constructive characteristic of the QualiROL liquid level gauge is its set-up in two parts. It consists of the driving element with gasket flange and indicating part. Cases with internal pressures up to 10.5 bar are completely sealed. Flanges for higher pressures on request.

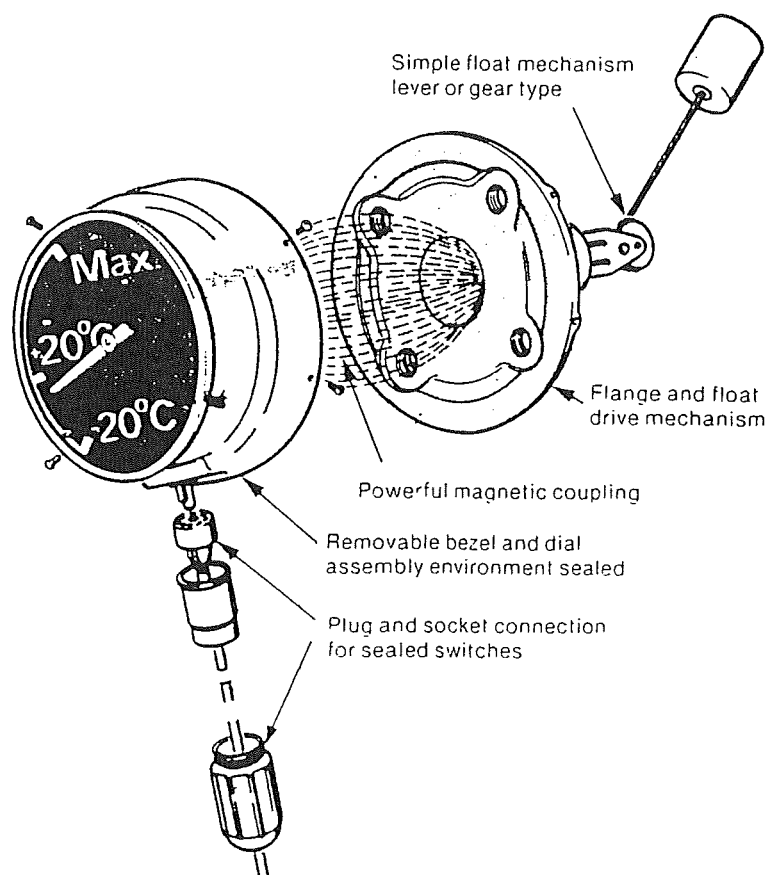
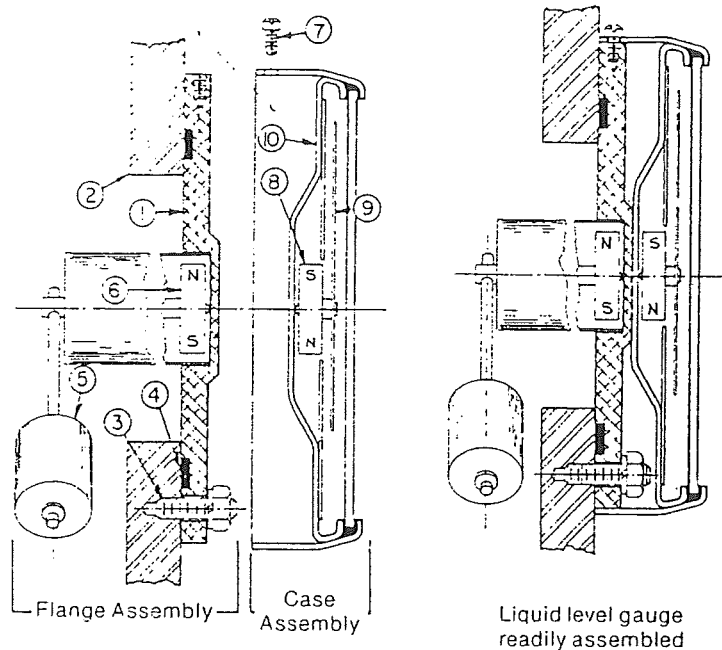
The indicating part doesn't get in touch with oil so that it can easily be separated of the transmitting part's flange, after having loosened the 4 cylinder screws of the rear edge of the housing. Therefore the oil level in the conservator must not be lowered.

Sealing holes at top and bottom of back of the indicating part reliably avoid perspiration in the inside housing.

## Function

The float (5) follows the respective liquid level of the transformer tank. The float material remains chemically neutral when being exposed to cooling liquids for transformers. Even after longer lasting operation the material doesn't suck itself full. The float's motion is radially transmitted by direct lever action. On request axially with gear drive. This version is equipped with a transmission gearing. The driving magnet (6) adjusts itself automatically. An additional adjustment is not necessary. Its magnetic field directs the indicating magnet by the pointer. So there won't be the problem of sealing a rotating driving axle.

The driving magnet (6) controls the opposite polarized dial magnet (8) with the pointer (9). Two permanent magnets with high precision and life-span. The aluminium housing of the indicating part which is seawater resistant as well as the drive are both antimagnetic. Interfering influences of ferromagnetic objects are to be excluded. Liquid level gauges with a scale diameter of 90mm and more can also be supplied with integrated QualiROL pressure switches.







### Function Test

Function of the control switches can be tested on the mounted pointer.

The milled nut of the visual disk has to be unscrewed and the disk must be turned in a way that the visible carrier of the interior side of the glass pushes the pointer towards the break-over point. When finishing the test procedure, the disk has to be re-arrested in its starting position.

It has to be observed that the marking „TOP“ is vertically adjusted to the top. Otherwise the carrier could irritate the pointer's course and such make the respond of the control switches impossible.

### Float Rod Length

A float of  $\varnothing 35\text{mm} \times 51\text{mm}$  is sufficient up to a length of 700mm. For longer float rods different float dimensions are available.

### Application Under Extreme Environment Conditions

All QualiTROL instruments are appropriate for open air application. Please contact us in case of unusual strain like sandstorms, extreme variations of temperature or chemically heavy loaded atmosphere.

### Control Switches

Liquid level gauges can be alternatively delivered with one or two change-over switches.

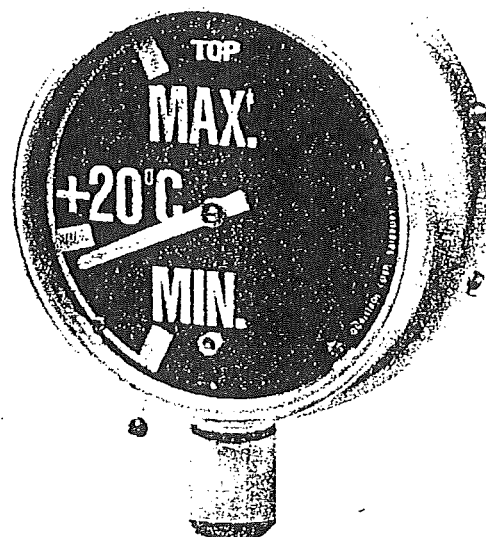
The capacity is:

15 Amp. 125-230 V A.C.

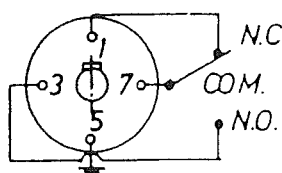
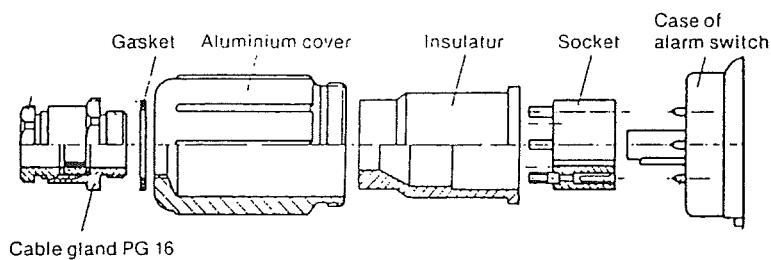
1/2 Amp. 125 V D.C.  
resistive load

1/4 Amp. 250 V D.C.  
resistive load

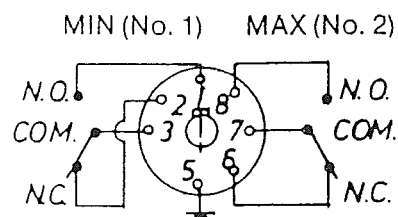
Switches with gold contacts can be supplied on request.



### QualiTROL Connector

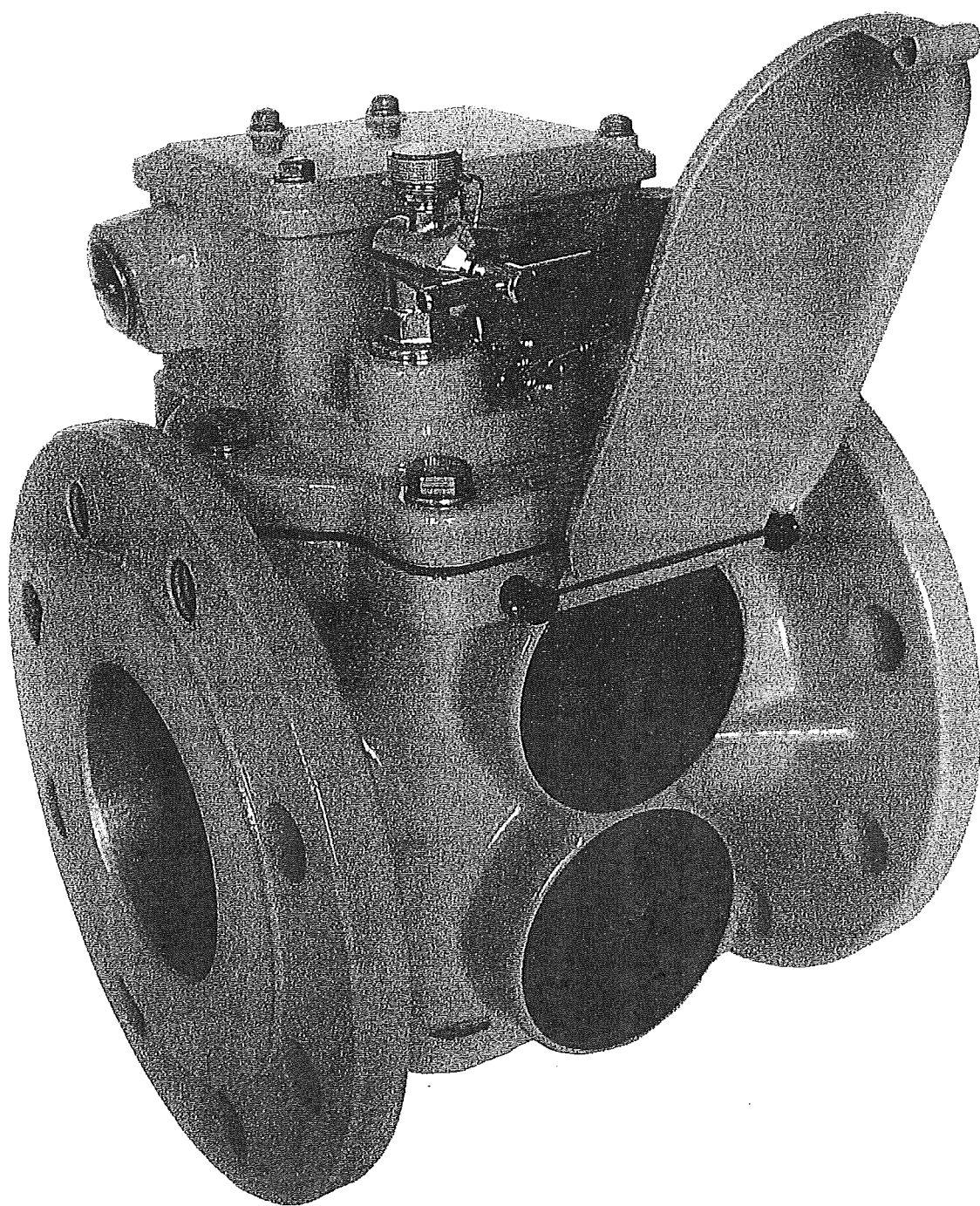


1 Contact

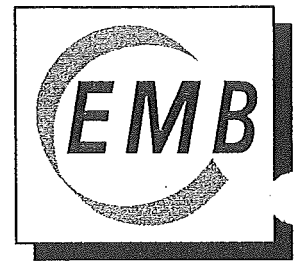


2 Contacts





**Transformer Protection Relays  
(Buchholz Principle)**



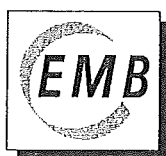
## Content

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2.	Function of the Buchholz relay	6
3.	Tests	7
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## Firm's history

Since its foundation the company has been passed through an eventful history with regard to ownership, affiliation and connected with this changes of firm names.

- 1863** Foundation of the company as sugar factory
- 1943** Establishment of SIEMENS Magdeburg
- 1948** VEB<sup>1</sup> Elektromotorenwerk Barleben; VEM (state-owned firm)
- 1951** VEB<sup>1</sup> Starkstromanlagenbau Magdeburg (state-owned firm)
- 1951** Start of manufacturing Buchholz relays at site in Barleben
- 1970** VEB<sup>1</sup> Elektrotechnik und Gerätebau Magdeburg; EGEM (state-owned firm)
- 1980** VEB<sup>1</sup> Kombinat Elektromaschinenbau Dresden VEB<sup>1</sup> Elektromotorenwerk Barleben; VEM; ELMO (state-owned firm)
- 1990** VEM Antriebstechnik AG Dresden Elektromotorenwerk Barleben GmbH; VEM; ELMO (public limited company)
- 1993** Elektromotoren und Gerätebau Barleben GmbH; EMB (privately owned company)



## Preface

The Buchholz relay was developed in 1921 by Max Buchholz, Oberrat at the Prussian Electric supply company - PLC in Kassel.

Since that time it has been an important protection and monitoring device for liquid-cooled transformers and choke coils. It is known for its easy operation, high reliability, maintenance-free operation and extremely long life.

It is built in the cooling cycle of the appliances to be protected and responds in the event of troubles like gas accumulation, loss as well as high flow of the insulation liquid.

The company has had for more than 50 years experience in producing Buchholz relays and other protection devices for liquid-cooled appliances. It ranks among the most distinguished manufacturers of this kind of equipment.

Experiences collected and profound know-how are the sound basis for a high product quality. References from reputed transformer manufacturers and further users are proof of the high level of the products.

The company is ISO 9001/2000 certified.

The staff of highly qualified engineers and experienced skilled workers do their best to guarantee top quality high-precision products.

The mechanical working of the casings is done on modern CNC-controlled machine tools. The final tests, where all the functions of the Buchholz relays are checked, are done with each device by using special test equipment.

Each device is delivered with a test certificate.

The type diversity of the Buchholz relays is tailored to norms and standards as well as to special customer demands.

EMB-Buchholz relays are in compliance with EN 50216.

The type of relay to be used depends on nominal rating and construction features of appliance to be protected. Our range of products permits optimum adaptation to actual requirements.

Buchholz relays may be used in open-air or also in indoor equipment.

<sup>1</sup> VEB = nationally owned firm

## 1. Design features

### Casing (Figures 1A and 1B)

The casing is a weather-resistant casting of light alloy and is provided with a paint coat. It is supplied either with screwed or flanged ends (1). The variants of casings are shown under para. 4, further are possible on request.

The casing has sightglasses (2) for inspection of function of the switching systems. The sightglasses with scale divisions permit reading of collected gas volume.

The relays can be equipped with lids (3, may be folded up) before the sightglasses.

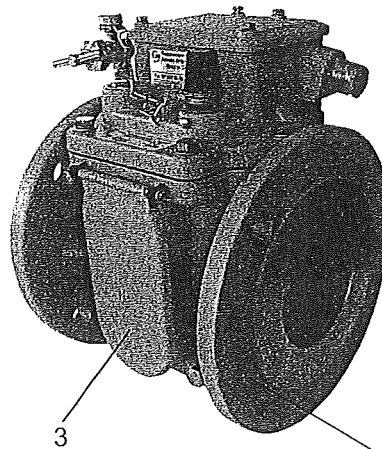


Figure 1A : casing with  
flange connection

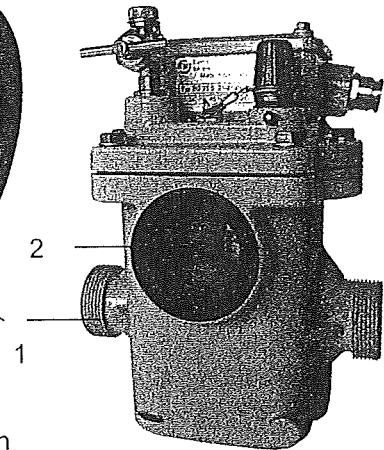


Figure 1B : casing with  
thread connection

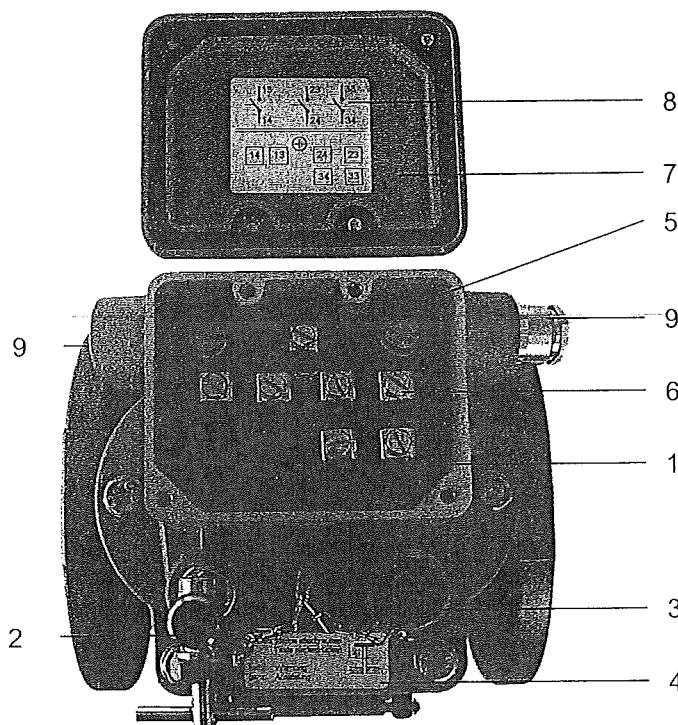


Figure 2 : cover with dismantled cap

### Cover (Figure 2)

The cover is a weather-resistant casting of light alloy and is provided with a paint coat. Terminal box (1), test valve (2) and test key, covered by a cap nut (3) as well as a plate for operation of the test key (4) are arranged above the cover. The terminal box has an earthing contact (5) and the electrical connectors (6). The aluminium cap (7) seals the terminal box. If the cap is opened the contact setting (8) can be seen.

The cable may be optionally brought in through one of both cable glands (9).

## Switchgear (Figures 3A and 3B)

The switchgear has the following main components:

- Switching system
- Carrier, frame
- Mechanical testing device.

Whereas the single-float Buchholz relay has only one switching system, the double-float Buchholz relay has an upper and a lower switching system.

Permanent magnet and float are rigidly linked forming an unit that is movably fitted to the frame together with mechanical testing device and magnet contact tube(s).

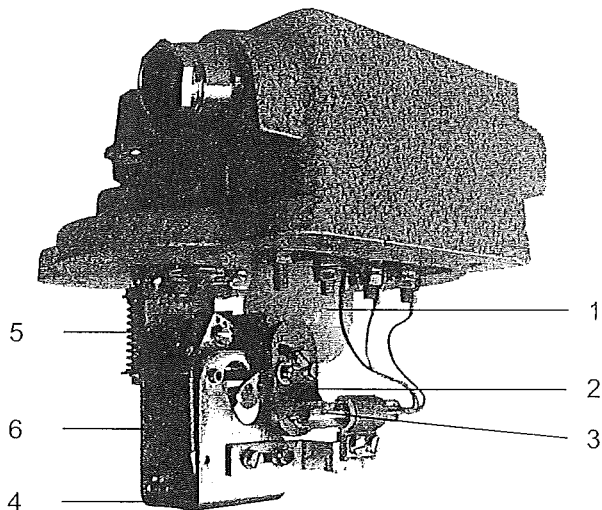


Figure 3A : Switchgear of a single-float Buchholz relay

### Switchgear of a single-float Buchholz relay:

- float (1)
- permanent magnet (2)
- one or two magnet contact tubes (3)
- frame (4)
- mechanical testing device (5)
- damper (6)

The damper is hold by permanent magnets.

### Switchgear of a double-float Buchholz relay:

- upper float (1)
- lower float (1a)
- permanent magnet for upper float (2)
- permanent magnet for lower float (2a)
- one or two magnet contact tubes for upper switching system (3)
- one or two magnet contact tubes for lower switching system (3a)
- frame (4)
- mechanical testing device (5)
- damper (6)

The damper is hold by permanent magnets and acts on the lower switching system.

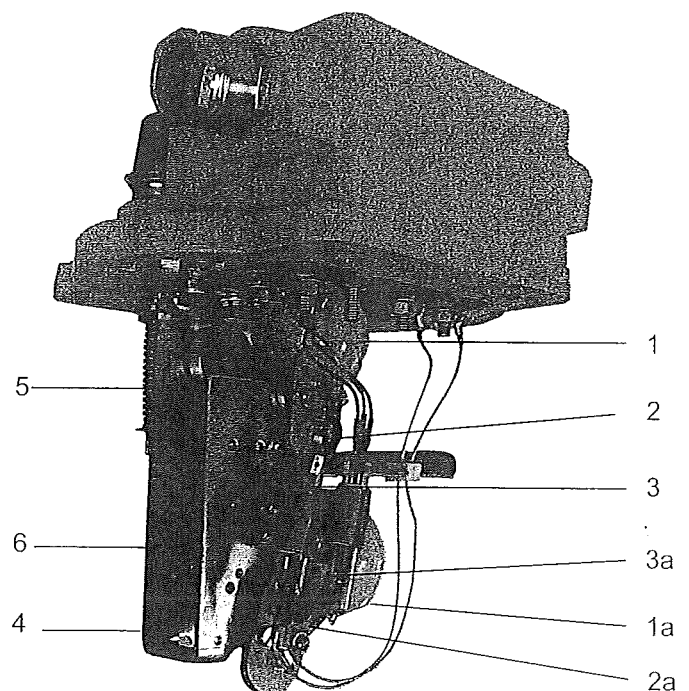


Figure 3B : Switchgear of a double-float Buchholz relay

## 2. Function

In the following the operation of a Buchholz relay is explained using the example of a double-float Buchholz relay.

The relay is built in the connecting pipe between the transformer tank and the conservator. During normal operation it is filled completely with insulating liquid. Due to buoyancy the floats are at their top position. If a fault occurs inside the transformer, the Buchholz relay responds as follows:

### Gas accumulation (Figure 4)

**Fault:** Free gas is available in the insulating liquid.

**Response:** The gas in the liquid moves upwards, accumulates in the Buchholz relay and displaces the insulating liquid level. The moving float actuates a switch contact (magnet contact tube).

An alarm signal is tripped.

The lower float is not affected as from a certain gas volume the gas flows through a piping to the conservator.

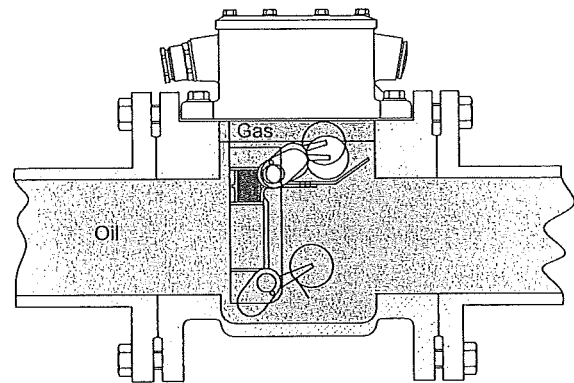


Figure 4: Gas accumulation

### Insulating liquid loss (Figure 5)

**Fault:** Insulating liquid loss due to leakage.

**Response:** As the liquid level falls the top float moves downward. An alarm is tripped. If the liquid loss continues, conservator and piping as well as the Buchholz relay will be emptied.

As the liquid level falls, the lower float moves downward. The moving float actuates a switch contact so that the transformer is disconnected.

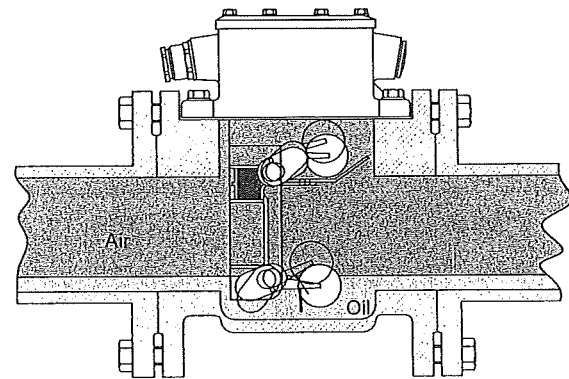


Figure 5: Insulating liquid loss

### Insulating liquid flow (Figure 6)

**Fault:** A spontaneous incident generates a pressure wave moving in the direction of the conservator.

**Response:** The liquid flow reaches a damper arranged in the liquid flow. If the flow rate exceeds the operating threshold of the damper, the latter moves in flow direction. Due to this movement a switch contact is actuated so that the transformer is disconnected.

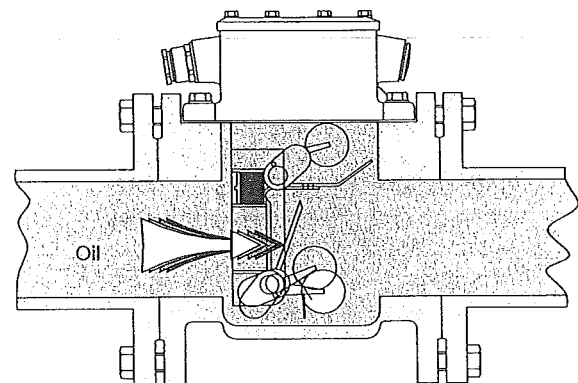


Figure 6: Insulating liquid flow

The upper and lower switching system form a functional unit in the single-float Buchholz relay. In case of a fault, the single-float Buchholz relay normally isolates the transformer immediately from the mains system.



### 3. Tests

To each Buchholz relay a works-number is given mentioned in the test certificate. Furthermore the tests made with each Buchholz relay

- Dielectric strength test  
(AC 2000 V against casing)
- Leakage test  
(25 min with 80° C warm Transformer oil at 0.25 MPa)
- Functional test  
(damper setting, switching systems)

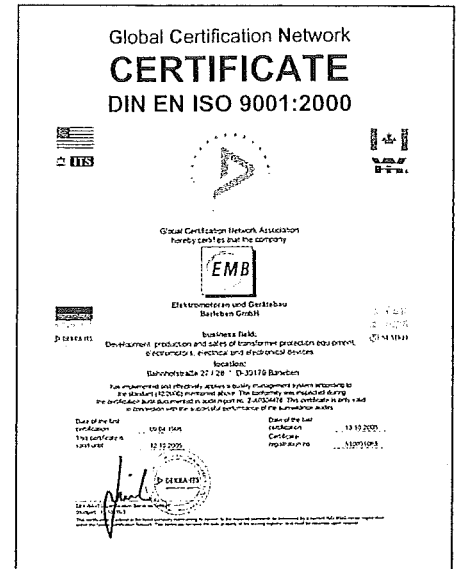
are documented in the test certificate.

The Buchholz relays are delivered in transport cardboards. In the cap nut of the test key there is a temporary lock for the switching system. This temporary lock has to be removed before the device is taken into operation.

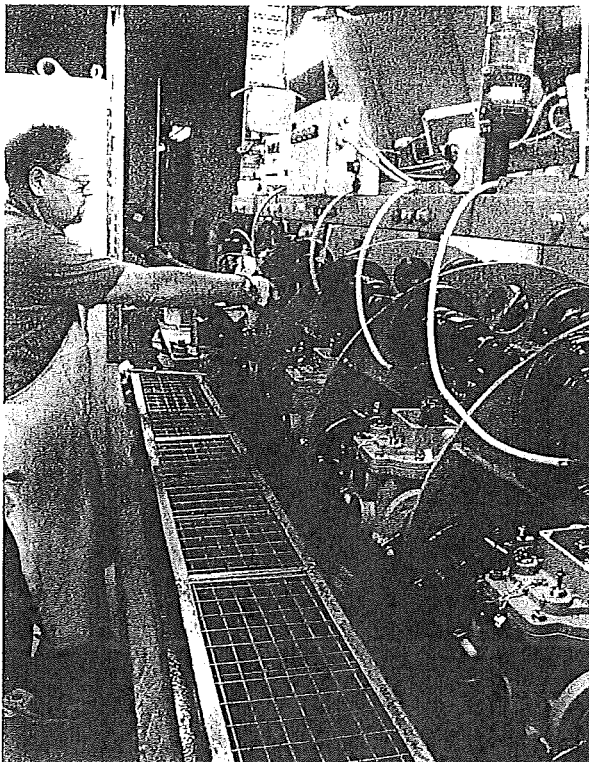
With each device we deliver

- operating instructions
- test certificate

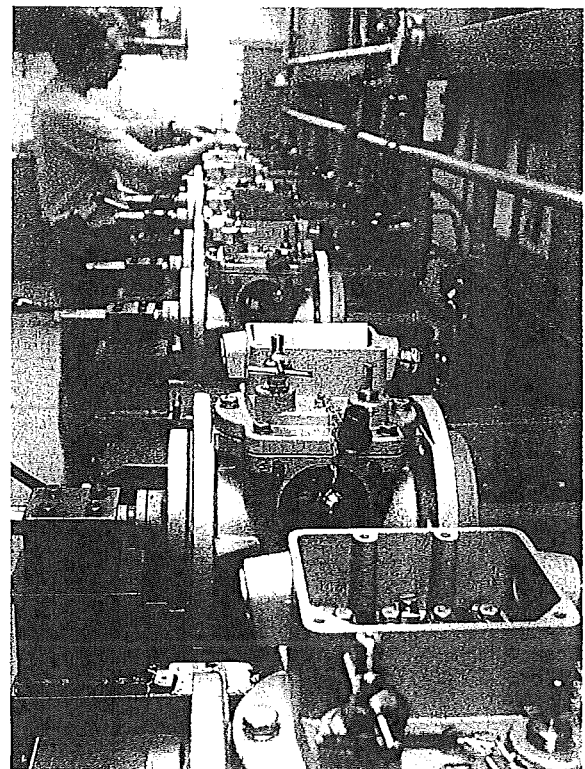
in the desired language.



DIN EN ISO 9001:2000 certificate




Flow test



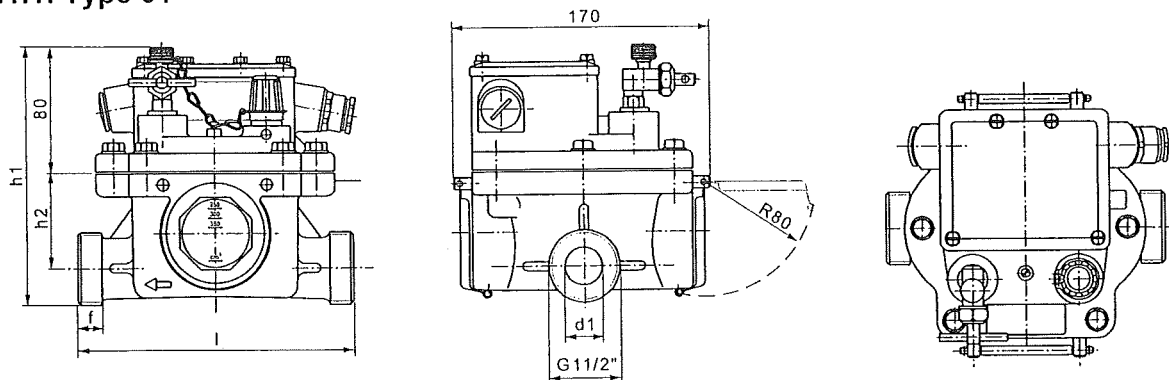
Functional and leakage test

## 4. Type list


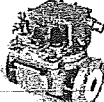

### 4.1. Single-float Buchholz relays thread connection

	Type code no. Works-design. DIN-design.	Mode of connection	DN of pipe (mm) $d_1$	Flange dimensions (mm) $d_2$ $d_3$ $d_4$ $d_5$ $f$					Device dimensions (mm) $l$ $h_1$ $h_2$			weight (kg)	Suited for transformer ratings of
	<b>01</b> (AG 25) (CG 25)	Connection thread G 1 1/2 "	<b>25</b>	-	-	-	-	16	185	170	62	3.1	≤ 1600 KVA

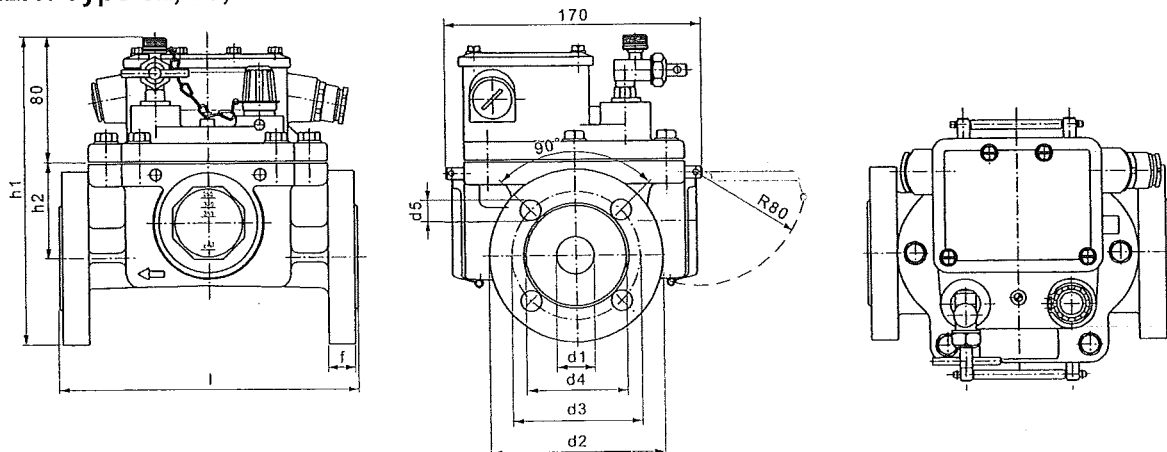
#### 4.1.1. Type 01



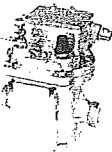
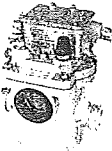
### 4.2. Single-float Buchholz relays flange connection

	Type code no. Works-design. DIN-design.	Mode of connection	DN of pipe (mm) $d_1$	Flange dimensions (mm) $d_2$ $d_3$ $d_4$ $d_5$ $f$					Device dimensions (mm) $l$ $h_1$ $h_2$			weight (kg)	Suited for transformer ratings of
	<b>02</b> (AF 25/6) (-)	Flange 4-holes	<b>25</b>	100	75	60	12	12	185	195	62	3.6	≤ 1600 KVA
	<b>03</b> (AF 25/10) (-)	Flange 4-holes	<b>25</b>	115	85	68	14	16	200	205	62	4.0	≤ 1600 KVA
	<b>25</b> (AF 25) (-)	Flange 4-holes	<b>25</b>	100	75	--	12	10	160	195	62	3.3	≤ 1600 KVA

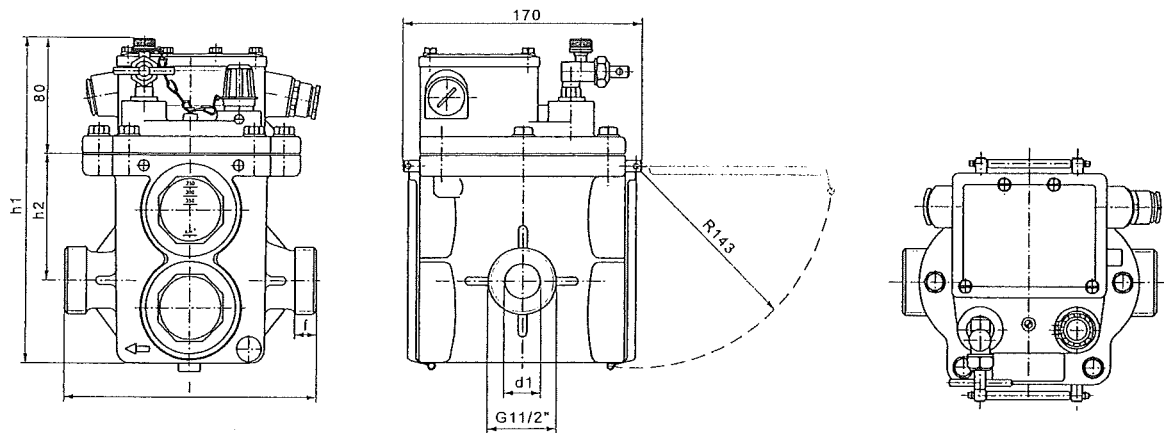
#### 4.2.1. Type 02, 03, 25



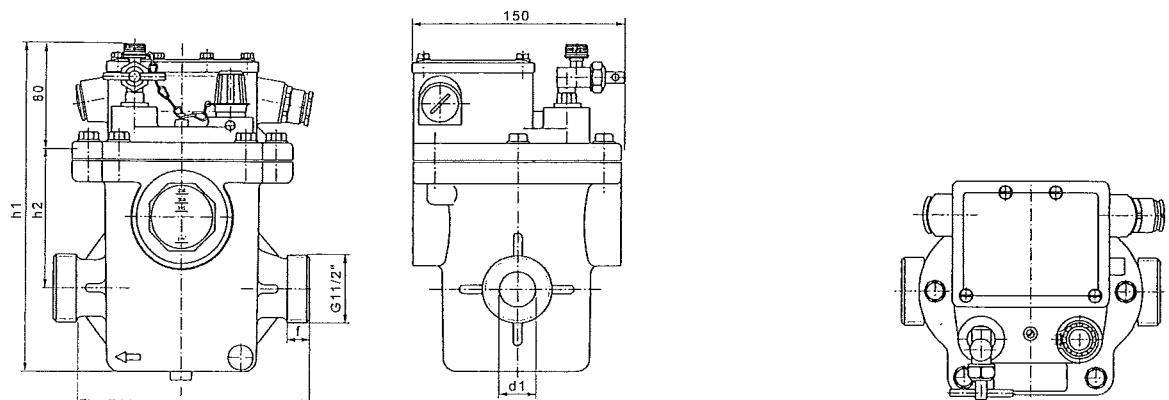
### 4.3. Double-float Buchholz relays thread connection

	Type code no. Works-design. DIN-design.	Mode of connection	DN of pipe (mm) $d_1$	Flange dimensions (mm)					Device dimensions (mm)			weight (kg)	Suited for transformer ratings of
				$d_2$	$d_3$	$d_4$	$d_5$	$f$	$l$	$h_1$	$h_2$		
	<b>04</b> (BG 25) (DG 25)	Connection thread $G 1\frac{1}{2}"$	<b>25</b>	-	-	-	-	16	185	235	90	4.2	$\leq 5000$ KVA
	<b>21</b> (BG 25 S) (-)	Connection thread $G 1\frac{1}{2}"$	<b>25</b>	-	-	-	-	16	185	235	90	3.6	$\leq 5000$ KVA

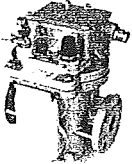
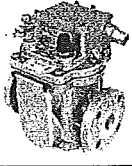
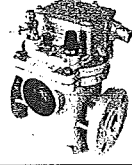

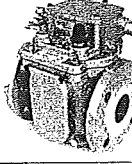
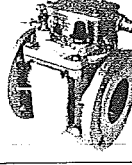
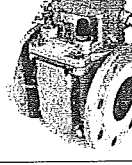
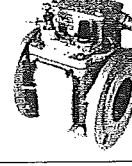
#### 4.3.1. Type 04



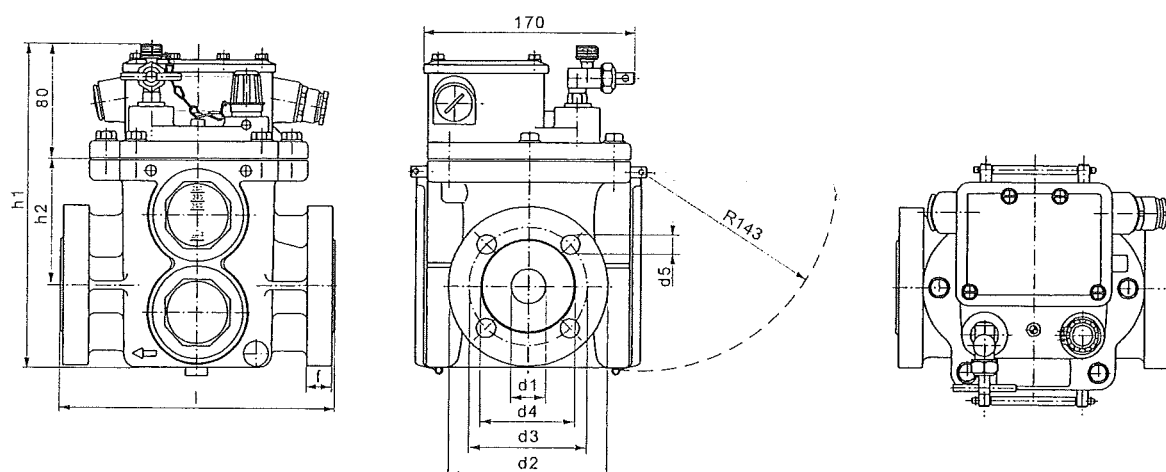
#### 4.3.2. Type 21



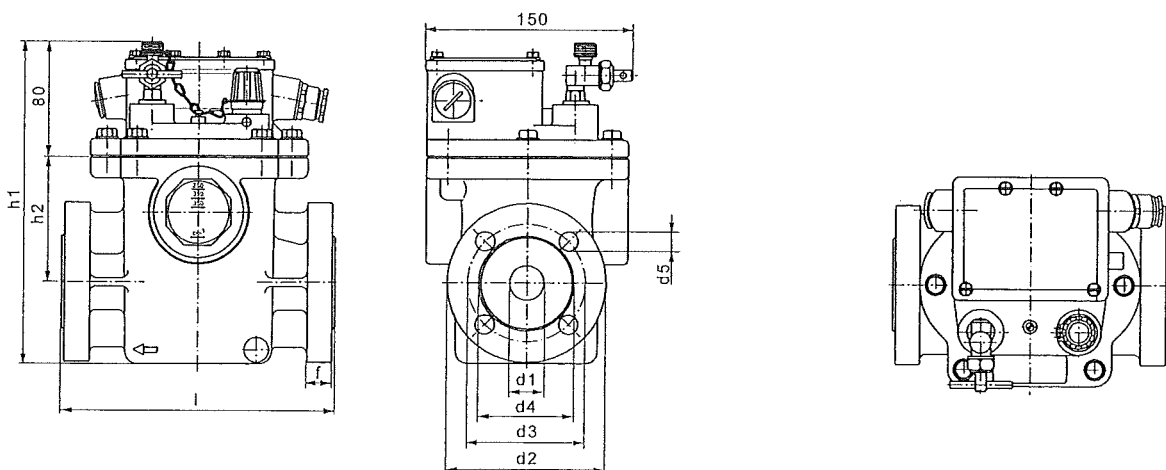
#### 4.4. Double-float Buchholz relays Flange connection (round)

	Type code no. Works-design. DIN-design.	Mode of connection	DN of pipe (mm) d <sub>1</sub>	Flange dimensions (mm)					Device dimensions (mm)			weight (kg)	Suited for transformer ratings of
				d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	f	l	h <sub>1</sub>	h <sub>2</sub>		
	<b>05</b> (BF 25/6) (-)	Flange 4-holes	<b>25</b>	100	75	60	12	12	185	235	90	4.4	≤ 5000 KVA
	<b>06</b> (BF 25/10) (DR 25)	Flange 4-holes	<b>25</b>	115	85	68	14	18	200	235	90	4.8	≤ 5000 KVA
	<b>23</b> (BF25/10S) (-)	Flange 4-holes	<b>25</b>	115	85	68	14	18	200	235	90	4.4	≤ 5000 KVA
	<b>07</b> (BF 50/6) (-)	Flange 4-holes	<b>50</b>	140	110	90	14	12	185	235	80	4.6	≥ 5000 KVA ≤ 10000 KVA
	<b>08</b> (BF 50/10) (DR 50)	Flange 4-holes	<b>50</b>	165	125	102	18	16	195	250	80	5.9	≥ 5000 KVA ≤ 10000 KVA
	<b>09</b> (BF 80/10) (-)	Flange 4-holes	<b>80</b>	200	160	138	18	15	195	265	80	6.2	≥ 10000 KVA
	<b>09-26.</b> (BF80/10/8) (DR 80)	Flange 8-holes	<b>80</b>	200	160	138	18 M16	15	195	265	80	6.2	≥ 10000 KVA
	<b>24</b> (BF 80/6) (-)	Flange 4-holes	<b>80</b>	190	150	130	18	15	195	260	80	6.0	≥ 10000 KVA

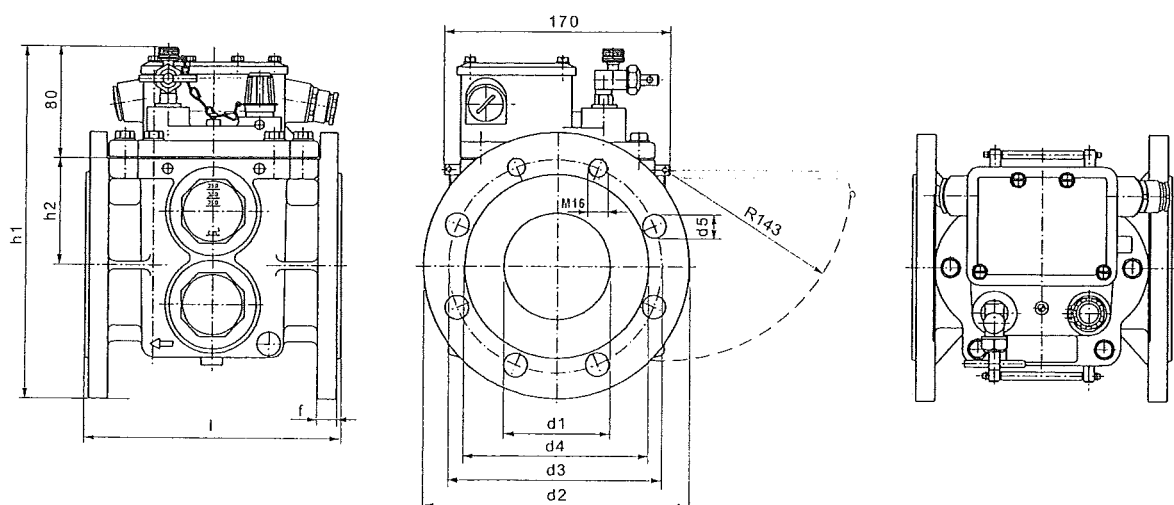
#### 4.4.1. Type 05, 06, 07, 08, 09, 24



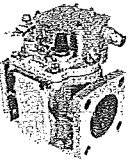
#### 4.4.2. Type 23



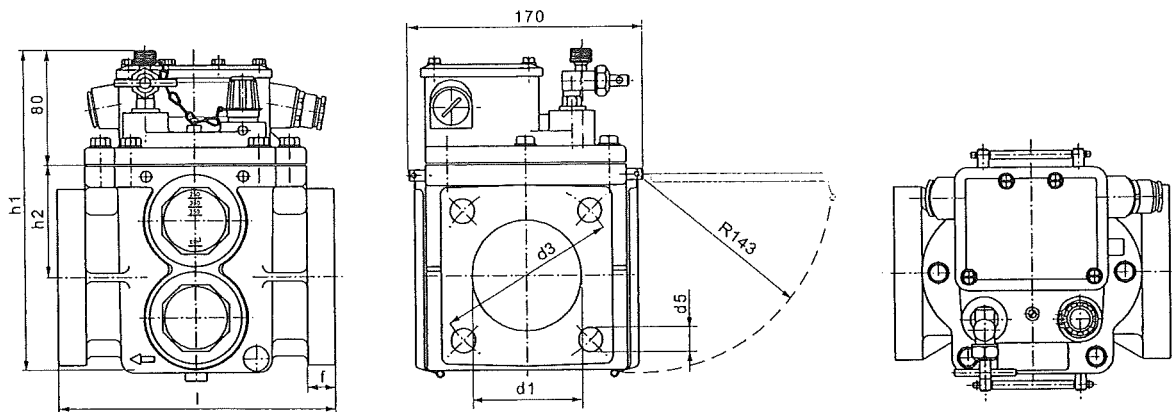
#### 4.4.3. Type 09-26.



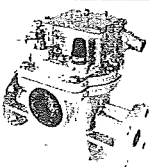


#### 4.5. Double-float Buchholz relays Flange connection (square)

	Type code no. Works-design. DIN-design.	Mode of connection	DN of pipe (mm) $d_1$	Flange dimensions (mm)					Device dimensions (mm)			weight (kg)	Suited for transformer ratings of
				$d_2$	$d_3$	$d_4$	$d_5$	$f$	$l$	$h_1$	$h_2$		
	<b>10</b> <b>(BF 80/Q)</b> <b>(DQ 80)</b>	Flange square 4-holes	<b>80</b>	125	132	-	18	20	200	235	80	5.0	$\geq 10000$ KVA

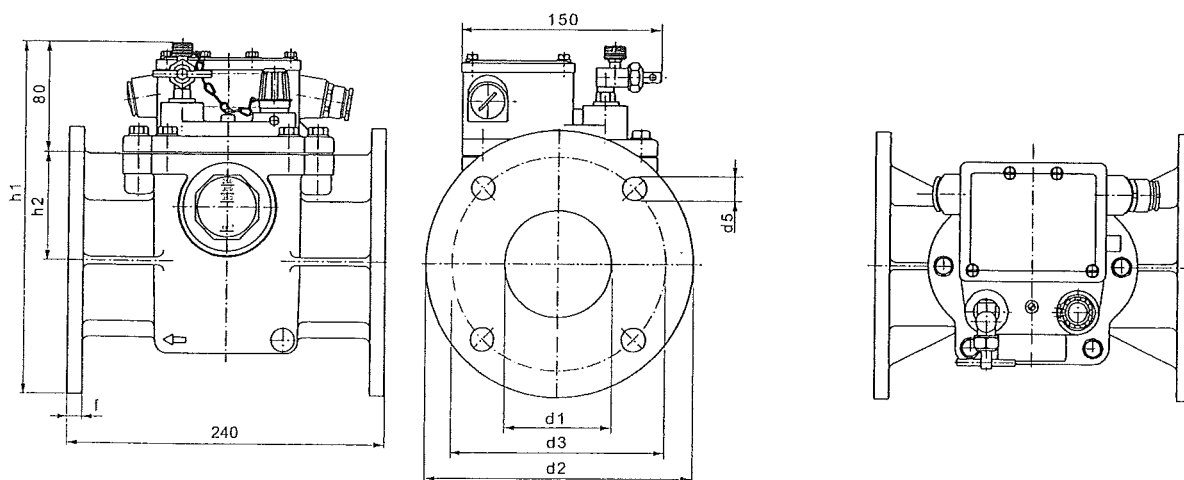
##### 4.5.1. Type 10



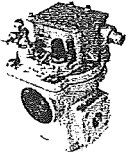

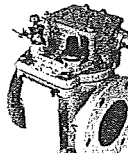
#### 4.6. Buchholz relays according to French norm

	Type code no. Works-design.	Mode of connection	DN of pipe (mm) $d_1$	Flange dimensions (mm)				Device dimensions (mm)			weight (kg)	Suited for transformer ratings of
				$d_2$	$d_3$	$d_5$	$f$	$l$	$h_1$	$h_2$		
	<b>41</b> (NF 25)	Flange 4-holes	<b>25</b>	115	85	14	8	240	235	90	4.2	$\leq 5000$ KVA
	<b>42</b> (NF 50)	Flange 4-holes	<b>50</b>	165	125	18	11	240	250	80	5.1	$\geq 5000$ KVA $\leq 10000$ KVA
	<b>43</b> (NF 80)	Flange 4-holes	<b>80</b>	200	160	18	11	240	265	80	5.5	$\geq 10000$ KVA

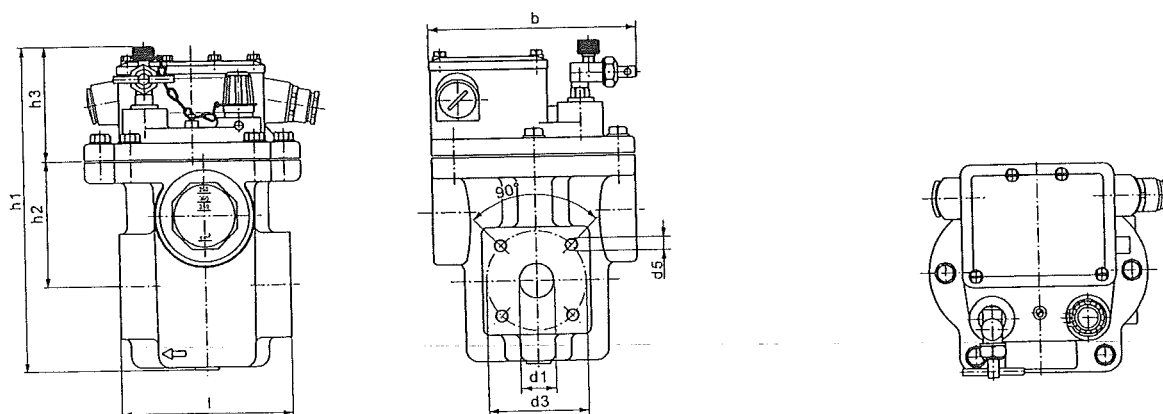
##### 4.6.1. Types 41, 42, 43



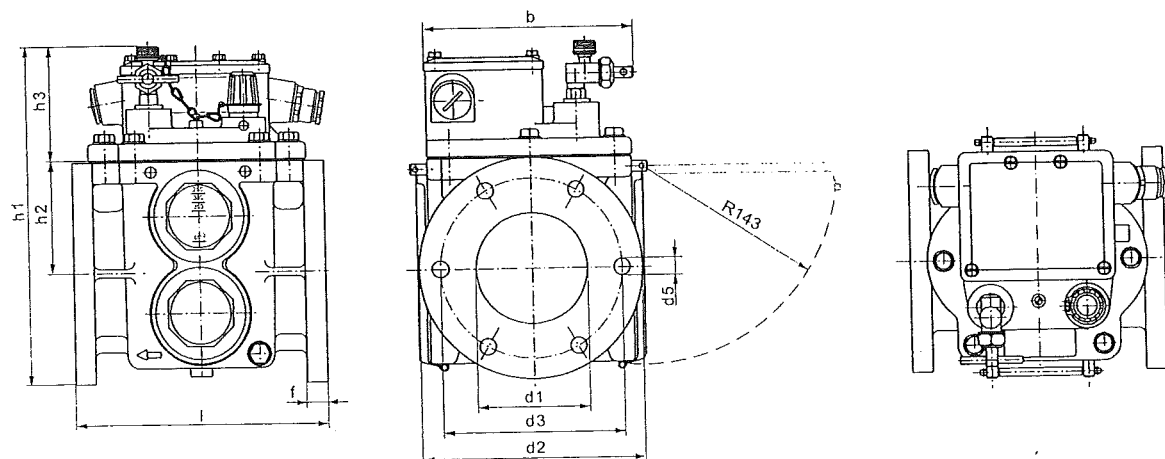
#### 4.7. Buchholz relays according to British standard

	Type code no. Works-design.	Mode of connection	DN of pipe (mm) (inch) $d_1$	Flange dimensions (mm) (inch)				Device dimensions (mm) (inch)					weight (kg)	Suited for transformer ratings of
				$d_2$	$d_3$	$d_5$	f	b	l	$h_1$	$h_2$	$h_3$		
	<b>51</b> (BS 25)	Flange square 4-holes	<b>25</b>	-	72 2.83	M10 M10	-	170 6.69	127 5	235 9.25	90 3.54	80 3.15	3.7	$\leq 5000$ KVA
	<b>52</b> (BS 50)	Flange 6-holes	<b>50</b>	140 5.51	110 4.33	12 0.47	12 0.47	170 6.69	185 7.28	235 9.25	80 3.15	80 3.15	4.8	$\geq 5000$ KVA $\leq 10000$ KVA
	<b>53</b> (BS 80)	Flange 6-holes	<b>80</b>	160 6.30	130 5.12	12 0.47	13 0.51	170 6.69	185 7.28	240 9.45	80 3.15	80 3.15	5.0	$\geq 10000$ KVA

##### 4.7.1. Type 51



##### 4.7.2. Types 52, 53





## 5. Technical data

Table 1

Parameter	Data	Notes
Nominal voltage	AC 230 V DC 230 V	12 V to 250 V 12 V to 250 V
Nominal current	AC 2 A DC 2 A	0.05 A to 2 A 0.05 A to 2 A
Contact voltage capacity	AC 1000 V	--
Insulation voltage capacity	AC 2000 V	Contact against casing
Temperature range: - ambient temperature  - working range * temperature of the insulation liquid  * viscosity of the insulation liquid	-45°C to +55°C -49°F to +131°F  -25°C to +115°C -13°F to +239°F  1 mm <sup>2</sup> /s to 1100 mm <sup>2</sup> /s	Others on request
Shock resistance	class 4M6	
- Earthquake / Vibration	2g (peak value) frequency range 2Hz to 200 Hz	--
- Impact	25g / shock duration 11 ms	--
Resistance to pressure	0.25 MPa	--
Resistance to vacuum	< 2.5 kPa	--
Insensitivity to magnetic fields	25 mT	--
Switching system: - Switching contact - damper - Response time of damper  Response of switching system in case of: - Gas accumulation  - Flow of insulation liquid	magnet contact tube hold by magnets < 0.1 s   200 cm <sup>3</sup> to 300 cm <sup>3</sup>  0.65 m/s ± 15 % 1.00 m/s ± 15 % 1.50 m/s ± 15 % 2.00 m/s ± 15 % 2.50 m/s ± 15 % 3.00 m/s ± 15 %	-- -- --  --  Others on request
Cable gland	M 20x1.5	On request M 25x1.5 or Pg 16
Nominal installation position	1° ascending towards expansion vessel	0° to 5°
Degree of protection	IP 54	Others on request

## 6. Special designs

Special designs are available for use under conditions for which the Buchholz relays of standard design are not sufficient. The possibilities are mentioned in table 2.

Table 2

Explanation	Identif. no.
Silicone oil is used as insulation liquid	20
Midel oil is used as insulation liquid	21
Climatic version (suited for tropical or frigidal open-air climates)	22
Climatic version (suited for extrem frigidal open-air climates below -45 °C)	34
Special design approved by RWE, Germany	24
Special design approved by VKR, Germany	30
Upper switching system equipped with two magnet contact tubes	35
Lower switching system equipped with two magnet contact tubes	25
Upper <b>and</b> lower switching system each equipped with two magnet contact tubes	33
Testing of the switching systems by means of air <b>and</b> test key	32
Damper hold in response position	23
With oil drain plug	28
Customer requests on the basis of conditions agreed with the manufacturer	29
NM series – Buchholz relay with analog measurement of the gas volume	60

### 6.1. Explanations to Identif. no. 32

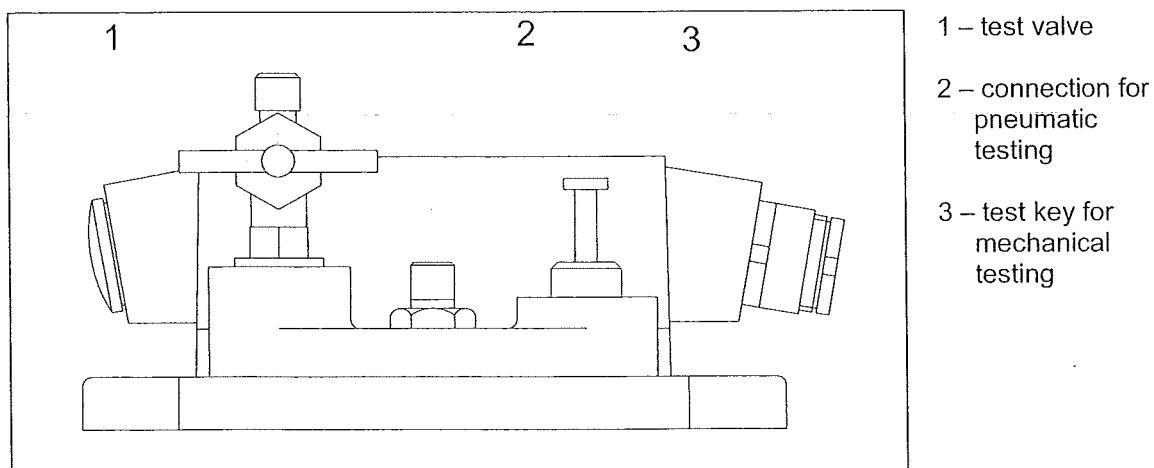
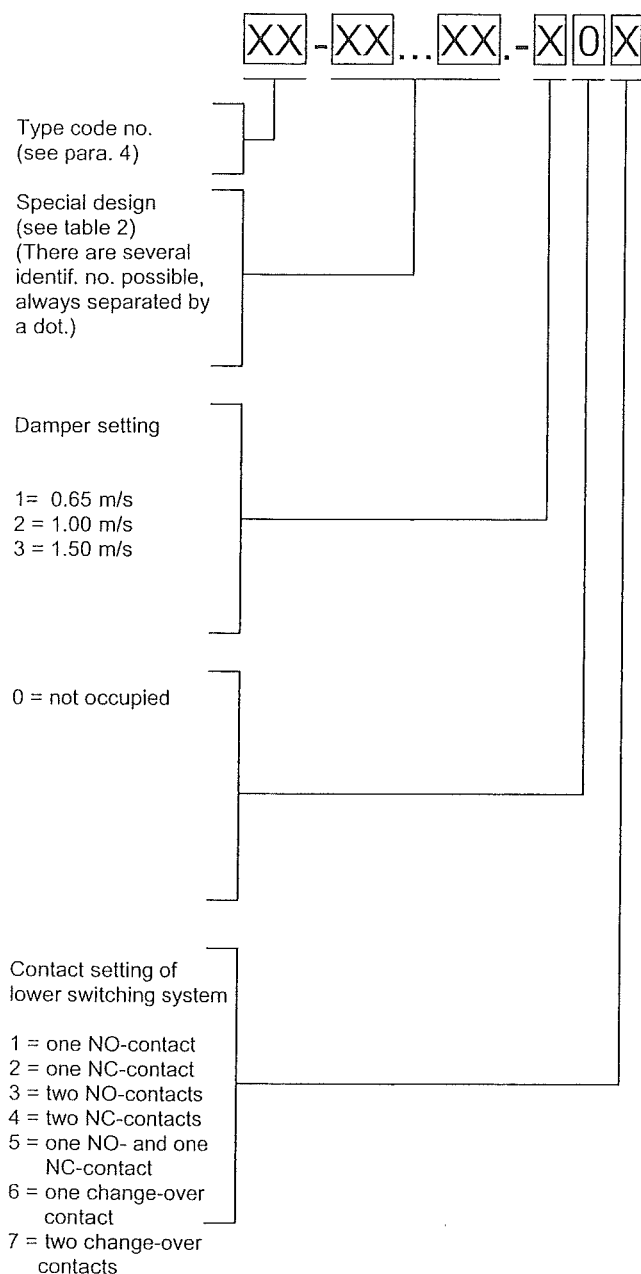


Figure 7: cover

## 7. Ordering data

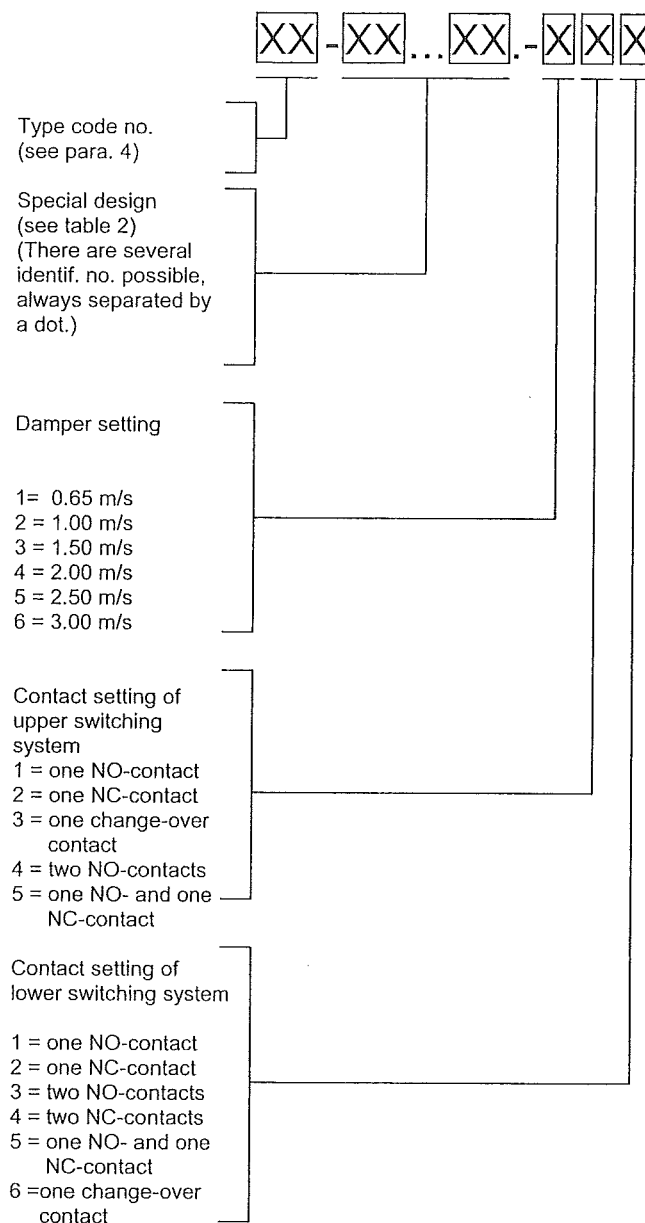
For placing orders, please, use the following key:

### Single-float Buchholz relays



**Important remark:** NO = normally-open  
NC = normally-closed

### Double-float Buchholz relays



### Ordering example:

Buchholz relay 09-22.25.26.28.-313 **Explanation:**

- 09 = Designation of a double-float Buchholz relay type 09
- 22 = climatic version
- 25 = lower switching system equipped with 2 magnet contact tubes
- 26 = Eight-hole-flange
- 28 = Oil drain plug
- 3 = Damper setting of 1.50 m/s
- 1 = contact setting of upper switching system – 1 NO-contact
- 3 = contact setting of lower switching system – 2 NO-contacts

## **8. Additional devices**

Elektromotoren und Gerätebau Barleben GmbH may supply further products for protection and supervision of liquid-insulated transformers.

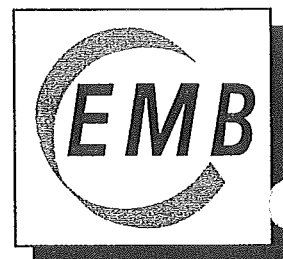
Please, ask for our separate catalogues.

<u>designation</u>	<u>description</u>
<b>ZG 1.2.</b>	<b>Gas sampling device</b> The device is mounted at the transformer and connected to the Buchholz relay by means of a pipe. It allows to sample the relay gas at normal operating level. A manual and an automatic version are available. The devices can be delivered with a lockable box.
<b>ZG 3.1.</b>	<b>Gas testing device</b> The device serves to analyse the relay gas by means of two test fluids. It can be mounted directly on the Buchholz relay as well as on the Gas sampling device ZG 1.2.
<b>ZG 4.1.</b>	<b>Reflux lock</b> The device prevents that the insulation liquid gets into the Gas testing device.
<b>ZG 5.1. ZG 5.2.</b>	<b>Test pump</b> The device serves to check the upper switching system by means of air. - manual-actuated - foot-actuated
<b>ZG 6.1.</b>	<b>Oil sampling device</b> The device is connected to the Buchholz relay by means of a pipe and serves to take oil samples (can be used for Buchholz relays with oil drain plug).
<b>BGS</b>	<b>Buchholz gas sampler</b> The Buchholz gas sampler can be connected to the Buchholz relay or to the Gas sampling device. It serves to sample and to transport safe the gas.
<b>BGT</b>	<b>Buchholz gas tester</b> The Buchholz gas tester serves to analyze the Buchholz gas regarding the hydrogen concentration.
<b>ÜRF 25/10</b>	<b>Monitoring relay for tap changer</b>
<b>SG 25 SF 25/10</b>	<b>Oil flow indicator</b> - with thread connection - with flange connection

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Notes:

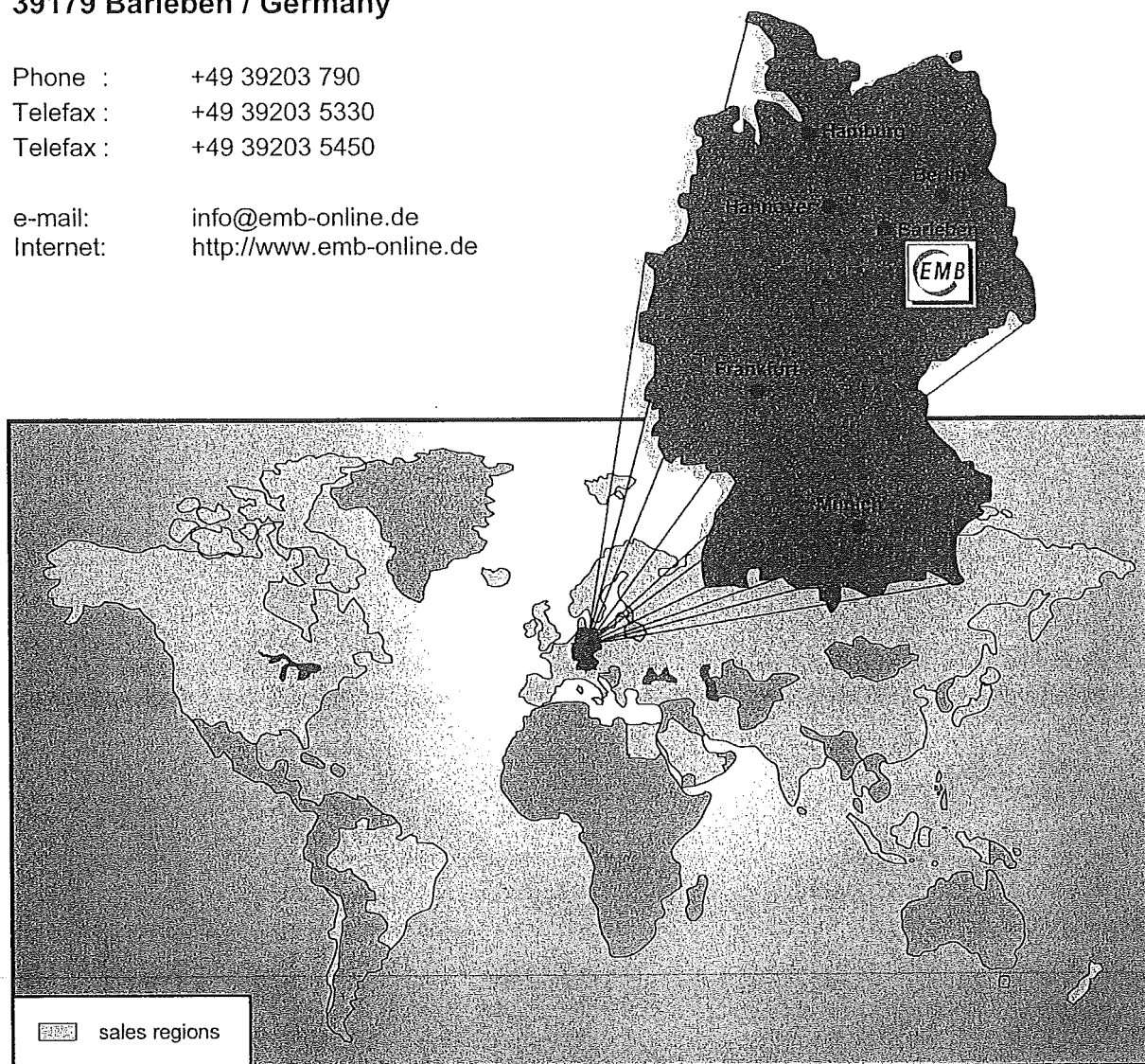
# Elektromotoren und Gerätebau Barleben GmbH



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Edition: Catalogue Buchholz relays 01 / 04 English

Due to technical improvement of our products, the information contained in this brochure may be subjected to change without notice.

Date : September 1993

## 1. Installation

### 1.1 Pipe-mounting (Figure 1)

The Buchholz relay (2) has to be installed in the pipe (4) that is connecting the tank (1) of the device to be protected (transformer, reactance coil) with the expansion tank (5).

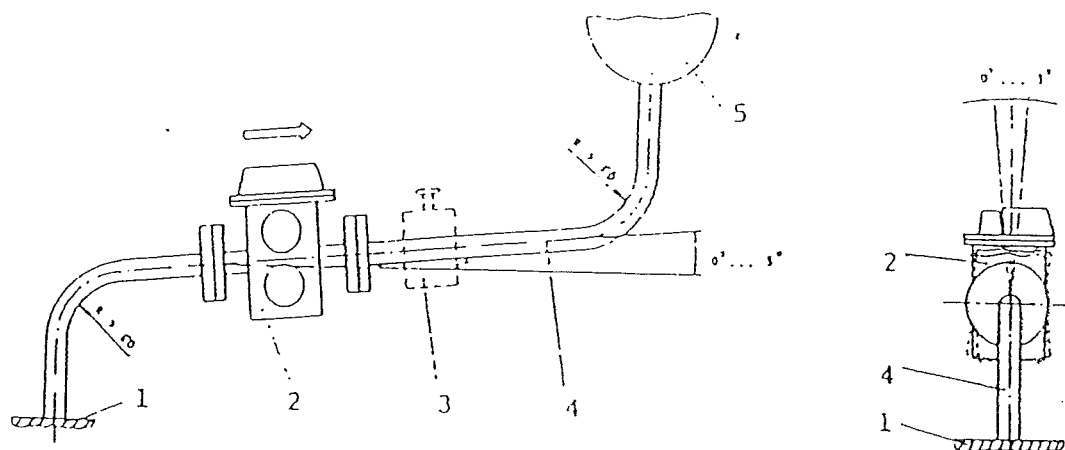


Figure 1 Pipe-mounting

When installing, note the following:

- The red arrow on the casing cover must point to the expansion tank.
- The upward slope of the pipe leading to the expansion tank must not fall below  $0^\circ$ , but should not exceed  $5^\circ$ .
- The sloping position of the Buchholz relay across the flow direction is such that the deviation from the perpendicular does not exceed  $5^\circ$ .
- The pipe should not contain any elbows. The radii of bends (R) must be greater than 50.
- The following limits apply to free pipe lengths between the Buchholz relay and the nearest reference point:

Nominal diameter	DN 25	DN 50	DN 80
Distance (m)	0.5	0.7	1.0

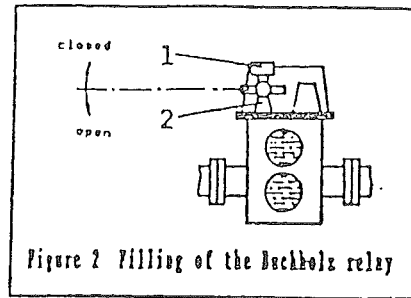
In case of longer distances than indicated, a supporting element should be provided next to the Buchholz relay.





### 1.2 Filling of the Buchholz relay (Figure 2)

- \* Screw off low cap nut (1) from test valve (2).
- \* Open test valve and let the air escape from the Buchholz relay.
- \* Close test valve when insulating liquid starts to flow out.
- \* Tighten low cap nut on test valve.



### 1.3 Draining of the Buchholz relay (Figure 1)

- \* Close shutoff valve (3) on expansion tank side (5).

Open the Buchholz relay

- \* Lower insulating liquid level down to the upper mark of the glass front.

Dismantle the Buchholz relay

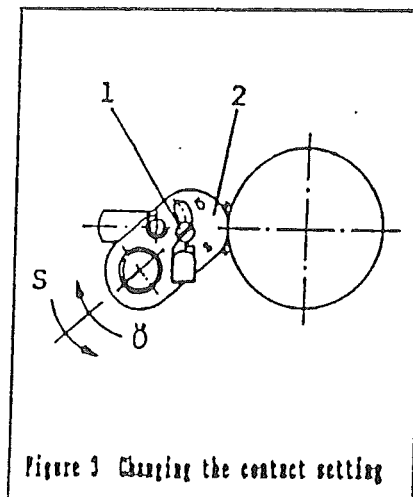
- \* Lower insulating liquid level down to the level of the lower interior wall of the piping.

### 1.4 Changing the contact setting (Figure 3)

Unless otherwise agreed, the switching systems of the devices are supplied as make contacts. The "make" setting can be changed, however, into the "break" setting, and vice versa. The manufacturer's setting of switching systems provided with changeover magnetic switches cannot be changed.

To change the setting, proceed as follows:

- \* Drain the Buchholz relay.
- \* Unscrew the M8 hexagon head cap screws of the cover.
- \* Remove cover together with switch mechanism from housing.
- \* Unscrew M3 fillister head screw (1).
- \* Turn magnetic mount (2) into the position marked "0" (break contact element) or "S" (make contact element).
- \* Tighten M3 fillister head screw.
- \* Put cover together with switch mechanism in the housing.



Ensure that

- the red arrow on the cover points to the expansion tank, and that
- the seal and the sealing faces are free from insulating liquid.

Tighten the M8 hexagon head cap screws uniformly.

- \* Fill the Buchholz relay. Carry out a functional test.



### 1.5 Changing the baffle plate setting (Figure 4, Figure 5)

Unless otherwise agreed, the supplied baffle plate is adjusted to a flow rate of the insulating liquid of 1.0 m/s. The manufacturer's setting can be changed to 0.65 m/s or 1.5 m/s, and vice versa.

On request, the flow rate can be set to 2.0 m/s by the manufacturer. This setting cannot be changed by the customer, however.

To change the setting, proceed as follows:

- \* Drain the Buchholz relay.
- \* Unscrew the M8 hexagon head screws of the cover.
- \* Remove cover together with switch mechanism from housing.

#### Single-float Buchholz relay (Figure 4)

- \* Loosen setting screw (2).
- \* Displace the upper part of baffle plate (3), until its cam snaps into the lower part of the baffle plate (1) at the desired operating value.
- \* Tighten setting screw.

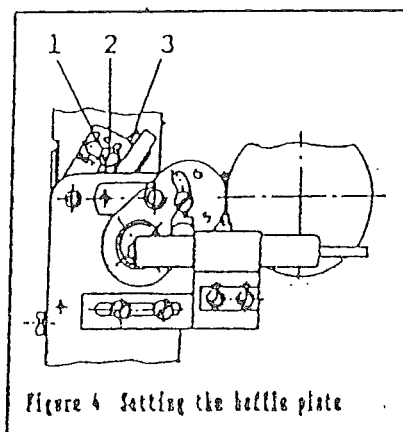


Figure 4 Setting the baffle plate

#### Two-float Buchholz relay (Figure 5)

- \* Loosen the setting screw (2).
- \* Lift magnetic mount (1) out of snap-in slots (3) of intermediate plate (4) and displace it, until the window (5) of the magnetic mount indicates the desired operating value.
- \* Snap magnetic hold into place.
- \* Tighten setting screw.

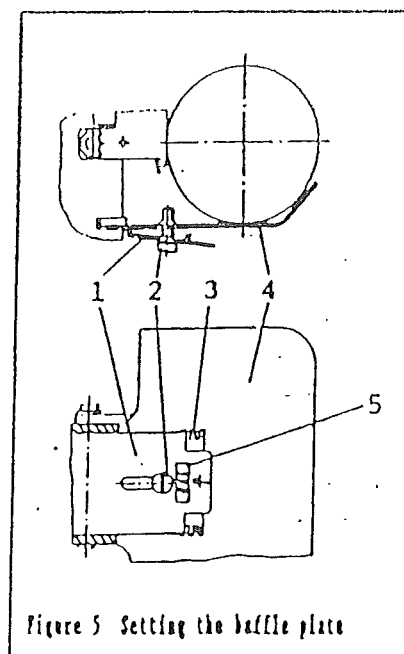


Figure 5 Setting the baffle plate

- \* Put cover together with switch mechanism in the housing.

Ensure that

- the red arrow on the cover points to the expansion tank, and that
- the seal and the sealing faces are free from insulating liquid.

- \* Tighten the M8 hexagon head cap screws uniformly.



## 1.6 Electrical connection (Figure 6)

The closure of the terminal box provides protection from contact and dust.

Connect the cables as follows:

- \* Loosen the fillister head screw (2).
- \* Fold up the spring flap cover (1).
- \* Insert cable through Pg 16 screwed conduit (3).
- \* Connect cable to the marked terminal bolt (4). (max. permissible cross-section:  $4\text{mm}^2$ )
- \* Close spring flap cover.
- \* Tighten fillister head screw.

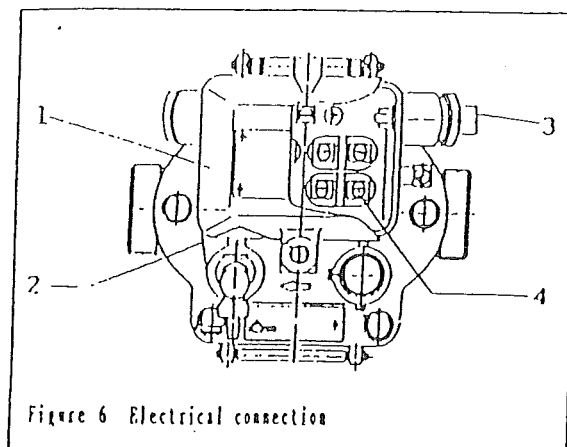


Figure 6 Electrical connection

Terminal box wiring is clear from the following diagrams:

Single-float Buchholz relay

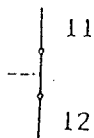
Contact setting of the switch system (disconnection):			
1 break contact element	1 make contact element	2 break contact elements	2 make contact elements
 12 11	 14 13	 12 11 21 22	 14 13 23 24
Contact setting of the switch system (disconnection):			
1 break contact element and 1 make contact element	1 change-over contact element		
 12 11 13 14	 2 1 4		



# Two-float Buchholz relay

Contact setting of the upper switching system (warning):

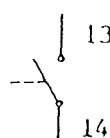
1 break contact element



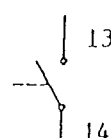
1 break contact element



1 make contact element

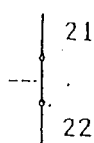


1 make contact element

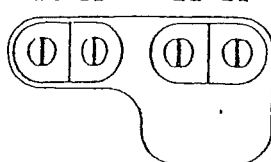


Contact setting of the lower switching system (disconnection):

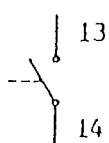
1 break contact element



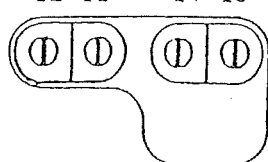
12 11 22 21



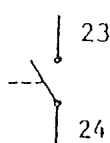
1 make contact element



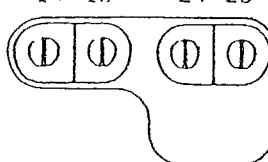
12 11 14 13



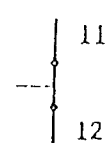
1 make contact element



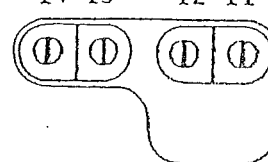
14 13 24 23



1 break contact element

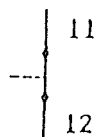


14 13 12 11

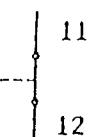


Contact setting of the upper switching system (warning):

1 break contact element



1 break contact element

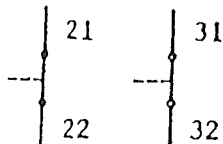


1 break contact element

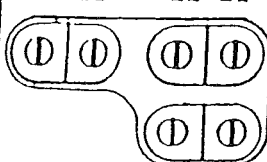


Contact setting of the lower switching system (disconnection):

2 break contact elements

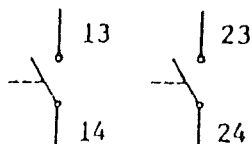


12 11 22 21

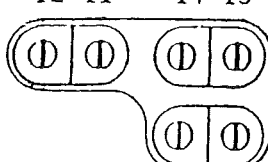


32 31

2 make contact elements

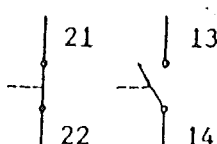


12 11 14 13

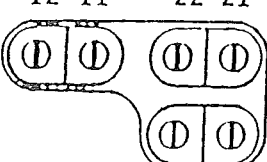


24 23

1 break contact element and 1 make contact element

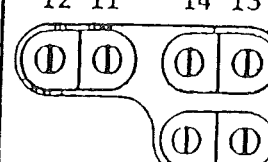


12 11 22 21



14 13

12 11 14 13



22 21

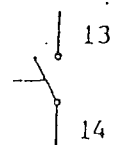




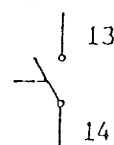
# Two-float Buchholz relay

Contact setting of the upper switching system (warning):

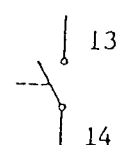
1 make contact element



1 make contact element

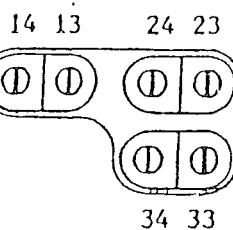
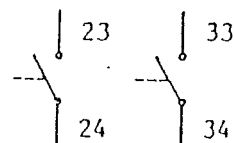


1 make contact element

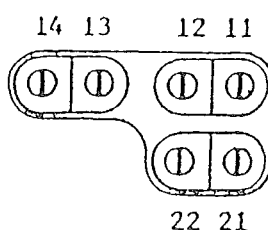
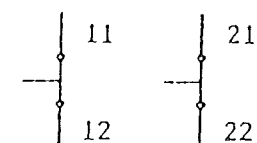


Contact setting of the lower switching system (disconnection):

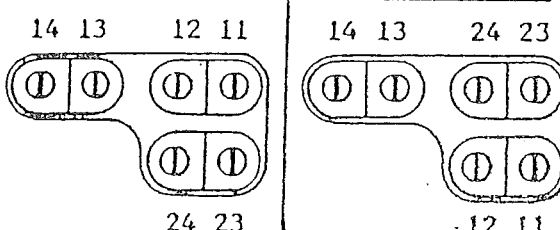
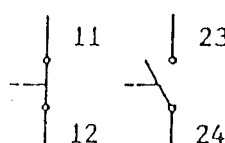
2 make contact elements



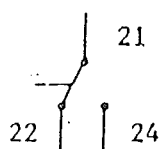
2 break contact elements



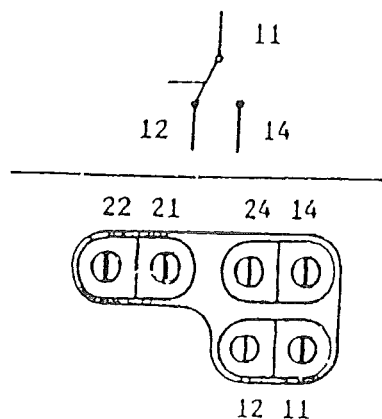
1 break contact element and 1 make contact element



Contact setting of the upper switching system (warning):  
1 change-over contact element

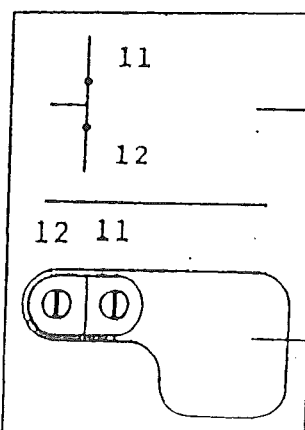


Contact setting of the lower switching system (disconnection):  
1 change-over contact element



Explanation of symbols:

Example: Single-float Buchholz relay



Graphical symbol with terminal marking and identification number

Terminal box wiring



ote: The illustration refers to switching systems in normal position. Normal position means the operating condition of the Buchholz relay completely filled with insulating liquid allowing trouble-free operation of the equipment to be protected. A plate showing the connection diagram and wiring is provided inside the spring flap cover.

Connected loads: Voltage AC 12V to 250V  
DC 12V to 250V

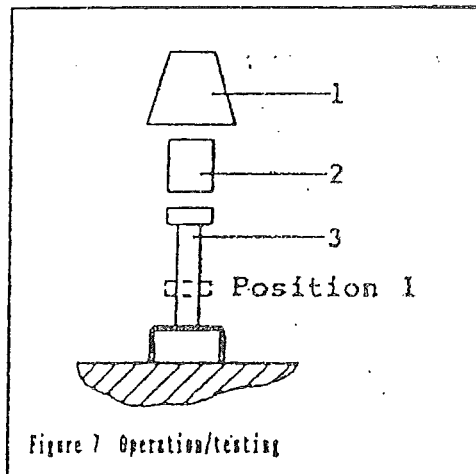
Current AC 2Amps  $\cos\phi \geq 0.4$   
DC 2Amps  $\tau=L/R \leq 75\text{ms}$

## 2. Operation

### 2.1 Single-float Buchholz relay (Figure 7)

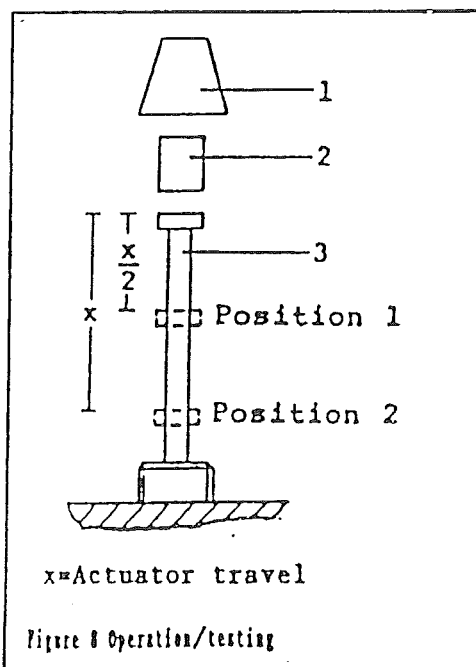
Screw off doned cap nut (1).

- \* Remove locking arrangement (2) from doned cap nut.
- \* Press test button (3) down to position 1 (stop position) and hold.
- \* Obtain verification of correct functioning from control room.
- \* Release test button.
- \* Screw on doned cap nut without locking arrangement.



### 2.2 Two-float Buchholz relay (Figure 8)

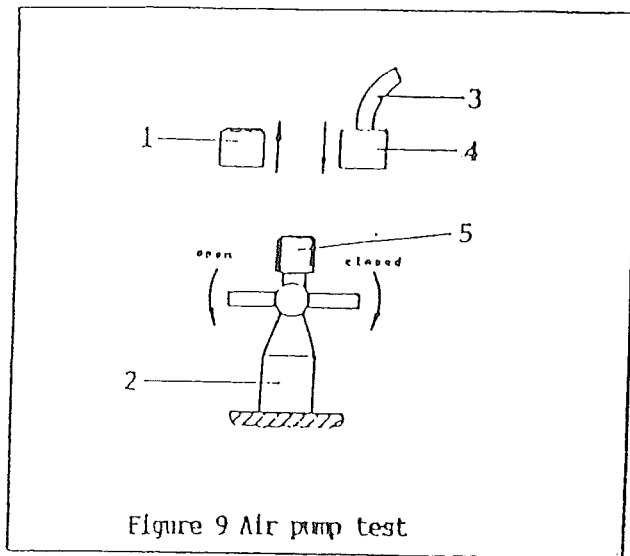
- \* Screw off doned cap nut (1).
- \* Remove locking arrangement (2) from doned cap nut.
- \* Press test button (3) down to position 1 and hold. (checking the upper switching system)
- \* Obtain verification of correct functioning from control room.
- \* Press test button (3) down to position 2 (stop position) and hold. (checking the lower switching system)
- \* Obtain verification of correct functioning from control room.
- \* Release test button.
- \* Screw on doned cap nut without locking arrangement





### 2.3 Testing by test pump (Figure 9)

- \* Screw off low cap nut (1) from the test valve (2).
- \* Connect adapter (4) of the connecting hose (3) of the air pump to valve sleeve (5).
- \* Open test valve.
- \* Pump air into the Buchholz relay until dropping of the (upper) float causes the magnetic dry-reed switch tube to make contact.
- \* Obtain verification of correct functioning from control room.
- \* Close test valve.
- \* Remove adapter from valve sleeve.
- \* Open test valve and let the air escape.
- \* Close test valve when insulating liquid begins to drain.
- \* Tighten low cap nut on test valve.



### 3. Maintenance

Buchholz relays are almost insensitive to ambient conditions. Therefore, continuous maintenance is not required in operation.

When repainting the Buchholz relay, keep condensate drain and vent hole free from paint coating. The condensate drain is arranged at the right side below the flanged connection of casing and cover. The vent hole is provided at the rear of the spring flap cover.

Buchholz relays should be visually inspected and checked according to the users' maintenance instructions. In that connection the functional tests indicated have to be carried out.

Check for accumulation of gas by means of a gas analyzer. An accessory facilitates the removal of gas at head height.



# TRASY2 Type Series

Temperature Measuring Systems for Transformers

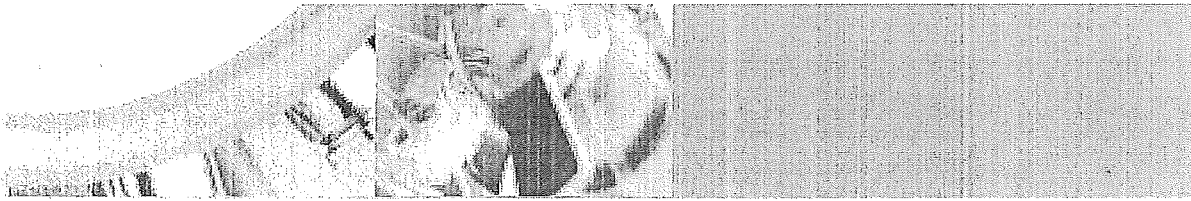


Messko





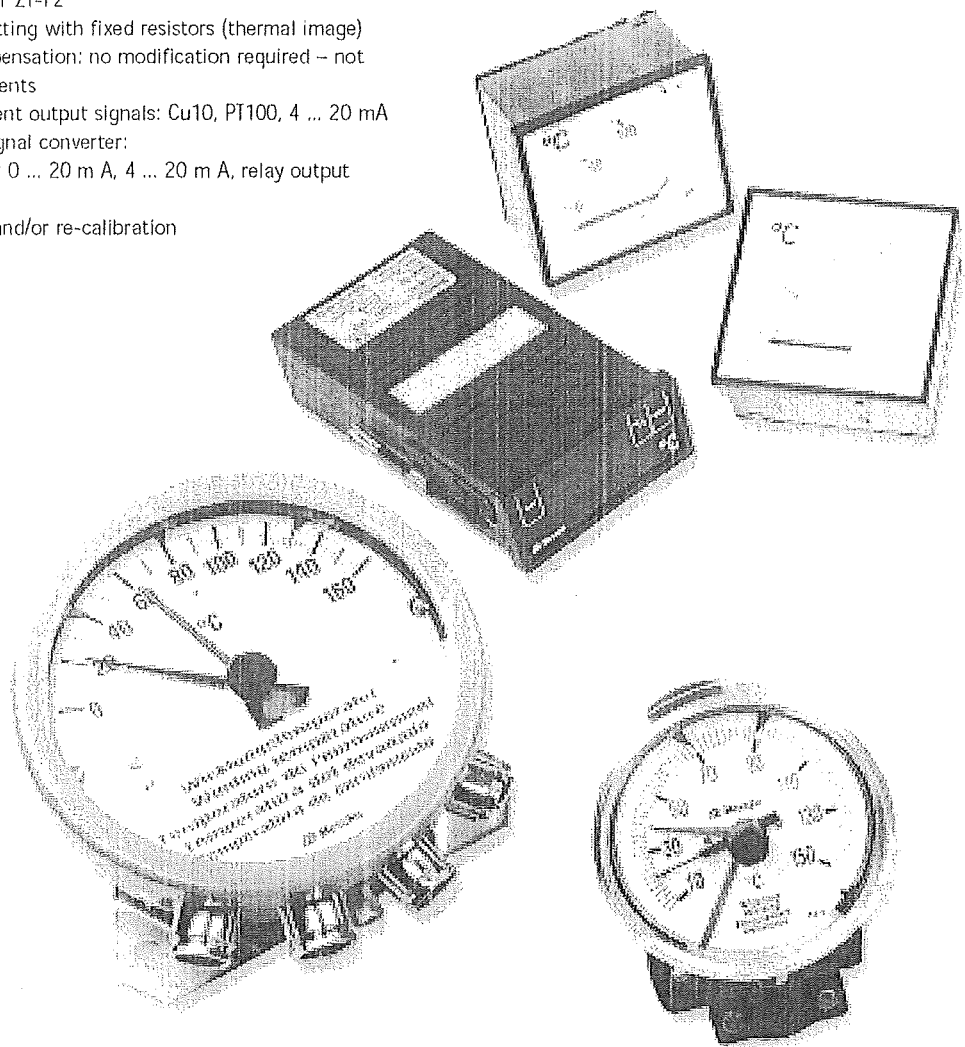




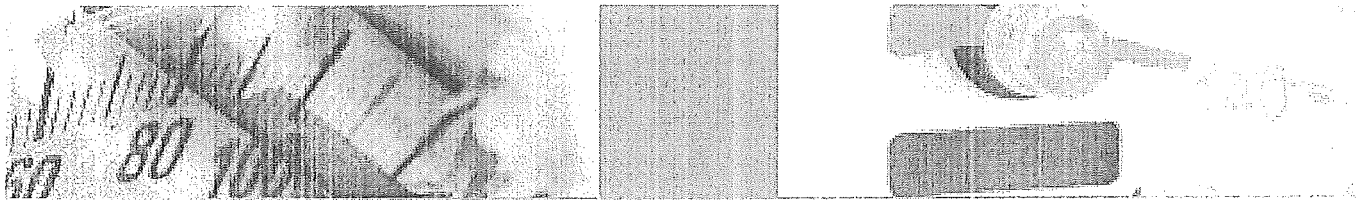
## Modularity has a name – TRASYS2

### TRASYS2 at a glance

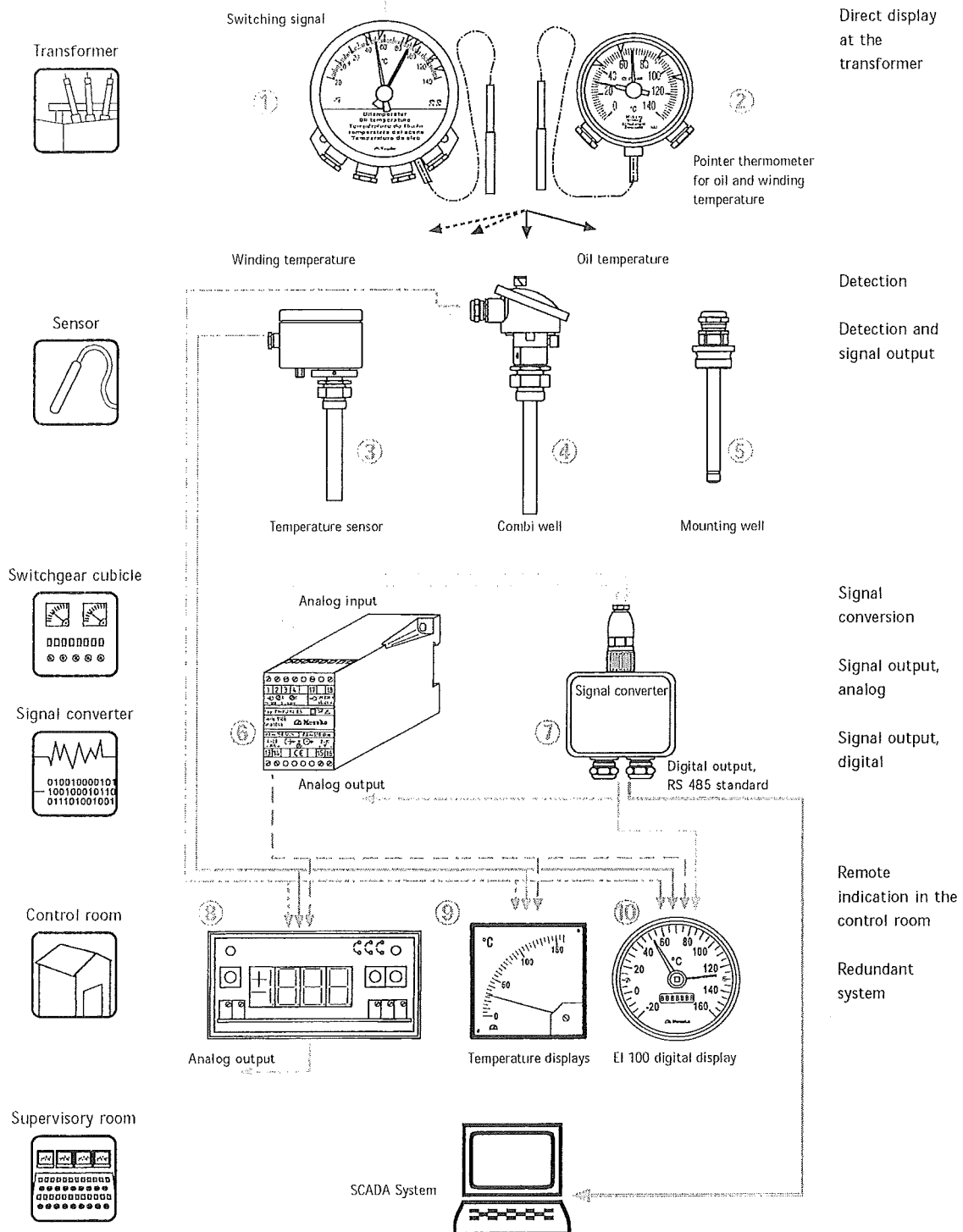
- extremely long-lived and functionally reliable
- modular-type system
- Bourdon tube: precise and robust, without additional mechanical elements
- two redundant measuring points in combination with Combi well or winding temperature sensor ZT-F2
- quick and easy gradient setting with fixed resistors (thermal image)
- ambient temperature compensation: no modification required – not even for extreme environments
- possibility of several different output signals: Cu10, PT100, 4 ... 20 mA
- in combination with the signal converter:  
analog signals: 0 ... 1 m A; 0 ... 20 m A, 4 ... 20 m A, relay output  
digital signals: RS 485
- no need of readjustments and/or re-calibration



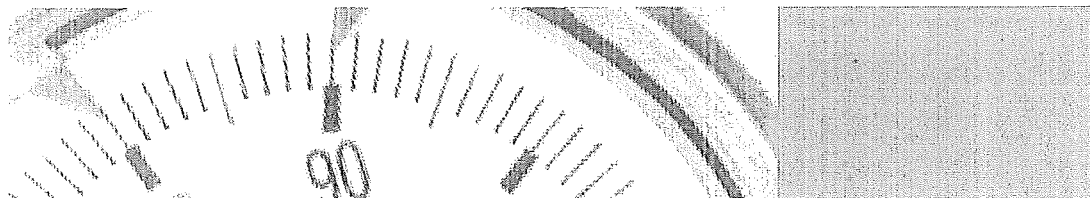




## TRASY2 – the functional modular system for temperature measuring







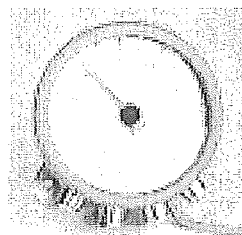
## Pointer thermometer for oil and winding temperature

Self-sufficient and non-energy dependent pointer thermometer featuring the following requirement profile:

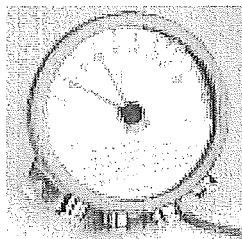
- robust and long-lived technology (Bourdon tube)
- functionally reliable and accurate
- vibration proof and outdoor-proof
- easy to install and commission
- low-maintenance

### ① MT-ST160F / MT-STW160F2 (Ø 160 mm)

The main application of pointer thermometer types MT-ST160F and MT-STW160F2 is temperature monitoring (winding/oil) in power transformers or large-size distribution transformers. They are equipped with micro-switches for external switching processes (ventilation control, alarm, trip) and are quick and easy to install. These robust pointer thermometers have been designed specifically for use under even the most diverse and exacting environmental conditions (heat, cold, ambient humidity). The measuring system (Bourdon tube, capillary tube, sensor) guarantees high-precision temperature displays without any need for re-calibration or readjustments, not even after decades of use!



Pointer thermometer for oil temperature  
MT-ST160F; Ø 160 mm



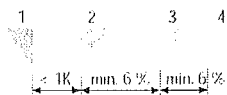
Pointer thermometer for winding temperature  
MT-STW160F2; Ø 160 mm

### ② MTA-F100 / MTA-F100W (Ø 100 mm)

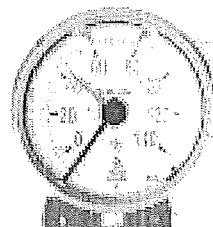
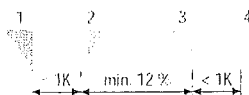
The functions of pointer thermometer types MTA-F100 and MTA-F100W are generally equivalent to the functions of the pointer thermometers specified above. Their smaller size, however, makes them ideally suited for application in switchgear cubicles and small or medium-sized distribution transformers.

Microswitch setting (switching distance)

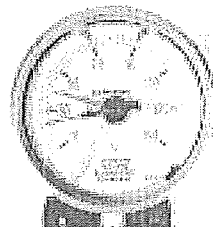
1+2 Narrow circuitry, standard



1+2 / 3+4 Narrow circuitry



Pointer thermometer for oil temperature  
MTA-F100, Ø 100 mm



Pointer thermometer for winding temperature  
MTA-F100W, Ø 100 mm



## ⑩ Electronic Indicator EI 100/160

The "electronic indicator EI 100/160" shows the temperature or a percentage output of any sensor. The information is indicated with an analog indicator instrument and a digital LCD display. The built-in max. memorized value can be reset by hand. The input signal is 4 ... 20 mA. The voltage supply is 24 V DC.

The EI 100 can be mounted with a holder (figure 1) or with a support (figure 2) in the switchgear cubicle. The EI 160 (figure 3) can be mounted in the switchgear cubicle or directly on the transformer.

The EI 100/160 is the ideal supplement for the thermometer with temperature transmitter (TT = 4 ... 20 mA) and can also be used in combination with "signal converter TT30."

The measured value can be presented in % or °C depending on the application.



figure 1 EI with holder

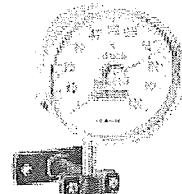


figure 2 EI with support



figure 3 EI 160

### MT-ST160F / MT-STW160F2

#### Technical data

Housing (standard)	Steel plate, galvanized
Mounting ring and housing	Acrylic resin coated, Bayonet fixing ring with Silicone seal
Viewing glass	Laminated safety glass with UV filter
Temperature sensor	Brass, polished
Mounting plate	Stainless steel
Capillary tube	Copper capillary with insulating PVC tube; or insulating, flexible stainless-steel tube
Cable gland	M25 brass, nickel-plated

#### Characteristic data

Measuring range	-20 ... 140°C or 0 ... 160°C
Tolerance	Category 1 as per DIN EN 13190
Place of installation	Indoors and outdoors, tropic-proof
Ambient temperature	-20 ... 80°C for the electronics (compensated); storage at -40 ... 100°C
Degree of protection	IP55 as per DIN VDE 0470-1
Ventilation	Thanks to the ventilation system included, the viewing glass will remain mist-free up to a level of 80 % of relative humidity
Maximum pointer	All thermometers are equipped with a resettable maximum pointer in red
Weight	approx. 2.5 kgs (6 metres of capillary line)

#### Micro-switches

Quantity	1 ... 6 adjustable micro-switches (1 ... 4 change-over switches)
Contact load	AC: 250 V / 5 A / $\cos\phi = 1$ DC: 250 V / 0.4 A (non-inductive) 110 V / 0.6 A, 60 V / 1 A, 24 V / 4 A (non-inductive)
Switching interval	6 % of the measuring range
Contact material	Silver Cadmium Oxide (AgCdO10)
Rated insulation voltage	AC: 2,500 V / 1 min
Switch hysteresis	Approx. 5°C
Terminals	min. 0.25 mm <sup>2</sup> / max. 2.5 mm <sup>2</sup>





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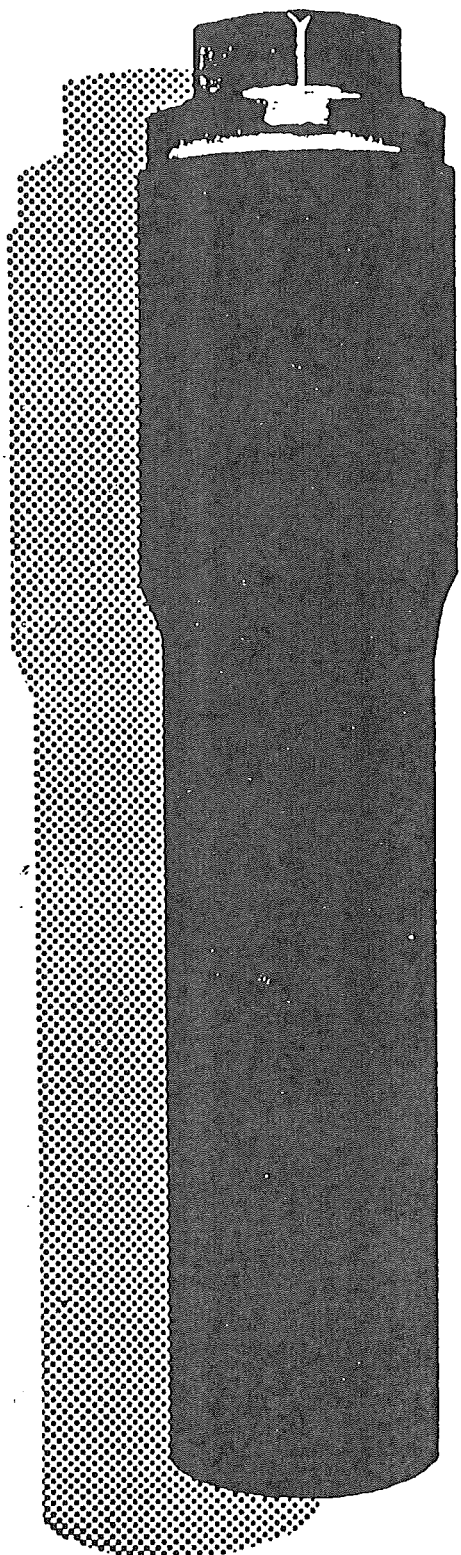
\*Messko Albert Hauser GmbH & Co. KG  
Gablonzer Strasse 25-27  
61440 Oberursel, Germany

Phone +49 (0)6171 63 98-0  
Fax +49 (0)6171 63 98-98  
E-Mail [info@messko.de](mailto:info@messko.de)

Messko







## Thermometertasche für Öltransformatoren

**DIN**  
**42 554**

Thermometer case  
for oil transformers

**EGE**

spol. s. r. o.

NOVOHRADSKÁ 34  
370 08 ČESKÉ BUDĚJOVICE  
CZECH REPUBLIC

Tel. 038/724 05 60 Fax 038/724 05 41  
Telex 144 268



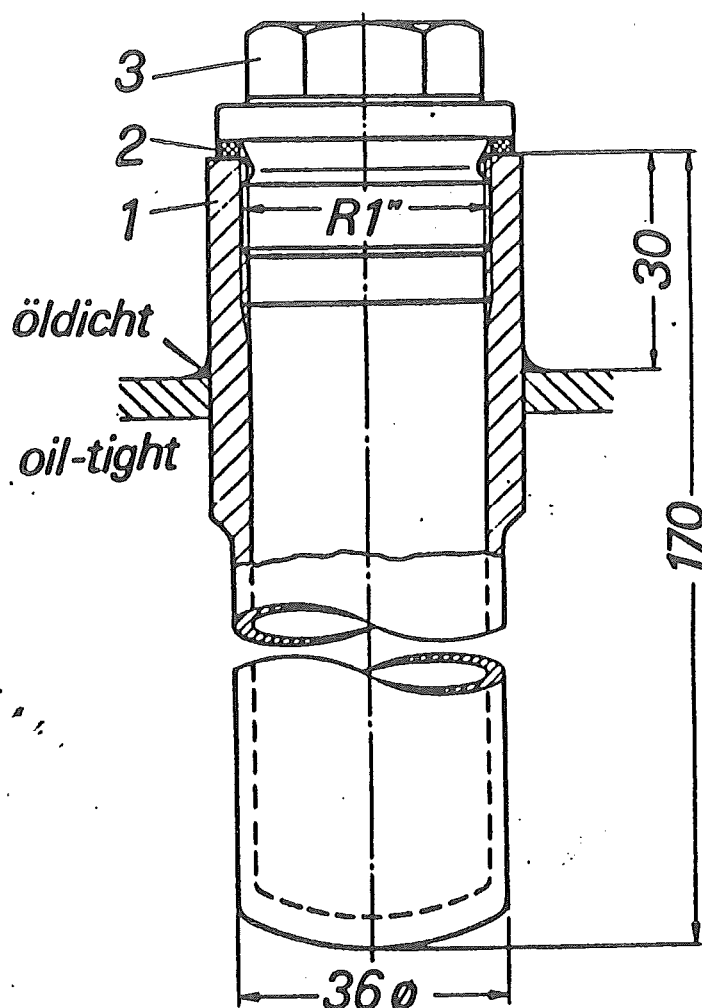
# Thermometertasche

## Thermometer case

**EGE** spol. s r. o.

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370 08 ČESKÉ BUDĚJOVICE  
CZECH REPUBLIC

Tel. 038/724 05 60 · Fax 038/724 05 41  
Telex 144 268



Maße in mm

Dimensions in mm

Bezeichnung der vollständigen

Thermometertasche (T) einschl. Dichtring und Verschlußschraube:

Designation of complete thermometer case (T) including packing ring and screw cap:

Thermometertasche T DIN 42 554 / Thermometer case T DIN 42 554

Lfd. Nr. Serial No	Stückzahl Number of parts	Bezeichnung Designation	
		Benennung Description	Kurzzeichen Symbol
1	1	Tasche Case	1 DIN 42 554
2	1	Dichtring Packing ring	A 33 x 39 DIN 7603 - lt
3	1	Verschlußschraube Screw cap	R 1" DIN 910 - A2G

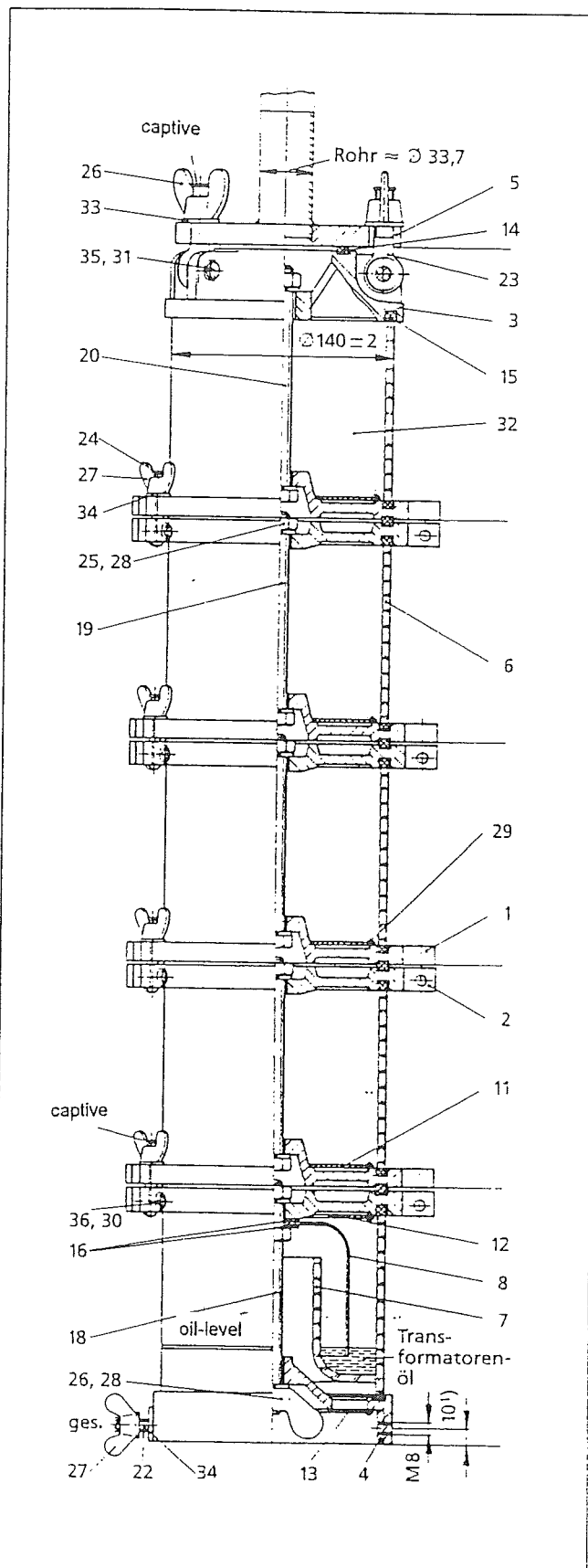


**DIN**  
**42 562**

## Dehydrating-breather, specification

Pos.	gruppe				CODE	
Nr.	B1	B2	OV	Designation	DIN	Remarks
1	1	1	0	Partition plate	42562-1	GG 20 gal zn
2	0	1	1	Partition plate	42562-2	GG 20 gal zn
3	1	0	0	Cover	42562-3	GG 20 gal zn
4	0	0	1	Bottom ring	42562-4	GG 20 gal zn
5	0	0	0	Flange	42562-5	1)
6	1	1	0	Cylinder	42562-6	glass
7	0	0	1	Vessel	42562-7	glass
8	0	0	1	Dome	42562-8	stainl.St.
11	1	1	0	Perf.plate	42562-11	Al
12	0	0	1	Perf.plate	42562-12	Al
13	0	0	1	Perf.plate	42562-13	Al
14	1	0	0	Joint washer	42562-14	NBR 70
15	2	3	3	Joint washer	42562-15	NBR 70
16	0	0	2	Joint washer	42562-16	PA 6
18	0	0	1	Stud	42562-18	M12x150 3)4)
19	0	1	0	Hex.bolt	931	M12x130 3)5)
20	1	0	0	Hex.bolt	931	M12x140 3)5)
22	0	0	2	Stud	939	M 8x30 3)
23	3	0	0	Eyebolt	444-B	M12x55 3)
24	0	3	3	Eyebolt	444-B	M 8x40 3)
25	1	1	2	Hex. nut	934	M 12 3)
26	3	0	1	Wing nut	315	M 12-C 3)
27	0	3	5	Wing nut	315	M 8-C 3)
28	1	1	2	Spring washer		B 12 6)7)
29	3	3	7	drive screw		2,5x5 8)10)
30	0	6	6		471	8x0,8 7)
31	6	0	0		471	10x1 7)
32	*	*	0	silica-gel		*=1.200 g 1)
33	3	0	0	Washer	125	B 13 9)
34	0	3	5	Washer	125	B 8,4 9)
35	3	0	0	Pin	42562-35	14305
36	0	3	3	Pin	42562-36	14305

- 1) Flange (pos 5) to be ordered seperately  
3) A2-70 acc DIN 267 part 11  
4) acc. DIN 967 forme B  
5) acc. DIN 931 part 1  
6) acc. DIN 127 forme B  
7) X 12 CrNi 177 (1.4310) acc. DIN 17224  
8) acc. DIN 1476  
9) X 5 CrNi 1812 (1.4303) acc. DIN 17440  
10) X 5 CrNi 1911 (1.4303) acc. DIN 17440







# DEHYDRATING BREATHER L DIN 42562

## Operating Instructions

### Installation

When a transformer is despatched from the factory it is practice for the complete dehydrating breather to be mounted on the transformer and be covered with a protective plate which must be removed before the transformers is set to work. In some cases the preassembled dehydrating breather is packed separately without the drying crystals and without the oil in the glass vessel 7. When this is the case, the following work must be carried out on site before the transformer is put into service:

### Fitting

Ensure that the breathing pipe is clean and dry. Bolt the round flange at the top end of the pipe to the mating flange on the conservator making an airtight joint. Secure the bottom end of the pipe to the transformer tank by means of the clip 44 just above the triangular flange 5 welded to the pipe end.

### Filling

Check that each glass cylinder 6 is securely assembled with the appropriate cover 3 intermediate cover 2 and intermediate plate 1 incorporating sealing rings 15 to produce an airtight joint and also check that the hexagon bolts 20 and 19 are tight. Then fill the chambers with fresh drying crystals through the holes in the cover/intermediate cover.

### Assembly

When attaching the topmost chamber to the flange 5, and when joining two chambers together, do not tighten the wing nuts 26 and 27 onesidedly otherwise there is a danger of breaking the glass cylinder (part 6). Fill the removed glass vessel 7 to the mark 7.1 with new transformer oil (never with askarel), assemble the bottom chamber and attach it to the intermediate plate immediately above. Finally, engage the two studs 22 of the bottom ring 4 in the appropriate slots in the clamping device on the transformers tank and tighten the wing nuts 27.

### Testing

When the dehydrating breather has been installed, check that it is functioning correctly – by pumping air through the Buchholz relay for example. This should give rise to fluctuations of the oil level in the glass vessel 7 and air bubbles should be seen. If these effects are not apparent it indicates the presence of leaks on the air side of the conservator, in the connecting pipe between dehydrating breather and conservator or at the dehydrating breather itself which must be eliminated immediately.

## Maintenance

### Functional check of the dehydrating breather

The indications of satisfactory functioning of the dehydrating breather during changes in temperature of the insulating liquid in the transformer tank are as follows:

Rising air bubbles in the oil trap; Colour of drying crystals changing from orange to colourless, beginning at the bottom and spreading slowly upwards.

In the absence of these indications it can be concluded that the transformer is breathing through a leaking joint on the conservator or dehydrating breather. Leaks must be found and sealed as quickly as possible.

### Changing the drying crystals

In order to completely exclude any possibility of moisture reaching the conservator, the drying agent should be renewed when there is still a layer of active orange crystals approximately 7 cm thick at the top of the topmost chamber.

First unscrew the glass vessel 7 filled with oil so that should the removed dehydrating breather be inadvertently tipped over, no oil can run into the bottom glass cylinder 6 and spoil some of the drying crystals. Next separate the individual chambers from each other by releasing the wing nuts and empty out the drying crystals 40. Blow out the perforated plates 11 with compressed air.



Finally, carry out the procedures described under the headings „Filling“, „Assembly“ and „Testing“ in the section on installation.

## Description

### Application

The dehydrating breather removes practically all moisture from the air which flows through it into the conservator when the transformer is cooling down. This has the effect of largely preventing any reduction of the dielectric strength of the insulation due to moist ambient air and any formation of condensation in the conservator. Thus the dehydrating breather increases the operational integrity of the transformer.

### Construction and mode of operation

The type L DIN 42562 dehydrating breather comprises several identical chambers bolted together to form an airtight unit. The number of chambers used depends on the air humidity at the place where the transformer is installed and also on the expected throughput of air. Hence the size of the dehydrating breather is related to the size or load cycle of the transformers. Each chamber consists of a glass cylinder 6 filled with drying crystals and clamped between the cover 3 or 2 and the intermediate plate 1 with sealing ring 15 by the hexagon bolts 20 and 19. At each intermediate cover 2 there are three pivoted eyebolts with wing nuts 27 which, by means of a sealing ring, make an airtight joint with the intermediate plate 1 of the chamber above it. The topmost chamber is closed by the cover 3 whose three eyebolts and wing nuts 26 secure the whole dehydrating breather to the flange 5. Flange 5 is welded to the pipe 9 providing an airtight connection to the conservator. The bottom of the breather is closed by the glass vessel 7 which is filled with oil to the mark 7.1. The oil trap 42 prevents the drying crystals being in continuous contact with the damp atmosphere and also filters the inflowing air. If the temperature of the insulating liquid in the transformer tank falls, its volume also reduces and this causes a corresponding quantity of air to be drawn in through the holes in the bottom ring 4. The perforated plate 13 prevents the ingress of coarse dust or insects. On this way to the conservator the air passes through the oil trap and subsequently through the drying crystals which remove the moisture from it. If the temperature of the insulating liquid in the transformers tank rises, air is expelled from the conservator and flows through the dehydrating breather in the opposite direction.

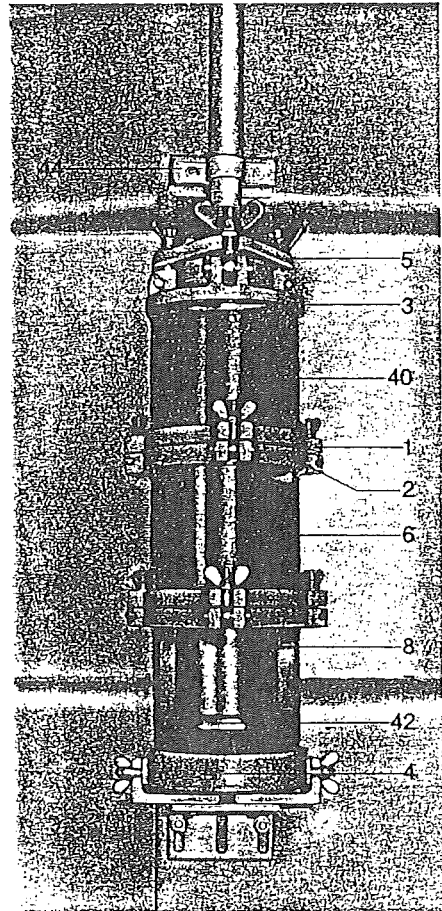


Bild 1  
Luftentfeuchter L DIN 42562

### Drying agent

The drying crystals are approximately 3 to 5 mm in size, have a orange colour indicator and are of pure aluminium silicate which has very good adsorption properties. In the activated condition they have a orange crystalline appearance but as they absorb moisture the colour changes to colourless, beginning at the bottom and spreading progressively to the top. Each glass cylinder 6 contains about 1 kg of drying crystals.



Auslaufventile aus Rotguß  
PN 6, DIN 42568

für Transformatorenöl,  
Abschlußkörper aus Messing,  
Eintritt DN 15: Rund-Flansch gebohrt  
nach DIN PN 6,  
Eintritt DN 32: Vierkant-Flansch gebohrt  
nach DIN PN 6,  
Austritt: Verschlußkappe mit Kette,  
Handrad aus Polyamid,

Art.-Nr. 03199.X.0060  
Standardausführung.

Art.-Nr. 03199.X.0060  
mit Abschließvorrichtung und Schloß.

Outlet valves, gunmetal  
PN 6, DIN 42568

for transformer oil,  
obturator made in brass,  
inlet DN 15: rounde flange drilled  
acc. to DIN PN 6,  
inlet DN 32: square flange drilled  
acc. to DIN PN 6,  
outlet: cap with chain,  
handwheel in polyamide,

Part No. 03199.X.0060  
standard type.

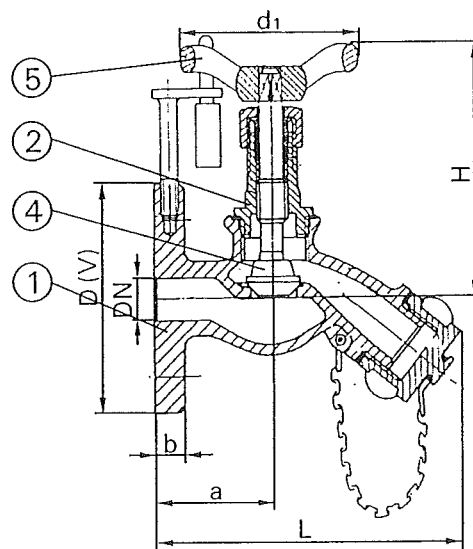
Part No. 03199.X.0060  
with locking device and lock.

**Verwendungsbereich:**

Geeignet für Transformatorenöl.  
Zulässige Betriebstemperatur:  
max. + 110°C (383K).

**Applications:**

Suitable for transformer oil.  
Working temperature:  
max. + 110°C (383K).



**Wichtig:** Bei Bestellungen und Anfragen bitten wir  
um Angaben über Durchflußmedium, Betriebsdruck  
und Betriebstemperatur.

**Werkstoffe/Materials**

	Mat.Nr.	
1-Gehäuse/body	2.1096.01	G-Cu Sn 5 Zn Pb
2-Kopfstück/head piece	2.0402	Cu Zn 40 Pb 2
4-Teller/disc	2.0402	Cu Zn 40 Pb 2
5-Handrad/handwheel	Kunststoff/synthetic material	

**Essential:** When ordering or requesting an offer  
please indicate flow medium, working pressure  
and working temperature.

Art.-Nr./Part No.	03199.X.
Nenngröße/Nom.Size	DN 15 32
Größenschl./dim. code	.X. 0150 0320
Baulänge/face-to-face dim.	L 110 130
Höhe/height	H 95 135
Rund-Flansch-Ø/rounde flange-Ø	D 80 -
Vierkant-Flansch/square flange	V - 90
Handrad-Ø/handwheel-Ø	d1 60 80
Länge/length	a 44 55
Blattdicke/width of flange	b 10 13
Gewicht/weight	ca. Kg 1,0 2,3

Maße in mm/dimensions in mm.





«Sector»

# Safety Data Sheet

Issued: August 6, 1997

SDS No. SN09M006

**SHELL DIALA D**

## 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY

**Product name:** SHELL DIALA D

**Product type:** Insulating oil

**Supplier:** «Supplier»

**Address:** «Add1»

«Add2»

**Contact numbers:**

**Telephone:** «ContactNo»

**Telex:** «ContactTlx»

**Fax:** «ContactFax»

**Emergency telephone number:**

«EmergencyCover» «ENT24Hour»

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

**Preparation description:** Blend of highly refined mineral oils and distillate aromatic extract.

**Dangerous components/constituents:**

Component name	CAS number	Content range	EC hazard	R phrases
Distillate aromatic extract	64742-04-7	<0.1%	T	R45

## 3. HAZARDS IDENTIFICATION

**Human health hazards:** No specific hazards under normal use conditions. Contains mineral oil for which an exposure limit for oil mist applies. Prolonged or repeated exposure may give rise to dermatitis. Used oil may contain harmful impurities.

**Safety hazards:** Not classified as flammable, but will burn.

**Environmental hazards:** Not readily biodegradable. Expected to have a high potential to bioaccumulate.

**Other information:** Not classified as dangerous for supply or conveyance.





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#### 4. FIRST AID MEASURES

Symptoms and effects:	Not expected to give rise to an acute hazard under normal conditions of use.
First Aid - Inhalation:	In the unlikely event of dizziness or nausea, remove casualty to fresh air. If symptoms persist, obtain medical attention.
First Aid - Skin:	Remove contaminated clothing and wash affected skin with soap and water. If persistent irritation occurs, obtain medical attention.
First Aid - Eye:	If high pressure injection injuries occur, obtain medical attention immediately.
First Aid - Ingestion:	Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
Advice to physicians:	Wash out mouth with water and obtain medical attention. DO NOT INDUCE VOMITING. Treat symptomatically. Aspiration into the lungs may result in chemical pneumonitis. Dermatitis may result from prolonged or repeated exposure.

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#### 5. FIRE FIGHTING MEASURES

Specific hazards:	Combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide, oxides of sulphur, and unidentified organic and inorganic compounds.
Extinguishing media:	Foam and dry chemical powder. Carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media:	Water in a jet. Use of Halon extinguishers should be avoided for environmental reasons.
Protective equipment:	Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

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#### 6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Avoid contact with: skin and eyes.
Personal protection:	Wear impermeable gloves and boots.
Environmental precautions:	Prevent from spreading or entering into drains, ditches or rivers by using sand, earth, or other appropriate barriers. Inform local authorities if this cannot be prevented.
Clean-up methods - small spillage:	Absorb liquid with sand or earth. Sweep up and remove to a suitable, clearly marked container for disposal in accordance with local regulations.
Clean-up methods - large spillage:	Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Dispose of as for small spills.



## 7. HANDLING AND STORAGE

**Handling:**

When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Prevent spillages.

**Storage:**

Keep in a cool, dry, well-ventilated place. Use properly labelled and closable containers. Avoid direct sunlight, heat sources, and strong oxidizing agents.

**Storage temperature:**

0°C minimum to 50°C maximum.

**Recommended materials:**

For containers or container linings, use: mild steel or high density polyethylene.

**Unsuitable materials:**

For containers or container linings, avoid: PVC.

**Other information:**

Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Engineering control measures:**

Use local exhaust ventilation if there is a risk of inhalation of vapours, mists or aerosols.

**Occupational exposure standards:**

Threshold limit values are given below. Lower exposure limits may apply locally:

**Component name**

Oil mist, mineral

Limit type	Value	Unit	Other information
8-hour TWA	5	mg/m <sup>3</sup>	ACGIH
15-min STEL	10	mg/m <sup>3</sup>	ACGIH

**Hygiene measures:**

Wash hands before eating, drinking, smoking and using the toilet.

**Respiratory protection:**

Not normally required. If oil mist cannot be controlled, a respirator fitted with an organic vapour cartridge combined with a particulate pre-filter should be used.

**Hand protection:**

PVC or nitrile rubber gloves.

**Eye protection:**

Wear safety glasses or full face shield if splashes are likely to occur.

**Body protection:**

Minimise all forms of skin contact. Wear overalls to minimise contamination of personal clothing. Launder overalls and undergarments regularly.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Physical state:**

Liquid at ambient temperature.

**Colour:**

Pale Yellow

**Odour:**

Characteristic mineral oil

**Initial boiling point:**

>280°C

**Vapour pressure:**

< 0.5 Pa at 20°C

**Density:**

864 kg/m<sup>3</sup> at 15°C

**Kinematic viscosity:**

9.5 mm<sup>2</sup>/s at 40°C



Vapour density (air=1):	> 1 at 20°C
Pour point:	-45°C
Flash point:	149°C
Flammability limit - lower:	1% V/V (typical)
Flammability limit - upper:	10% V/V (typical)
Auto-ignition temperature:	> 320°C (typical)
Solubility in water:	Negligible
n-octanol/water partition coefficient:	Log P <sub>ow</sub> > 6 (typical)

## 10. STABILITY/REACTIVITY

Stability:	Stable
Conditions to avoid:	Extremes of temperature and direct sunlight.
Materials to avoid:	Strong oxidizing agents
Hazardous decomposition products:	Hazardous decomposition products are not expected to form during normal storage.

## 11. TOXICOLOGICAL INFORMATION

Basis for assessment:	Toxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the toxicology of similar products.
Acute toxicity - oral:	LD <sub>50</sub> expected to be above 2000 mg/kg
Acute toxicity - dermal:	LD <sub>50</sub> expected to be above 2000 mg/kg
Acute toxicity - inhalation:	Data not available.
Eye irritation:	Expected to be slightly irritant.
Skin irritation:	Expected to be slightly irritant.
Respiratory irritation:	If mists are inhaled, slight irritation of the respiratory tract may occur.
Skin sensitization:	Not expected to be a skin sensitizer
Carcinogenicity:	May contain less than 0.1% (m/m) of distillate aromatic extract, classified as a Category 2 carcinogen. Other components are not known to be associated with carcinogenic effects.
Mutagenicity:	Not considered to be a mutagenic hazard.
Other information:	<p>Prolonged and/or repeated contact with this product can result in defatting of the skin, particularly at elevated temperatures. This can lead to irritation and possibly dermatitis, especially under conditions of poor personal hygiene. Skin contact should be minimised.</p> <p>Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible.</p>



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## 12. ECOLOGICAL INFORMATION

<b>Basis for assessment:</b>	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.
<b>Mobility:</b>	Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
<b>Persistence/degradability:</b>	Not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.
<b>Bioaccumulation:</b>	Has the potential to bioaccumulate.
<b>Ecotoxicity:</b>	Poorly soluble mixture. Product is expected to be practically non-toxic to aquatic organisms, LC/EC <sub>50</sub> > 100 mg/L. May cause physical fouling of aquatic organisms. (LC/EC <sub>50</sub> expressed as the nominal amount of product required to prepare aqueous test extract)
<b>Sewage treatment:</b>	

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## 13. DISPOSAL CONSIDERATIONS

<b>Waste disposal:</b>	Recycle or dispose of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the contractor to deal satisfactorily with this type of product should be established beforehand.
<b>Product disposal:</b>	
<b>Container disposal:</b>	200 litre drums should be emptied and returned to the supplier or sent to a drum reconditioner without removing or defacing markings or labels.
<b>Local legislation:</b>	Non-reusable small metal and plastic containers should be recycled where possible, or disposed of as domestic refuse.

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## 14. TRANSPORT INFORMATION

Not dangerous for conveyance under UN, IMO, ADR/RID and IATA/ICAO codes.

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## 15. REGULATORY INFORMATION

<b>EC Classification:</b>	Not classified as Dangerous under EC criteria
<b>EINECS (EC):</b>	All components listed or polymer exempt.
<b>TSCA (USA):</b>	All components in compliance.
<b>Other information:</b>	For listing on other inventories, eg MITI (Japan), AICS (Australia) and DSL (Canada), please consult suppliers.





## 16. OTHER INFORMATION

**Uses and restrictions:**

Insulating oil.

**Technical contact point:**

«TechPoint»

**Technical contact number:**

Telephone:

«TechNo»

Telex:

«TechTlx»

Fax:

«TechFax»

**SDS history:**

Edition No.: 1

First Issue: August 6, 1997

Revised:

**Revisions highlighted:**

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not be construed as guaranteeing any specific property of the product.

