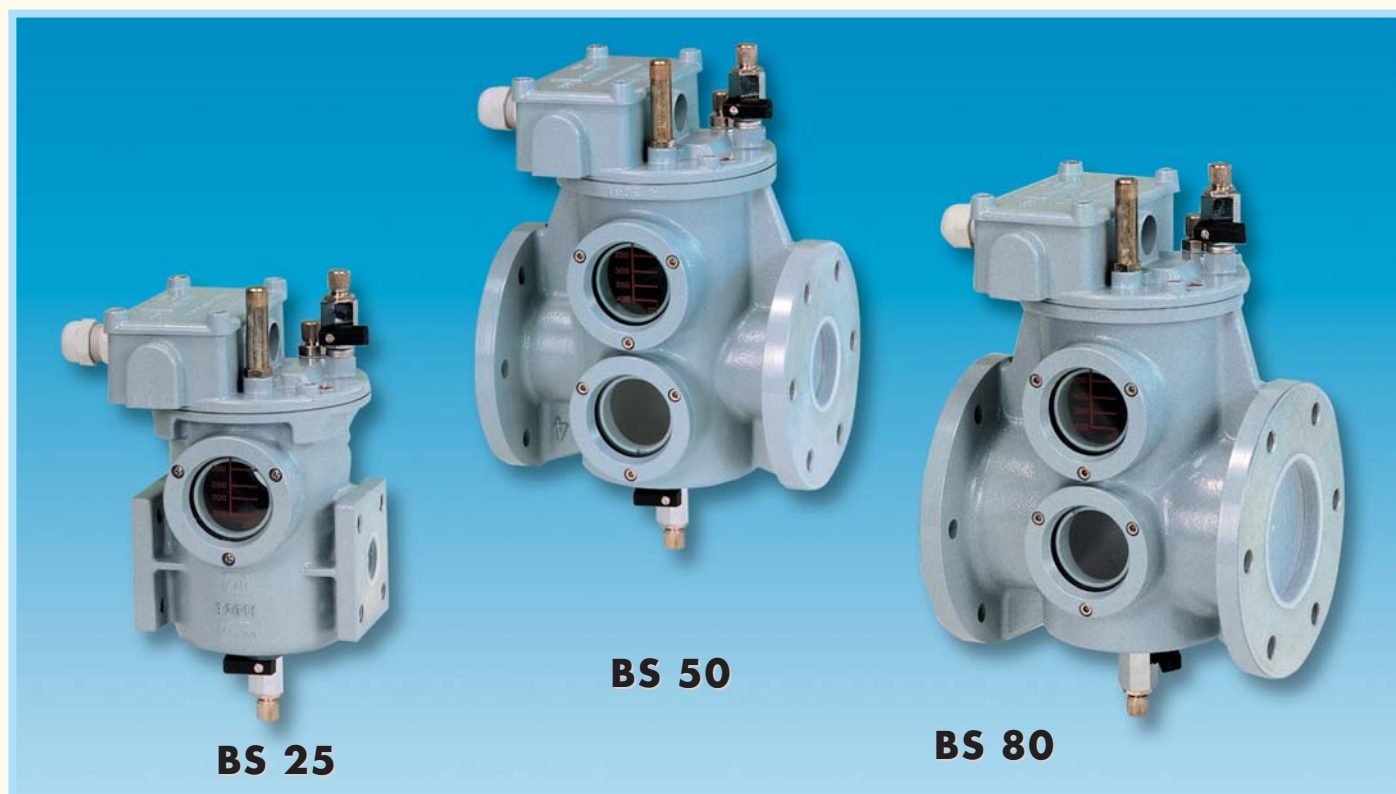
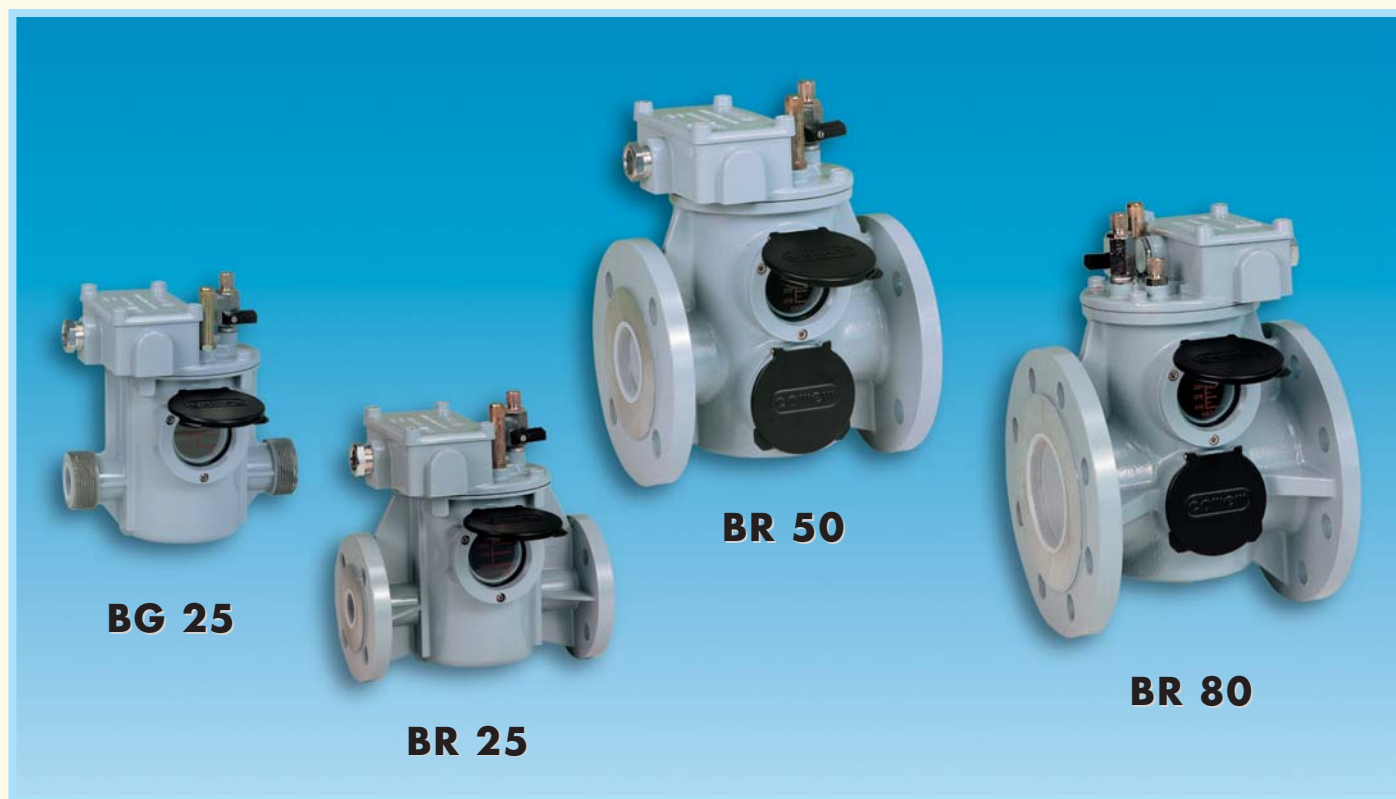
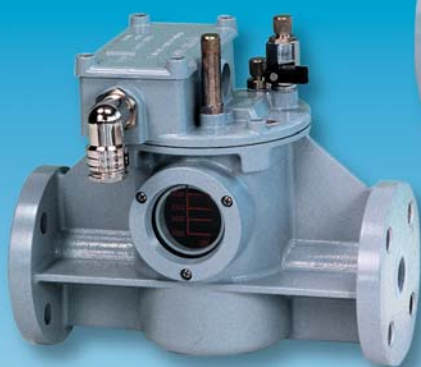


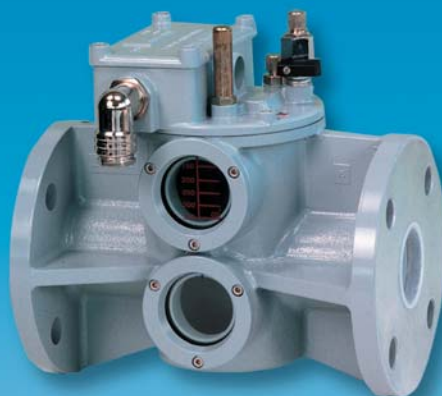
## RELÈ AD ACCUMULO DI GAS TIPO **BUCHHOLZ**



## RELÈ AD ACCUMULO DI GAS TIPO **BUCHHOLZ**



**NF 25**



**NF 50**



**NF 80**



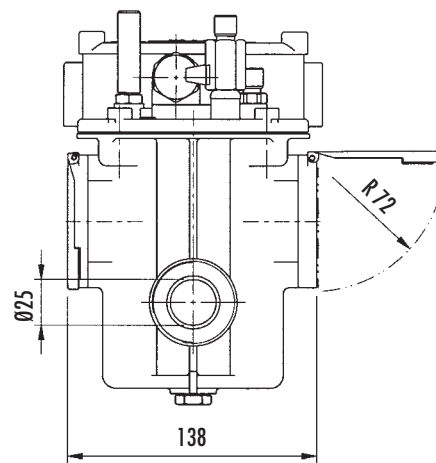
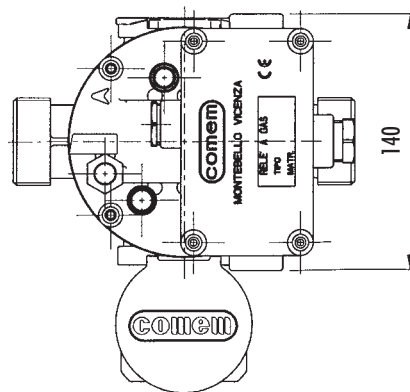
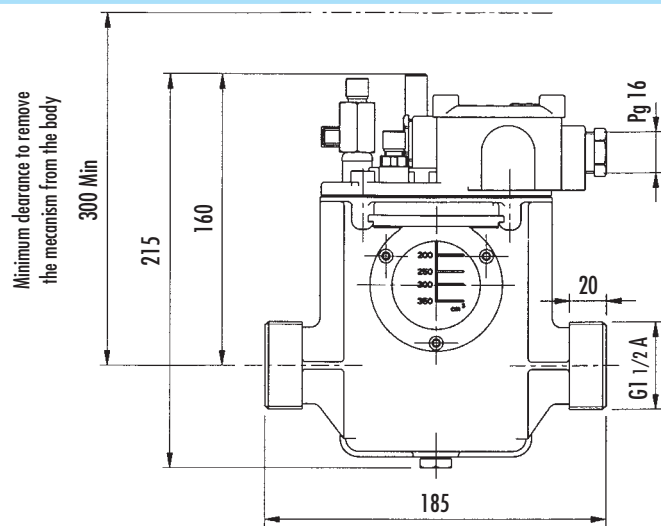
**C 1**



**C 4**



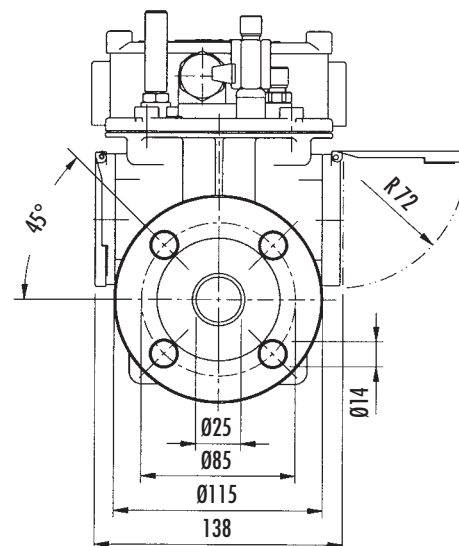
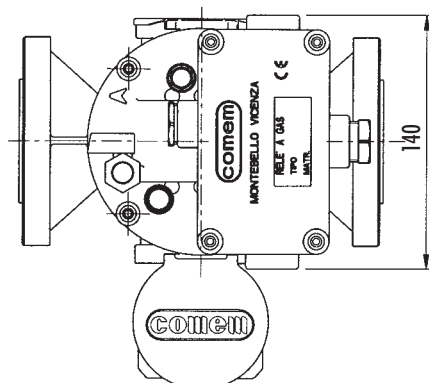
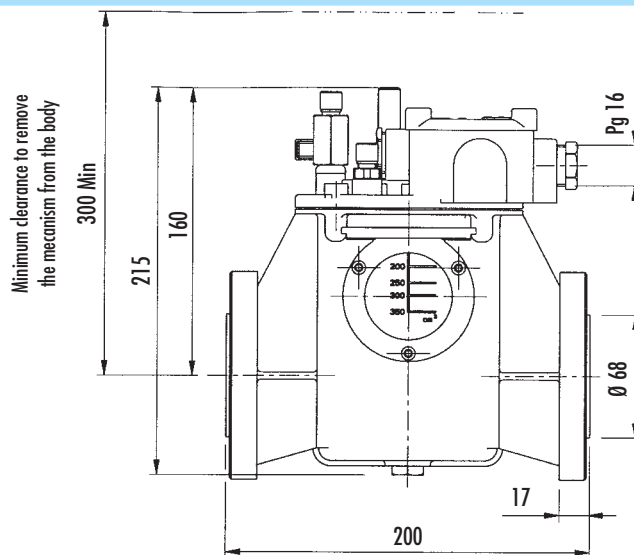
**C 01**



**BG 25**

Peso

**2.1 kg**

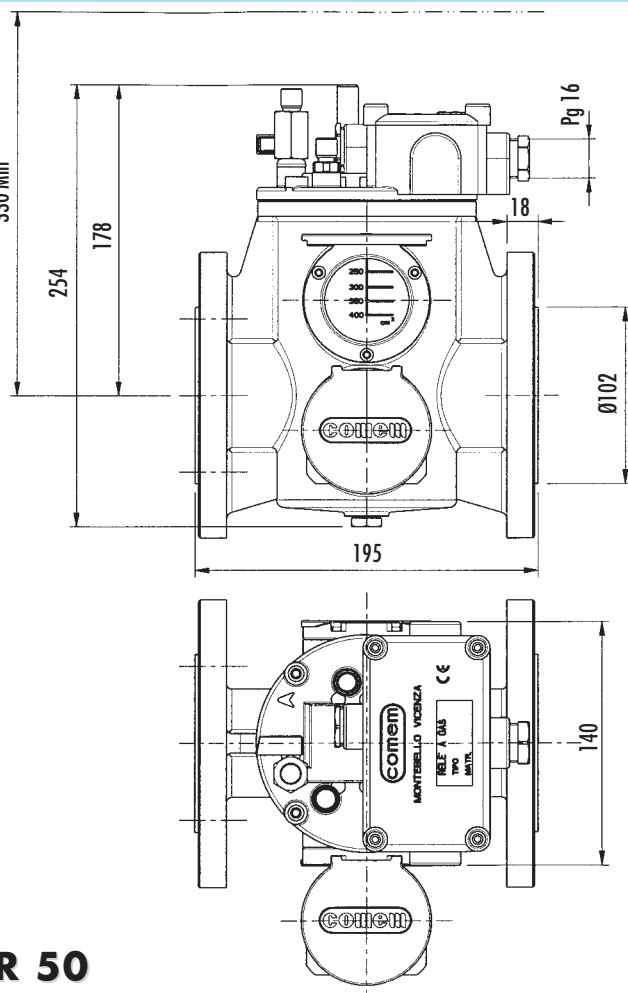


**BR 25**

Peso

**2.9 kg**

Minimum clearance to remove the mechanism from the body  
330 Min

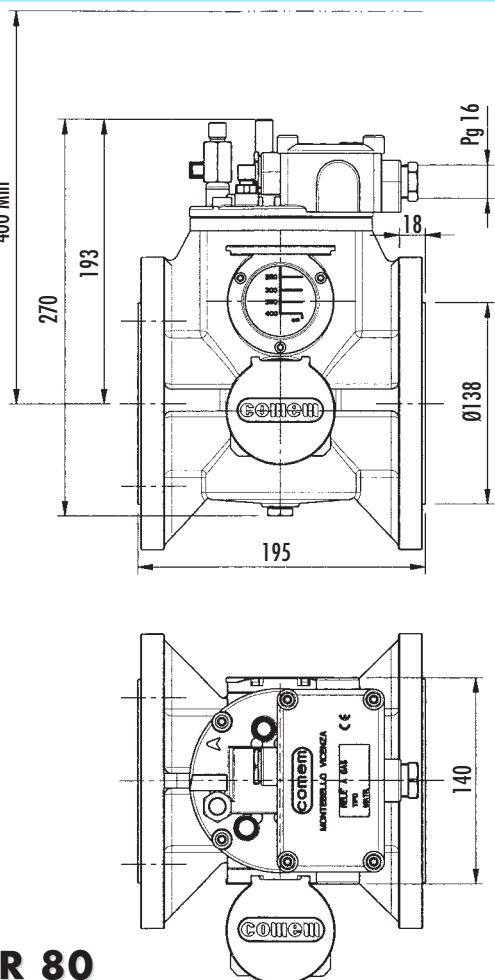


**BR 50**

Peso

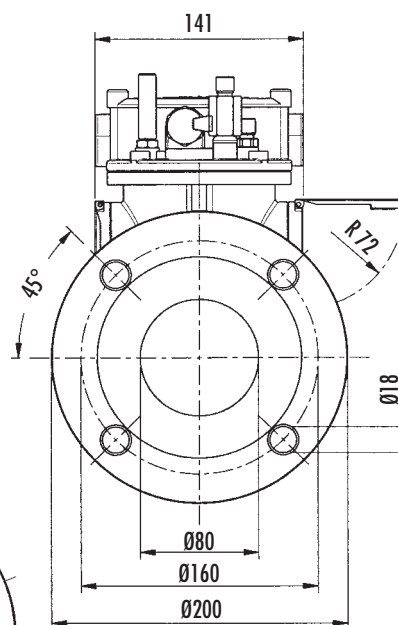
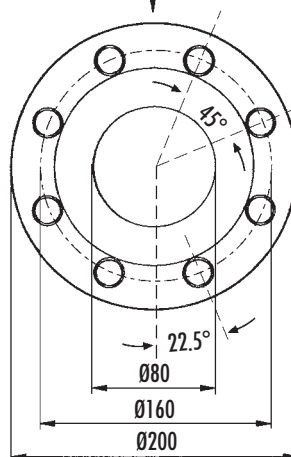
**4.9 kg**

Minimum clearance to remove the mechanism from the body  
400 Min



**BR 80**

DISPONIBILE CON N° 8 FORI

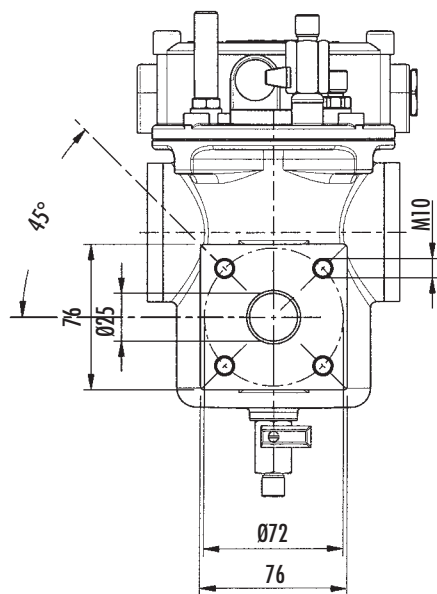
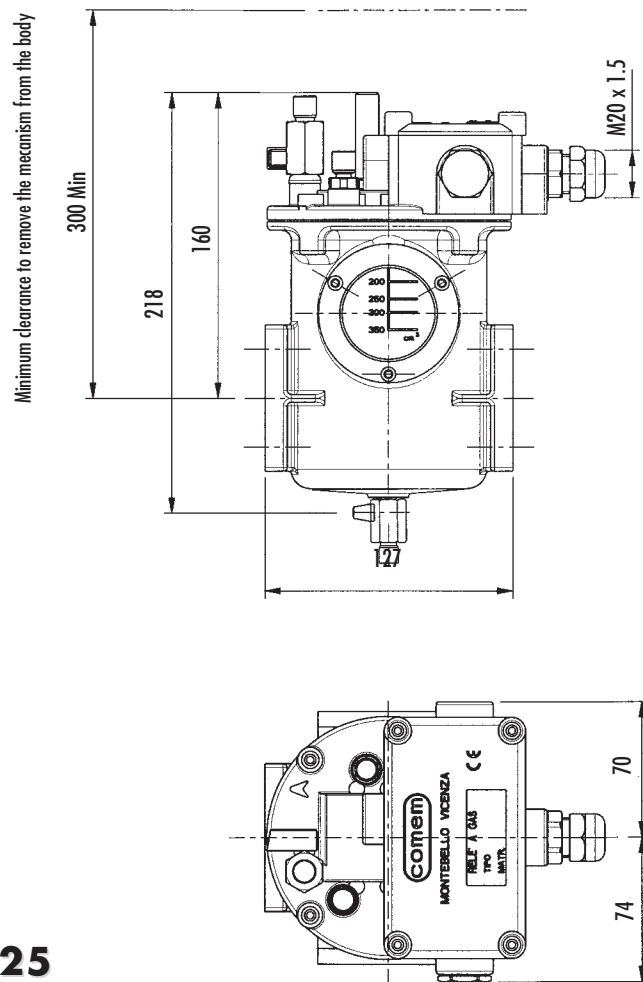


Peso

**5.8 kg**



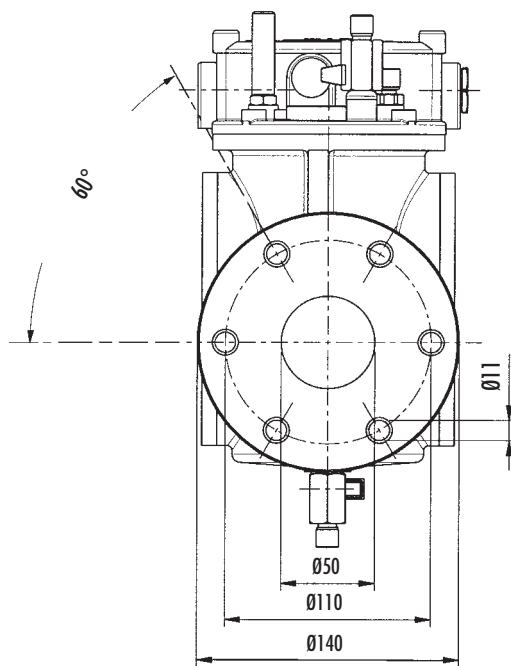
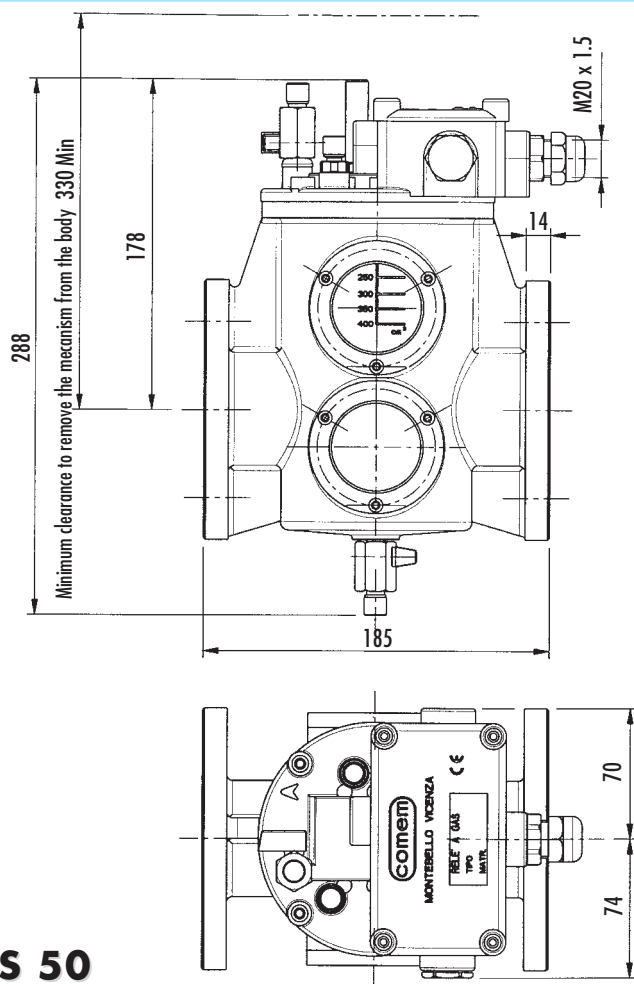
## BS 25



Peso

2.2 kg

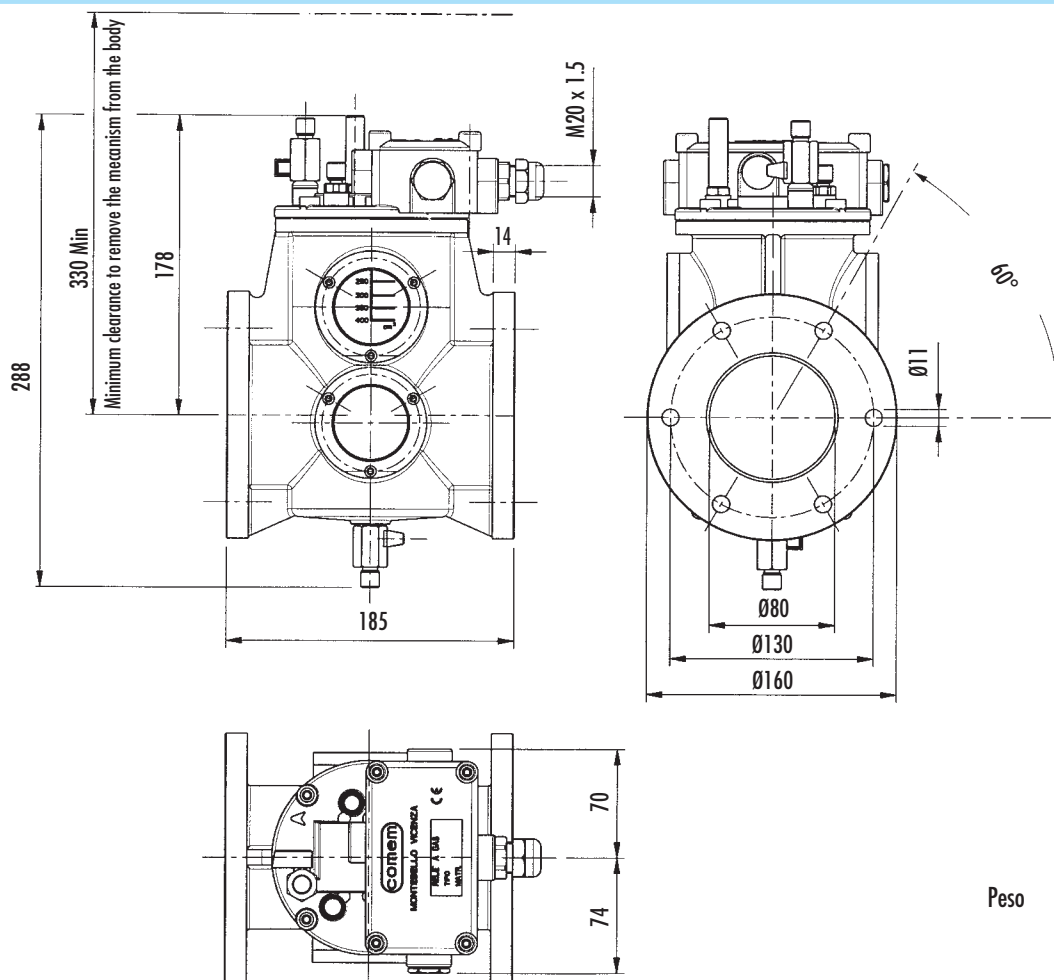
## BS 50



Peso

4.1 kg

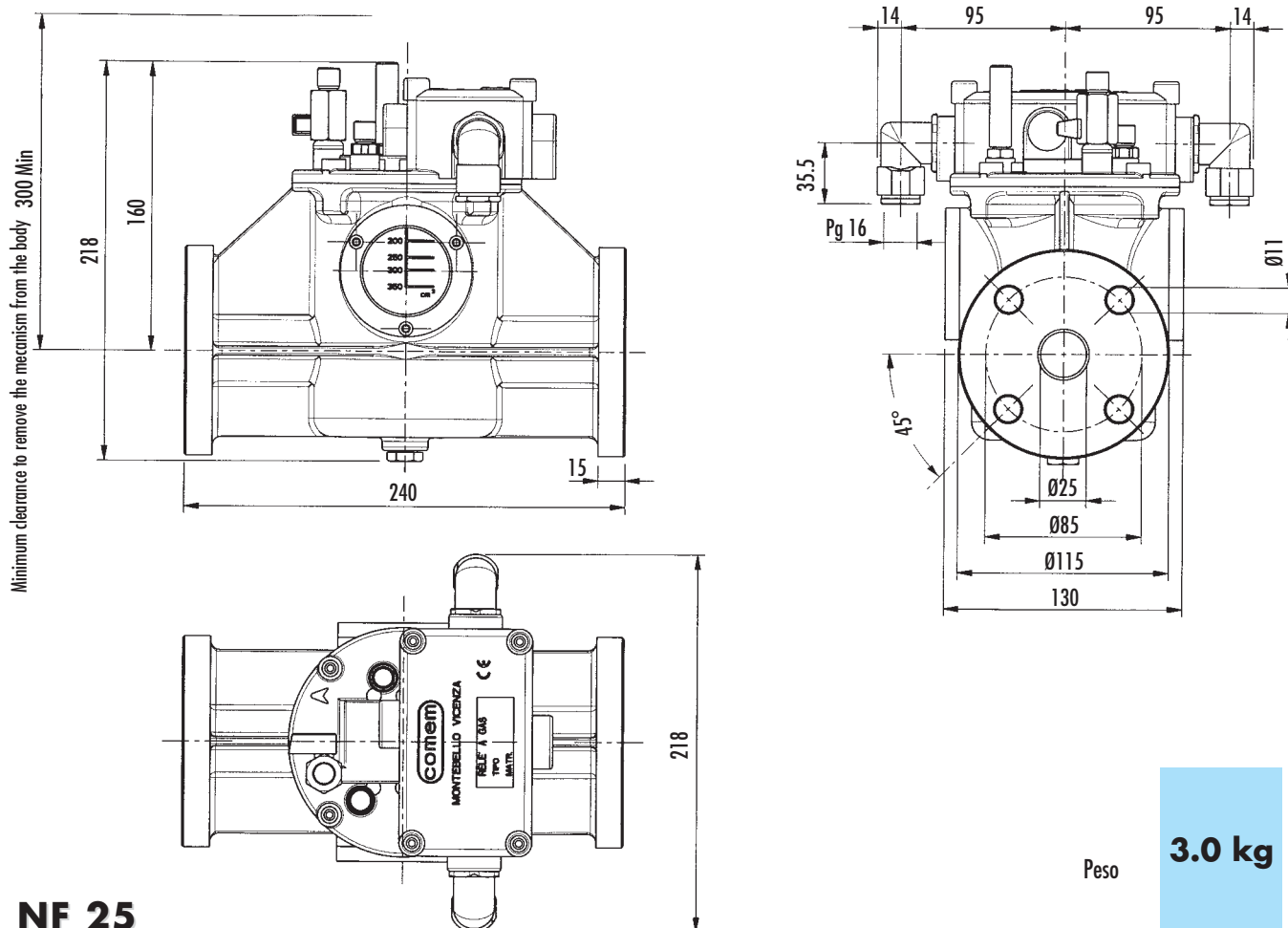
**BS 80**



Peso

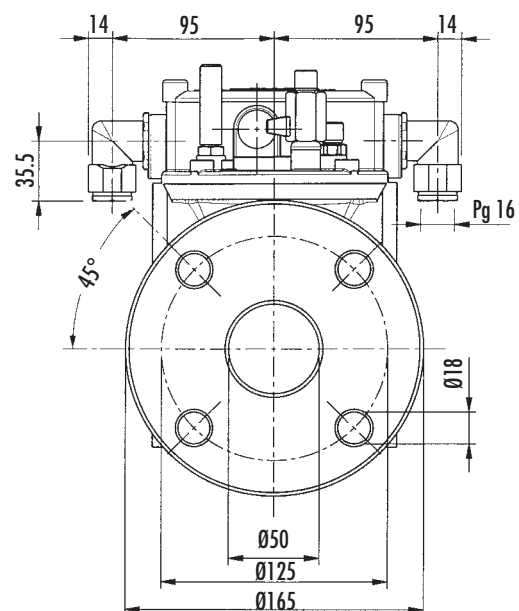
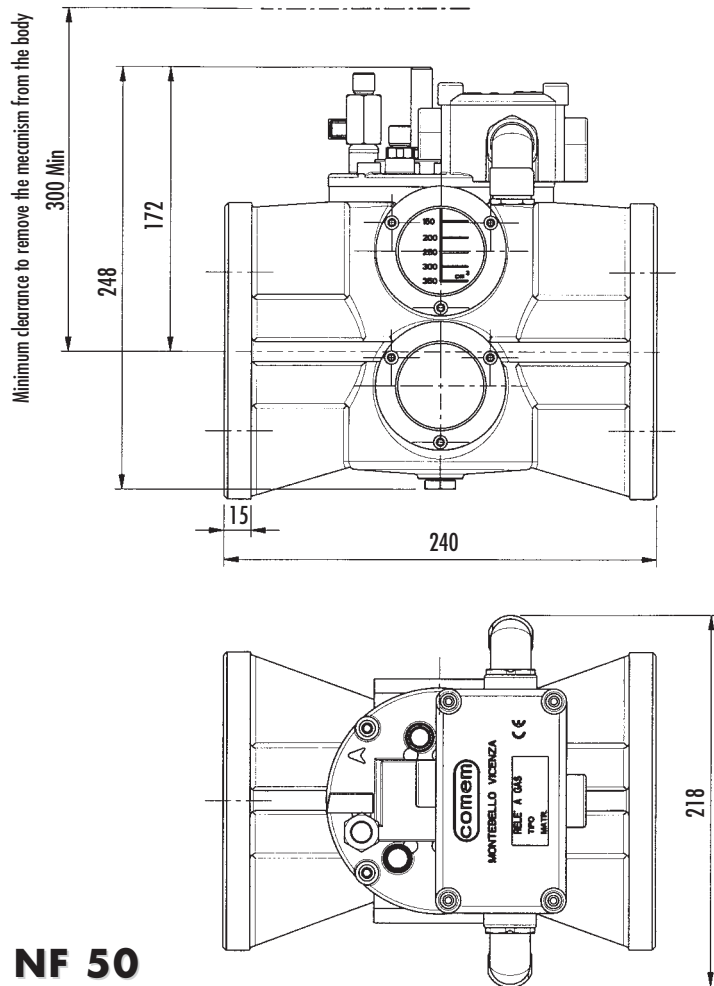
**4.3 kg**

**NF 25**

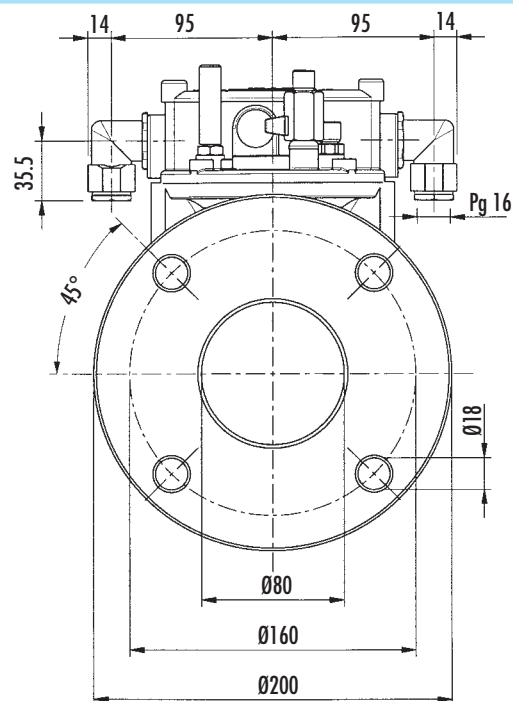
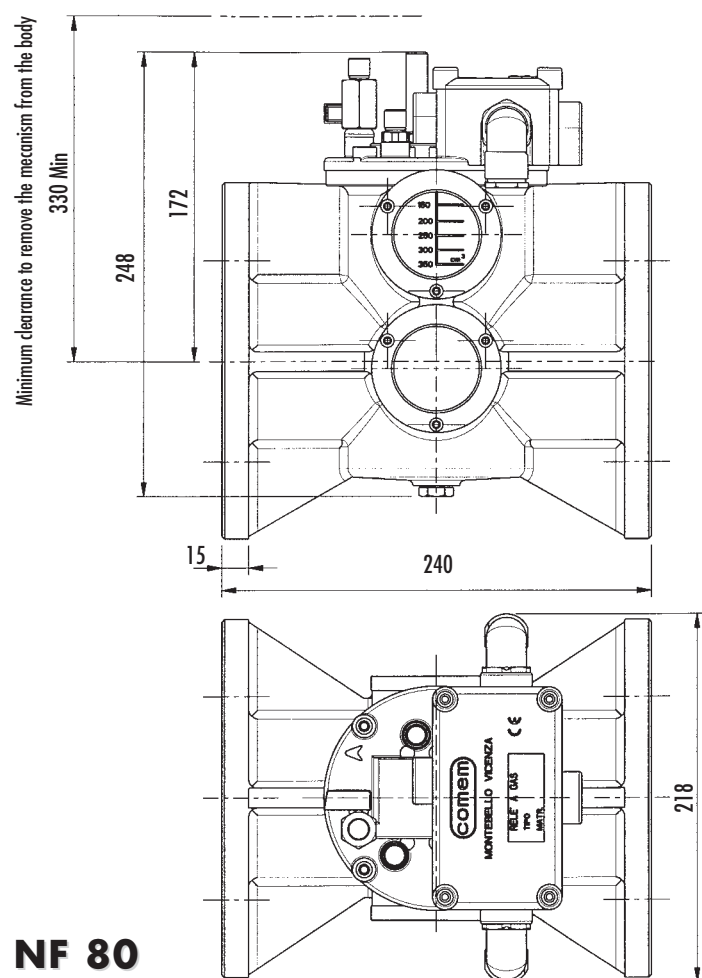


Peso

**3.0 kg**

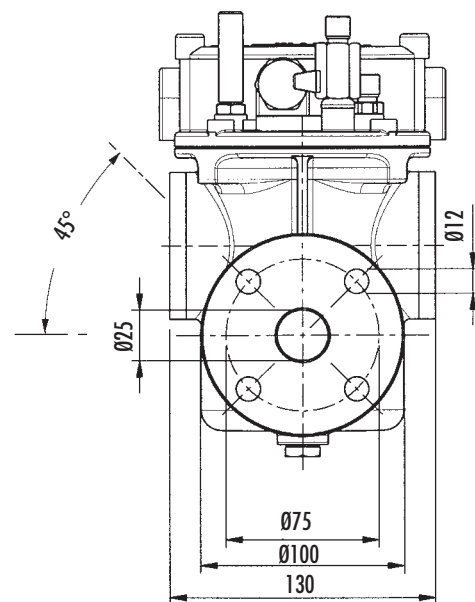
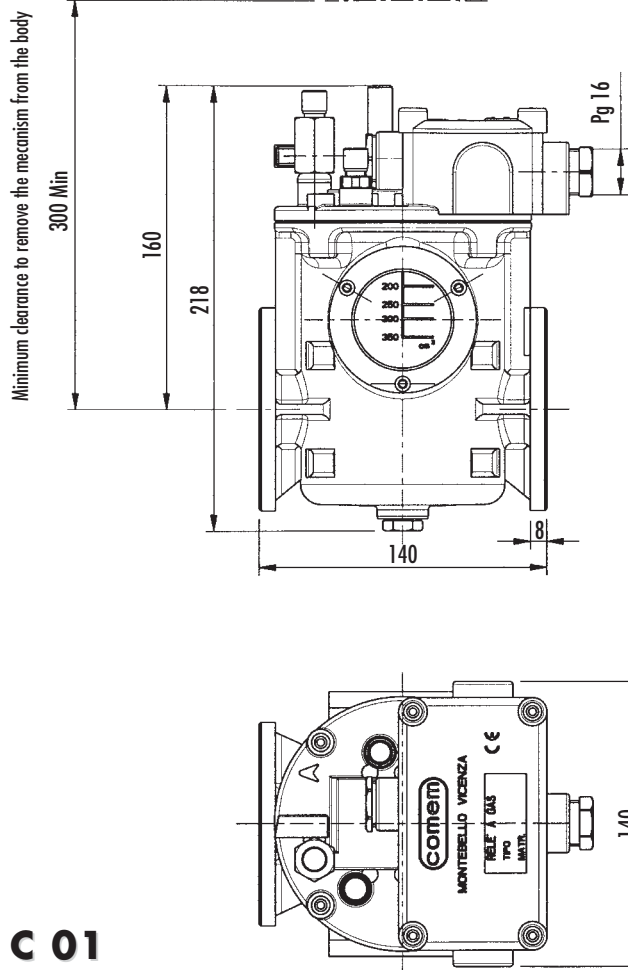


Peso **4.8 kg**



Peso **5.5 kg**

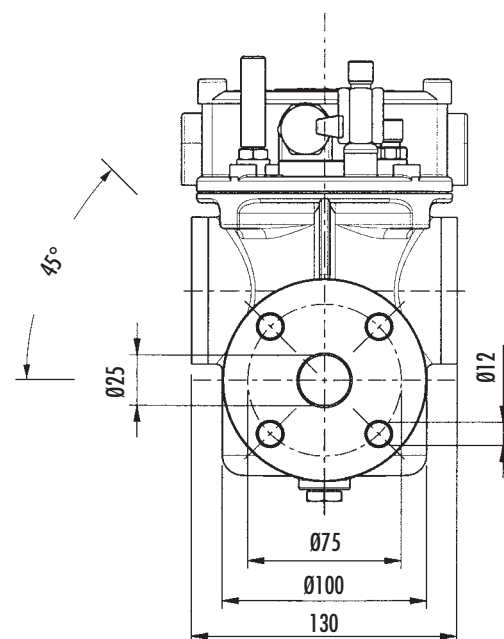
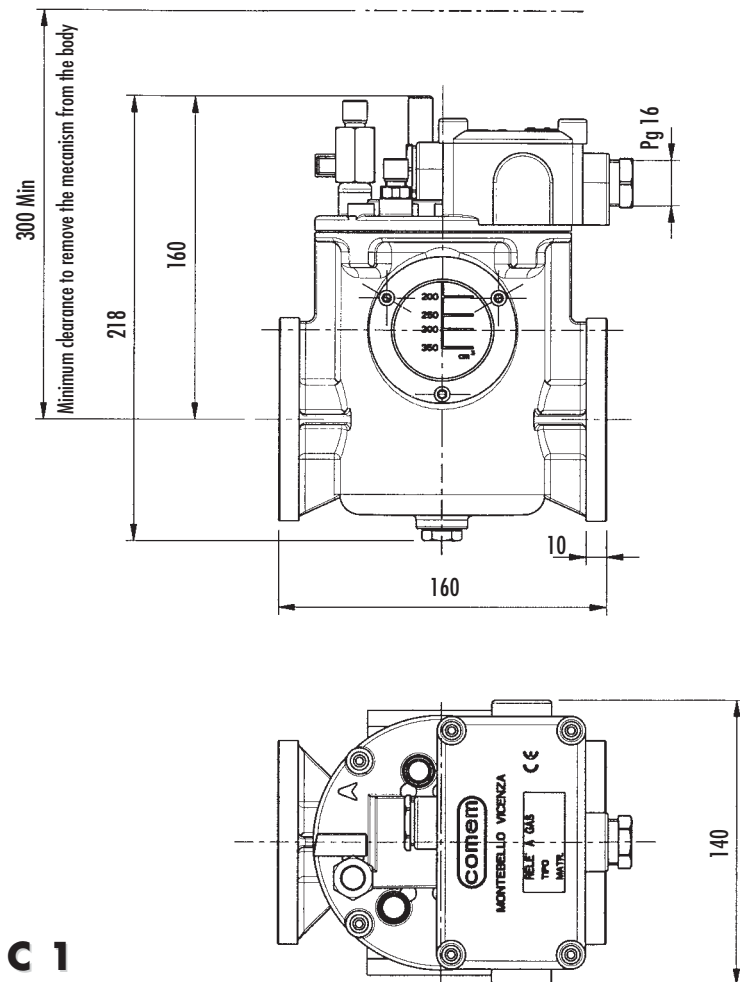
**C 01**



Peso

**2.2 kg**

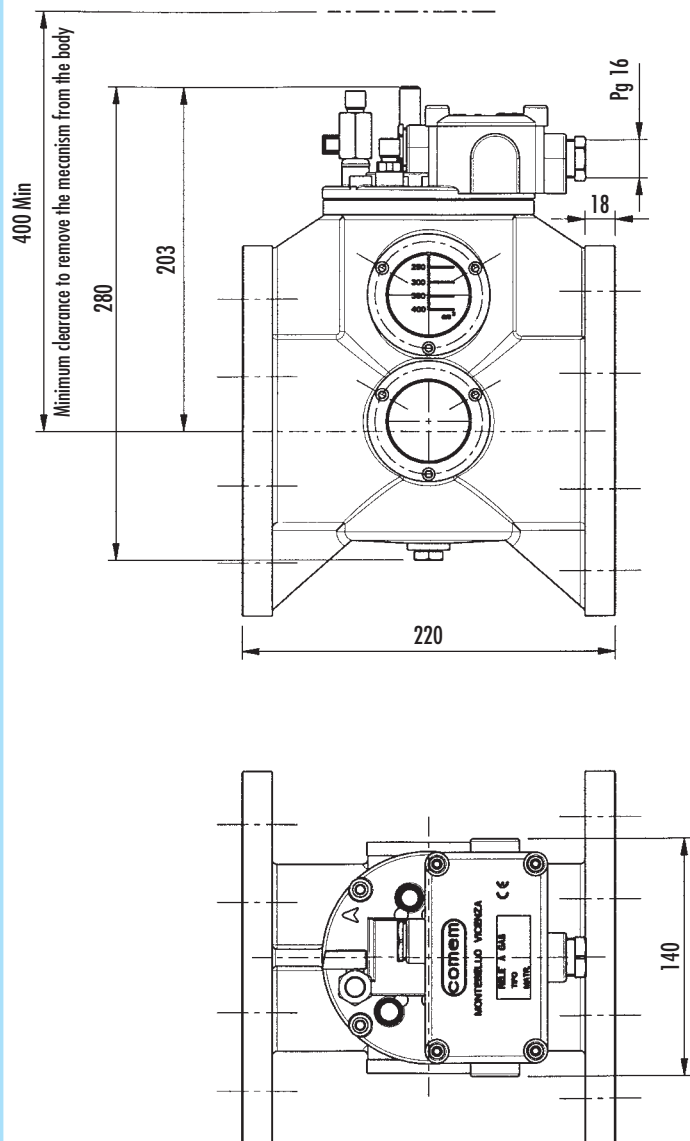
**C 1**



Peso

**2.3 kg**

**C 4**



Peso

**5.9 kg**



## RELÈ AD ACCUMULO DI GAS TIPO BUCHHOLZ secondo norma CENELEC EN 50216-2

La presenza di gas all'interno di un trasformatore in olio è sempre indice di anomalia di funzionamento.

Essa può manifestarsi a causa:

- della decomposizione di isolanti solidi o liquidi interni al trasformatore, dovuta a surriscaldamenti o ad archi elettrici;
- dall'ambiente esterno attraverso pompe di circolazione;
- dall'interno del trasformatore, qualora il dielettrico non venga sottoposto ad un accurato degassamento prima della messa in servizio.

Le eccessive correnti d'olio, specialmente nelle tubazioni verso il conservatore, nascono dall'effetto di cortocircuiti o da forti archi elettrici interni, i quali possono danneggiare o pregiudicare il funzionamento del trasformatore.

Una perdita d'olio, dalla cassa del trasformatore, potrebbe provocare seri danni di inquinamento ambientale e, nella peggiore delle ipotesi, alimentare un principio d'incendio.

Nella prospettiva di incrementare sicurezza e affidabilità nei trasformatori in olio e controllare queste tre possibili anomalie, la COMEM, grazie all'applicazione di nuove tecnologie e alla quarantennale esperienza nella costruzione e produzione di accessori per trasformatori elettrici, ha sviluppato il progetto di un nuovo relè ad accumulo di gas tipo "BUCHHOLZ" a due galleggianti con contatti magnetici.

Questo prodotto è stato ideato nel rispetto delle nuove Normative Europee **CENELEC EN 50216-1** e **EN 50216-2**.

### PRINCIPIO DI FUNZIONAMENTO

Durante il normale funzionamento il relè deve essere sempre riempito d'olio.

Quando nel trasformatore si ha una formazione di gas, le bolle devono convogliare, previo corretta progettazione del trasformatore stesso da parte del costruttore, nella tubazione che porta al conservatore.

Queste vengono "accumulate" all'interno del relè BUCHHOLZ, nella sua parte superiore, provocando l'abbassamento del livello dell'olio e quindi del primo galleggiante (o galleggiante superiore) con conseguente azionamento dell'interruttore di allarme.

Nel caso di una continua formazione di gas, questo passa liberamente nella tubazione subito a valle del relè verso il conservatore.

Con un ulteriore aumento del volume di gas, e/o perdita d'olio, si abbassa il galleggiante inferiore (o secondo galleggiante) e prima che il relè si svuoti completamente, si ha l'azionamento dell'interruttore di sgancio. Tale fenomeno si manifesterà solamente quando tutto l'olio all'interno del conservatore sarà fuoriuscito.

Se si volesse preservare l'olio isolante contenuto nel conservatore, suggeriamo l'installazione del dispositivo di ritenuta automatico tipo RDR MK II, per il quale si rimanda al catalogo specifico. In caso di eccessiva corrente d'olio, (elevata velocità) una valvola di flusso, opportunamente tarata o con valori previsti dalla normativa, o concordati con il cliente, fa azionare istantaneamente l'interruttore di sgancio e quindi il circuito ad esso collegato.

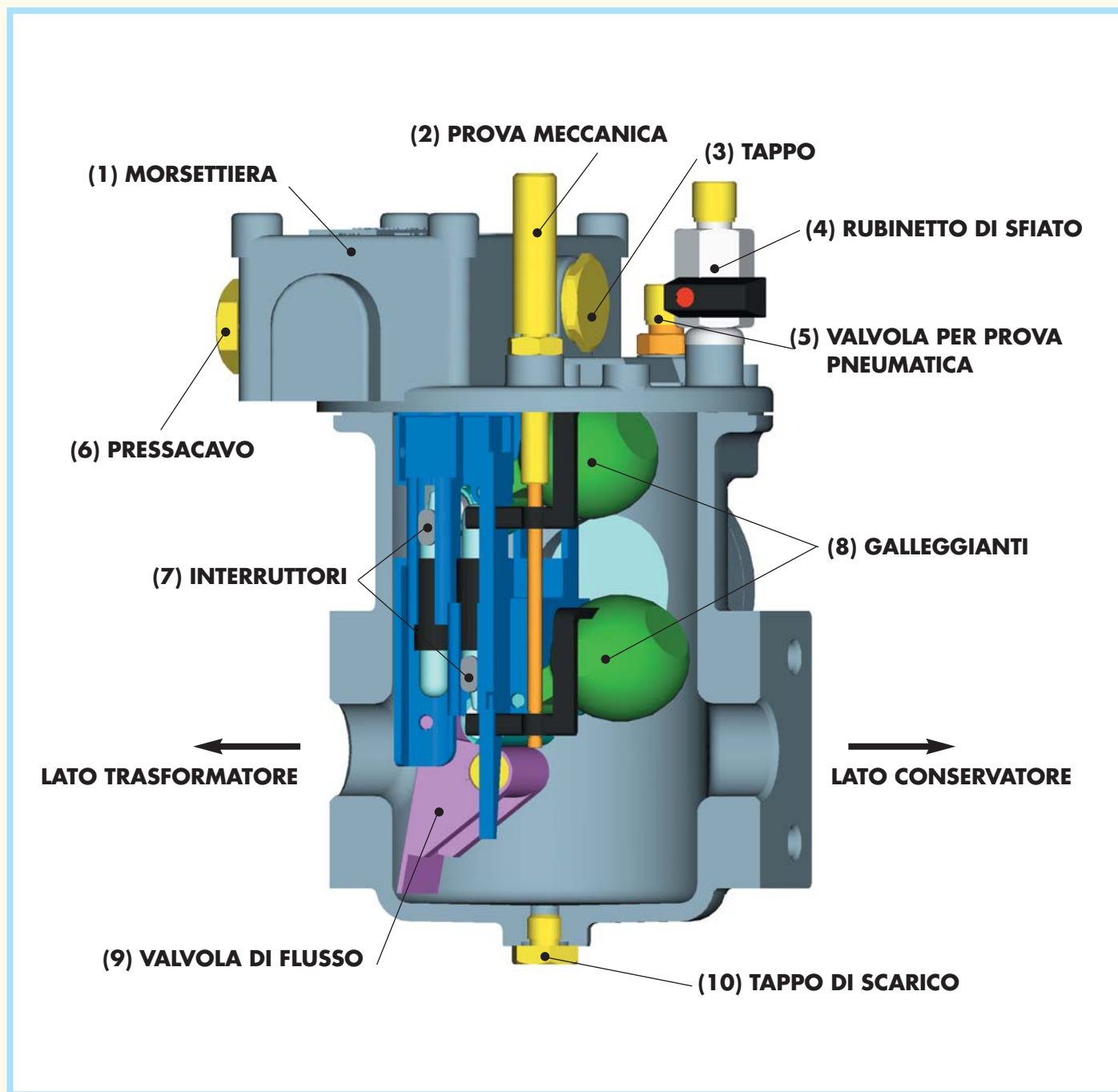
### DESCRIZIONE COSTRUTTIVA

Il relè BUCHHOLZ è costituito da due fusioni in lega di alluminio, resistenti alla corrosione, esenti da impurità e a perfetta tenuta:

- 1- il corpo su cui sono ricavate finestre di ispezione in vetro temperato che recano una scala graduata la cui taratura in cm<sup>3</sup> riguarda il volume interno del relè; nella parte inferiore è situato il tappo di scarico olio.
- 2- il coperchio nella cui parte interna inferiore è fissato un telaio portante gli elementi mobili costituenti la parte attiva del dispositivo. Tali elementi sono: 2 galleggianti, 2 o più interruttori elettrici racchiusi in ampolla di vetro, 1 valvola di flusso calibrata, 2 magneti permanenti.

Sulla parte esterna del coperchio sono inoltre posizionati:

- (4) 1 rubinetto per lo scarico dei gas con uscita filettata G 1/8" maschio con tappo di chiusura,
  - (5) 1 valvola per la prova pneumatica dei circuiti d'allarme e di sgancio con tappo di chiusura,
  - (2) 1 dispositivo per la prova meccanica dei circuiti d'allarme e di sgancio con tappo di chiusura,
- 1 scatola morsettiera all'interno della quale vi sono normalmente 4 o più isolatori, con attacco filettato M6, numerati ed una presa di messa a terra.



## PROTEZIONE ESTERNA E RIVESTIMENTO

Le parti esterne in alluminio sono verniciate con uno strato di smalto vinilico colore RAL 7001 previo trattamento di fosfatazione. Questo standard qualitativo è adatto per le applicazioni continentali e/o tropicali (500 h nebbia salina).

Nel caso di applicazioni in ambienti particolarmente avversi (> 500 h nebbia salina, es.: ambienti a bordo del mare e/o corrosivi acidi), suggeriamo richiedere la verniciatura per ambienti corrosivi nella quale viene inserito un adeguato strato di vernice epossidica come primer prima della mano finale.

Tutte le parti esterne in ottone sono protette da zincatura o nichelatura. La viteria è in acciaio inossidabile.

## LA SCELTA DEL RELÈ

Secondo la potenza nominale del trasformatore si può suggerire la scelta del relè, ma naturalmente il criterio della scelta dipende dal progettista e dall'utilizzatore finale del trasformatore stesso.

POTENZA TRASFORMATORE MVA	DIAMETRO NOMINALE
Fino a 5	25
da 5 a 20	50
da 20 a 50	80
oltre 50	100

tab. 1

## DATI TECNICI E PRESTAZIONI

- Inclinazione di  $1,5^\circ \div 2,5^\circ$  sull'asse orizzontale della tubazione dal trasformatore verso il conservatore; è possibile l'installazione con angolo max di  $9^\circ$ . In questo caso, su richiesta, si esegue una taratura specifica.
- Pressione di esercizio 1 bar, ma è in grado di resistere ad una sovrappressione di 2,5 bar per due minuti a  $100^\circ\text{C}$ .
- Volume di gas necessario all'intervento di allarme:

RELÈ BUCHHOLZ TIPO	VOLUME DI GAS NECESSARIO PER L'INTERVENTO DI ALLARME
BG 25, BR 25, NF 25, C 01, C 1	125 cm <sup>3</sup>
NF 50, NF 80	125 cm <sup>3</sup>
BR 50, BR 80, C 4	235 cm <sup>3</sup>
BS 25	230 cm <sup>3</sup>
BS 50, BS 80	300 cm <sup>3</sup>

tab. 2

- Velocità di flusso d'olio, in m/s con tolleranza di  $\pm 15\%$  a  $+20^\circ\text{C}$ , necessaria all'intervento di sgancio per tutte le grandezze con viscosità dell'olio secondo norme IEC 296.

Nella tabella di seguito sono indicati i valori disponibili, ma quelli standard sono evidenziati con "O", con "X" su richiesta e con "/" non disponibile.

DIAMETRO INTERNO DELLA TUBAZIONE	1,0 m/s	1,5 m/s	2,0 m/s
25	O	X	/
50	O	X	/
80	O	X	X
100	/	O	X

tab. 3

- Il relè opera in 0,5 secondi.
- Temperatura dell'olio compresa fra :  $-25^\circ\text{C} \div +115^\circ\text{C}$
- Temperatura ambiente compresa fra:  $-25^\circ\text{C} \div +60^\circ\text{C}$
- Grado di protezione IP65 secondo norma EN 60529.

## DATI ELETTRICI DEGLI INTERRUITORI

La corrente nominale degli interruttori è di **2 A r.m.s.** con max. **10 A r.m.s.** quale valore di corrente di breve durata per 30 ms.

Il potere di interruzione è indicato nella seguente tabella:

VOLTAGGIO	CORRENTE	POTERE D'INTERRUZIONE	
127 V d.c. (min. 12 V)	2 A x 10000 operazioni	250 W	L/R < 40 ms
230 V a.c. (min. 12 V)	6 A x 1000 operazioni	400 VA	$\cos \varphi > 0,5$

tab. 4

Tensione dielettrica dei contatti come indicato nella seguente tabella:

	PROVA DI TENUTA A FREQUENZA INDUSTRIALE DI BREVE DURATA kV/1 min. (r.m.s.)	TENSIONE DI TENUTA ALL'IMPULSO kV (picco)
Tra i circuiti e la terra	2,5	5
Tra i contatti in posizione aperta	1	3

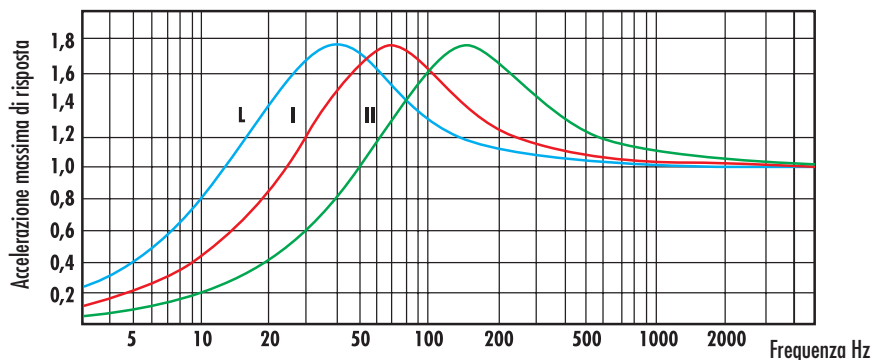
tab. 5

## PROVE E COLLAUDI

### PROVE DI TIPO

Oltre alle prove di routine sotto indicate, sono state eseguite su un campione tipo:

- Misurazione della quantità di gas necessaria per l'azionamento del contatto di allarme.
- Tenuta alla nebbia salina **500 ore**. Rif. norma EN 60721-3-4.
- Valore max di campo magnetico ammesso **25 mT** (nessun intervento del relè). Rif. norma EN 50216-2.
- Vibrazioni meccaniche stazionarie sinusoidali. Sono state eseguite prove in accordo con la norma EN 60721-3-4:
  - a) prova di vibrazione in classe **4M4**, che viene applicata per i luoghi dove si hanno vibrazioni trasmesse da macchine e dal passaggio di veicoli. Non si addice a macchine esposte ad alto livello di vibrazioni e urti. Con speciale apparecchiatura è stato impresso al relè un movimento nei tre assi con vibrazione stazionaria sinusoidale da **2 a 200 Hz**. Nel campo da **2 a 9 Hz** lo spostamento aveva ampiezza costante di **3 mm** (6 mm picco-picco), mentre sopra i **9 Hz** è stata imposta l'accelerazione costante di **10 m/s<sup>2</sup>** senza intervento degli interruttori di allarme e sgancio.
  - b) prove di vibrazione non stazionaria con shock verticale con una accelerazione di **250 m/s<sup>2</sup>** con uno spettro di tipo **I** (durata 11 ms), il cui grafico è sotto riportato. Non ci sono stati interventi dei contatti di allarme e sgancio.



Esempio di durata di un impulso semisinusoidale:

Spettro tipo L : durata 22 ms

Spettro tipo I : durata 11 ms

Spettro tipo II : durata 6 ms

- È stata eseguita inoltre una prova sismica in accordo con la norma EN 50216-1, che richiama la EN 60068 classe 0, livello 2. Il test consiste nell'applicare una accelerazione in orizzontale di **9 m/s<sup>2</sup>** e di **4,5 m/s<sup>2</sup>** con moto verticale con un aumento della frequenza di una ottava al minuto. Non è stato rilevato alcun intervento degli interruttori di allarme e sgancio.
- Prova di tenuta alla pressione massima di **2,5 bar** applicata per **2 minuti** con temperatura olio a **100 °C**.
- Prova di tenuta al vuoto con pressione assoluta di **2500 Pa** applicata per **24 ore**.
- Prova della velocità di flusso necessaria alla disinserzione del circuito (come tabella 3).
- Prova di funzionamento con flusso da conservatore a trasformatore.
- Prova di tenuta all'impulso (come tabella 5).

### PROVE DI ROUTINE

Tutti i relè Buchholz, prima di essere spediti, vengono sottoposti alle seguenti prove e collaudi; se superate viene emesso un verbale di collaudo, di cui un originale verrà fornito assieme al dispositivo.

- Prova di tenuta idraulica in olio minerale con temperatura di **90 °C** alla pressione **100 kPa** per la durata di **30 minuti**. Al termine di questo si effettua la verifica del funzionamento dei contatti elettrici di allarme e di sgancio, sia azionando il pulsante di prova meccanica, sia procedendo ad una simulazione di perdita d'olio.
- Verifica della velocità di flusso necessaria allo sgancio del circuito (come da tabella 3).
- Prova di tenuta alla frequenza industriale di breve durata tra circuiti e terra (come da tabella 5).
- Prova di tenuta alla frequenza industriale di breve durata fra i contatti in posizione aperta (come da tabella 5).

### PROVA DI FUNZIONAMENTO DEL RELÈ

Il seguente controllo si può effettuare quando il relè è già montato sul trasformatore. La posizione dei galleggianti può essere modificata o con un'azione manuale sul pulsante (2) (prova meccanica) oppure con l'immissione di aria (per il solo galleggiante superiore del contatto di allarme) all'interno del relè attraverso la valvola (5) mediante una pompa per bicicletta (prova pneumatica), **set disponibile con codice Comem 5400806002**.

In ambedue i casi si deve verificare l'abbassamento dei galleggianti del circuito di allarme e quello di sgancio (solo con la prova meccanica). Su richiesta si potrebbero effettuare, per il circuito di sgancio, anche prove idrauliche di funzionamento della valvola di flusso, ma data la loro complessità si raccomanda di consultare il nostro ufficio tecnico.

**N.B.** Prima di qualsiasi operazione sul relè, è necessario che il trasformatore non sia in funzione.

### ISTRUZIONI PER IL MONTAGGIO

Per il corretto funzionamento dell'apparecchiatura occorre rispettare queste disposizioni :

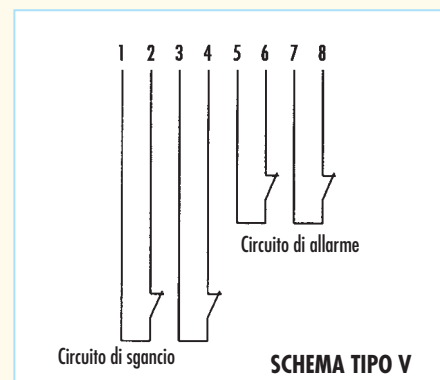
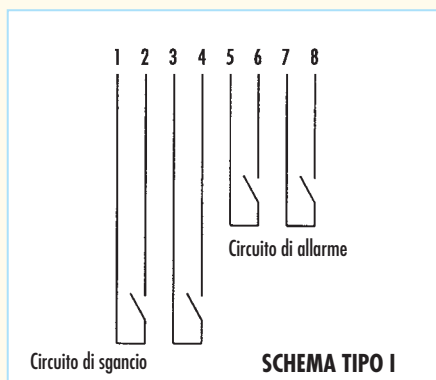
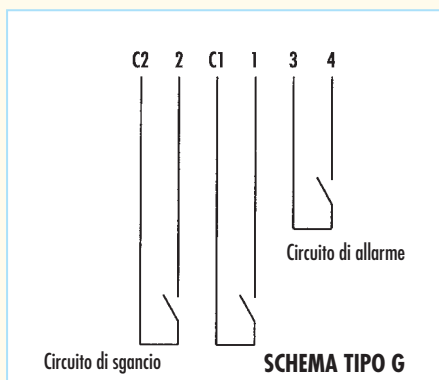
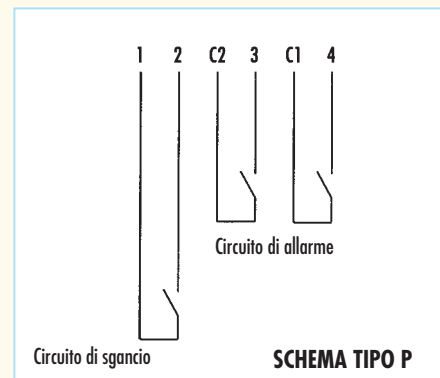
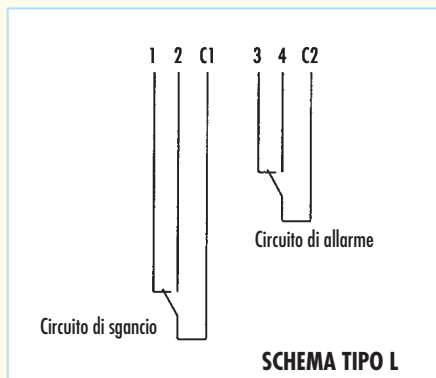
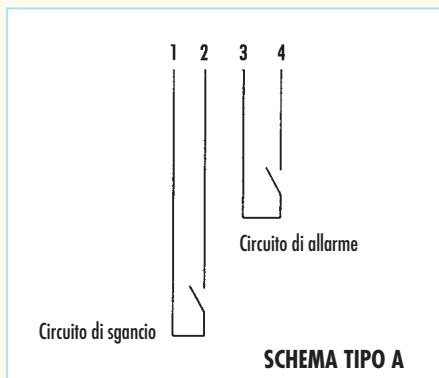
- sul relè si trova una freccia rossa che indica la direzione del corretto montaggio: dal trasformatore al conservatore.
- il relè deve essere sempre pieno d'olio per cui il livello minimo d'olio del conservatore deve essere sempre al di sopra del rubinetto di sfianto del relè.
- il relè deve essere sempre montato orizzontalmente per assicurare il funzionamento corretto dei galleggianti; è consigliata un'inclinazione di **1,5°÷2,5°** (max 9°) rispetto all'asse orizzontale verso il conservatore.
- il tubo che collega il trasformatore al relè deve uscire dal punto più alto del coperchio del trasformatore.
- la tubazione deve essere preferibilmente rettilinea per una lunghezza pari ad almeno **5÷10 volte** a monte del relè e **3 volte** a valle, il diametro nominale della tubazione stessa, ed essa deve essere ascendente verso il conservatore.

## SCHEMA DI ORDINAZIONE DEL RELÈ

Grandezza e modello prescelto (vedasi disegni e tabella 1):

BG 25   BR 25   BR 50   BR 80   BR 80 <sup>8 fori</sup>   BS 25   BS 50   BS 80   NF 25   NF 50   NF 80   C 01   C 1   C 4  
☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐   ☐

Schema dei contatti elettrici (si intende con relè pieno d'olio e in funzionamento normale):



A   L   P   G   I   V   Altro  
☐   ☐   ☐   ☐   ☐   ☐   ☐

Guarnizioni scelte:

A   B   C   Altro  
☐   ☐   ☐   ☐

	TIPO DI DIELETTRICO TEMPERATURA AMBIENTE/OLIO	MINERALE	SILICONICO	ESTERIFICATO
<b>A</b>	Ambiente -25 ÷ 60 °C Olio -25 ÷ 115 °C    Versione standard	NBR	VITON/NBR	//
<b>B</b>	Ambiente -10 ÷ 60 °C Olio -10 ÷ 115 °C    Esecuzione speciale	//	VITON	VITON
<b>C</b>	Ambiente -40 ÷ 60 °C Olio -40 ÷ 115 °C    Esecuzione speciale	NBR/VITON	NBR/VITON	NBR/VITON

(NBR/VITON = si intende come: parti a contatto con olio in VITON, parti non in contatto con olio in NBR)

tab. 6

Verniciatura:

Standard   Ambienti corrosivi   Altro speciale  
☐   ☐   ☐



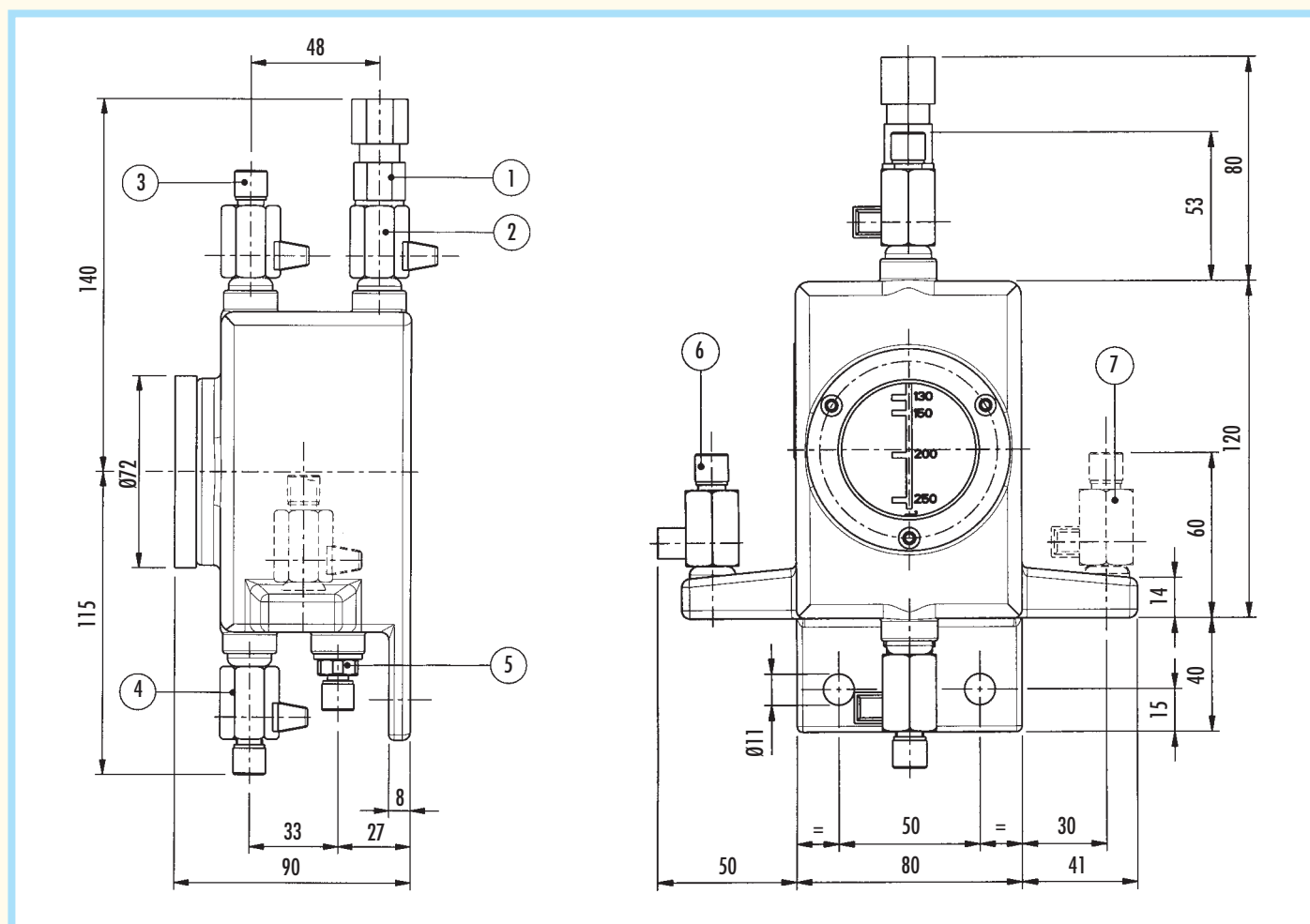
## DISPOSITIVO DI PRELIEVO GAS CON APPLICAZIONE DI RUBINETTO SCARICO OLIO DEL RELÈ BUCHHOLZ

### PRINCIPIO DI FUNZIONAMENTO

Com'è noto la presenza di gas all'interno di un trasformatore isolato in olio è sempre indice di anormale funzionamento e il relè Buchholz ha il compito di segnalarne l'esistenza. Può sorgere quindi la necessità di analizzare eventuali gas sia per accertarne la pericolosità sia per cercare di individuare l'origine di un possibile guasto senza dover sconnettere il trasformatore.

Sfortunatamente il relè Buchholz è posizionato vicino a parti in tensione del trasformatore e quindi risulta impossibile il prelievo del gas direttamente dal relè senza mettere fuori servizio il trasformatore stesso. Inoltre il suo posizionamento non lo rende accessibile da terra.

Il dispositivo di prelievo gas raffigurato ha il compito di ovviare a questo inconveniente. Infatti la parte superiore del relè viene messa in comunicazione con il dispositivo che può essere sistemato in posizione accessibile e non pericolosa per l'operatore.



### DESCRIZIONE COSTRUTTIVA

Costruttivamente il dispositivo di prelievo gas COMEM è costituito da una fusione in alluminio, resistente alla corrosione e a perfetta tenuta, su cui sono posizionati:

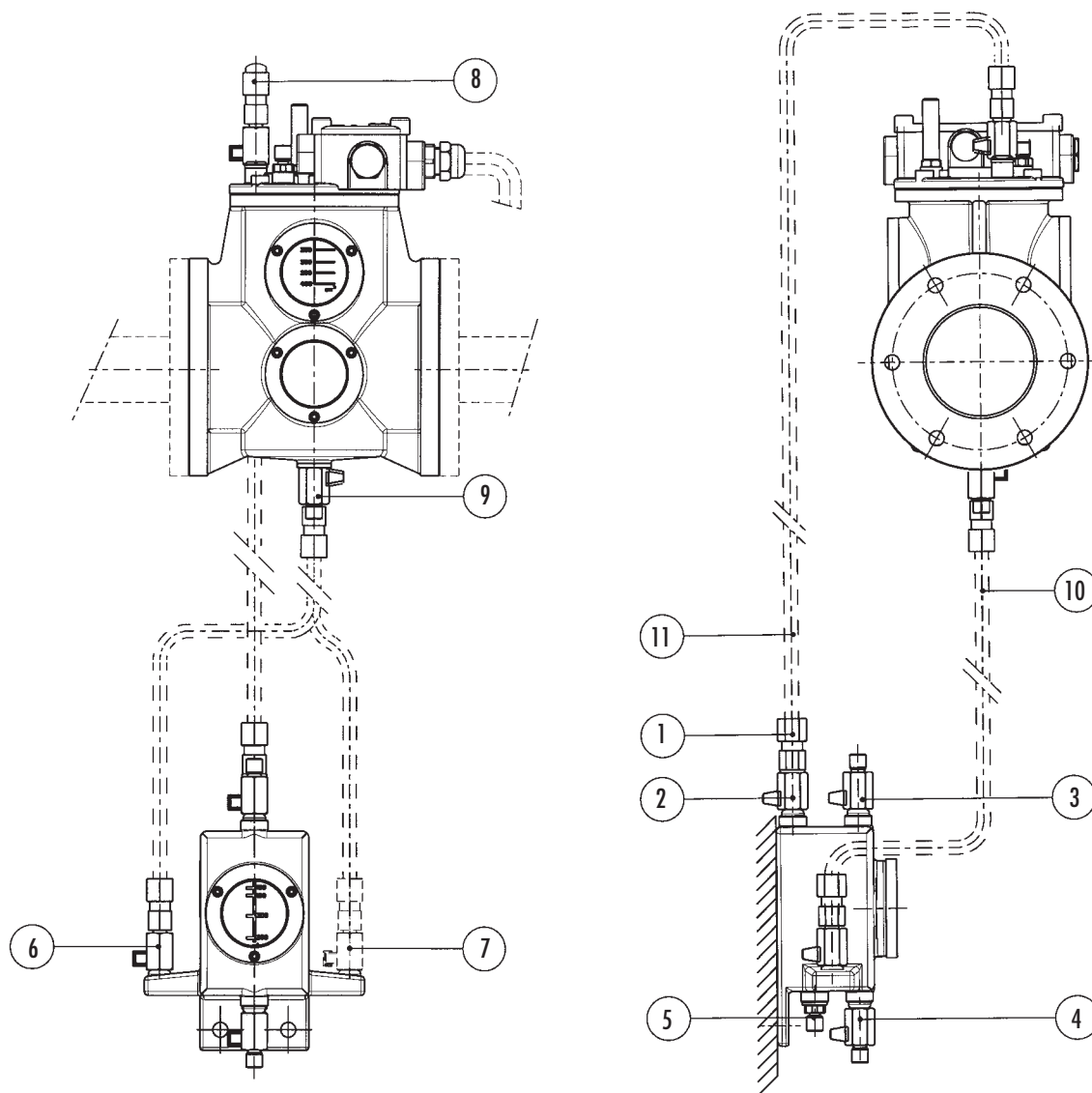
- un oblò di ispezione interna graduato;
- un rubinetto di collegamento relè per il prelievo del gas (2);
- un rubinetto di sfiato del gas dal dispositivo (3);
- un rubinetto di scarico olio dal dispositivo (4);
- una valvola di immissione gas per prova pneumatica circuiti relè (5);
- un rubinetto laterale per lo scarico olio dal relè. Tale rubinetto può essere indifferentemente applicato sulla sinistra o sulla destra del corpo (6) o (7).

Prima di essere spediti tutti gli involucri dei dispositivi di prelievo gas vengono sottoposti ad una prova di tenuta idraulica immettendo aria a temperatura ambiente con pressione di 2.5 bar per la durata di 2 minuti, se superata viene emesso un verbale di collaudo, di cui un originale verrà fornito assieme al dispositivo. Al fine di standardizzare il più possibile il prodotto, lo stesso viene consegnato con entrambi i supporti, sinistro e destro, ed un rubinetto. Il cliente all'atto dell'utilizzo, applicherà il rubinetto nella posizione voluta.

I dispositivi standard sono corredati di raccordi per tubo Ø10 mm esterno, codice d'ordinazione **1RDPG00005**.

Su richiesta possono essere forniti i seguenti dispositivi:

- con raccordi per tubo Ø 6 mm esterno, codice **1RDPG00006**;
- con raccordi per tubo Ø 8 mm esterno, codice **1RDPG00007**.



## DESCRIZIONE DEL FUNZIONAMENTO

Durante il funzionamento normale il relè Buchholz è pieno d'olio ed è collegato al dispositivo di prelievo gas con le tubazioni 10 e 11.

Sono aperti: i rubinetti (8) (2) (9)

Sono chiusi: i rubinetti (3) (4) (6) o (7)

Il dispositivo di prelievo gas è quindi tutto pieno d'olio:

Le operazioni che si possono eseguire sono le seguenti:

**A-** Prelevare olio: si aprono i rubinetti (6) o (4)

**B-** Prelevare gas se il relè ha dato il segnale di allarme o di disinserzione:

si apre il rubinetto (4) e si fa defluire l'olio dal dispositivo. Così facendo si richiama il gas presente nel relè che attraverso il rubinetto (8), il tubo (11) e il rubinetto (2) riempirà il corpo del dispositivo. La cosa potrà essere controllata attraverso l'oblò. Quando nel dispositivo si è accumulata la quantità di gas desiderata si chiudono i rubinetti (2) e (4) e si apre il rubinetto (3) per il prelievo.

**C-** Controllare il funzionamento dei circuiti di allarme e disinserzione:

si chiude il rubinetto (2), e si scarica tutto l'olio presente nel dispositivo aprendo i rubinetti (3) e (4); si applica una pompa d'aria (set disponibile con codice Comem 5400806002) alla valvola (5), si chiudono i rubinetti (3) e (4) e si pompa rapidamente aprendo contemporaneamente il rubinetto (2). In questo modo l'aria verrà spinta attraverso la tubazione (11) e si riempirà la parte superiore del relè facendo abbassare i galleggianti con conseguente chiusura dei contatti. Se si vuole provare anche il segnale di disinserzione bisogna avere l'avvertenza di chiudere la valvola di intercettazione fra relè e conservatore per evitare che l'aria affluisca al conservatore.

## AVVERTENZE PER LA MESSA IN FUNZIONE

È sufficiente assicurarsi che il relè, la tubazione di collegamento (11) e il dispositivo di prelievo siano riempiti d'olio.



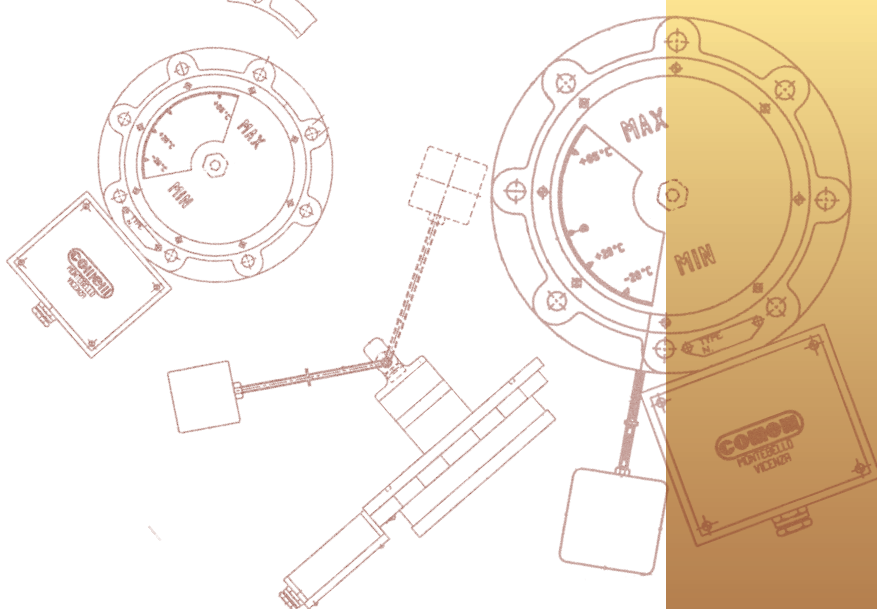
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Internet <http://www.comem.com> • e-mail: [comem@comem.com](mailto:comem@comem.com)



INDICATORI  
DI LIVELLO A GIUNTO  
MAGNETICO  
**L 14 - L 22 - L 34**

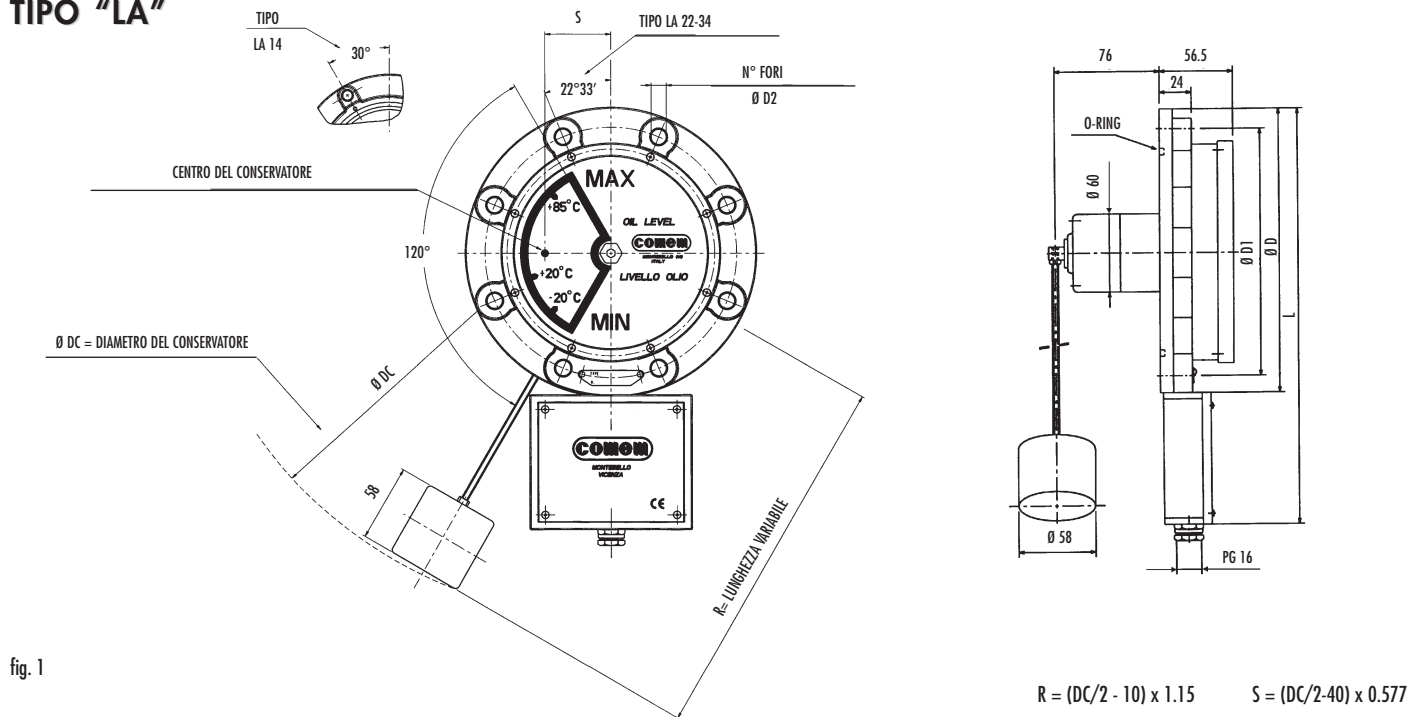
**comem**®

## INDICATORI DI LIVELLO A GIUNTO MAGNETICO GRANDEZZA Ø 140/220/340

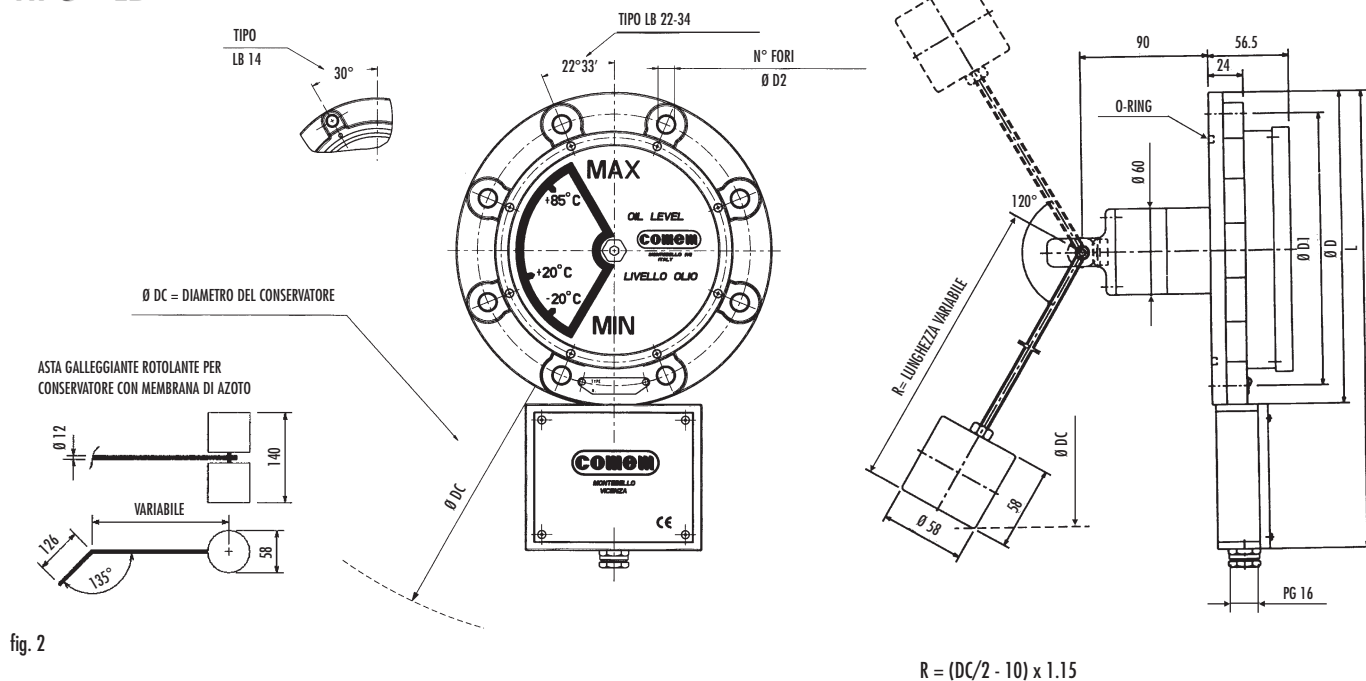




## TIPO "LA"



## TIPO "LB"



LIVELLO TIPO	Ø D	Ø D1	Ø D2	N° FORI	L	O.RING TIPO	PESO kg	R STANDARD
LA14	140	125	7	6	245	O.R. 186 (6362)	1.40	max. 370
LA22	220	190	11.5	8	325	O.R. 221	2.30	max. 550
LA34	340	305	18	8	445	O.R. 248 (81000)	6.00	max. 710
LB14	140	125	7	6	245	O.R. 186 (6362)	1.70	max. 370
LB22	220	190	11.5	8	325	O.R. 221	3.60	max. 550
LB34	340	305	18	8	445	O.R. 248 (81000)	6.30	max. 710

DIMENSIONI IN MILLIMETRI

## INDICATORI DI LIVELLO A GIUNTO MAGNETICO

Gli indicatori di livello a giunto magnetico sono costituiti da un robusto corpo in lega d'alluminio a tenuta idraulica, verniciato contro la corrosione. Il movimento tra asta del galleggiante e disco indicatore avviene mediante accoppiamento magnetico per una angolazione di 120°. In questo modo si ottiene che ad ogni variazione di livello del liquido si ha una corrispondente rotazione del magnete con conseguente indicazione di variazione sul quadrante dell'indicatore. Il disco indicatore è colorato in bianco e rosso. A chiusura del sistema è applicato un disco in policarbonato serigrafato con tacche di riferimento corrispondenti ai livelli che l'olio dovrebbe raggiungere alle temperature in gradi centigradi di: - 20°C, + 20°C, + 85°C.

**Nota:** Su richiesta possono essere eseguiti quadranti speciali.

### LETTURA DELLE INDICAZIONI DEI VARI LIVELLI DI LIQUIDO

- **Minimo livello:** quando si vede totalmente il colore rosso.
- **Massimo livello:** quando si vede totalmente il colore bianco.
- Indicazioni intermedie tra **MAX** e **MIN**: si vedrà parte di colore bianco e parte di colore rosso. Si deve tenere presente che la quantità di colore rosso che si vede indica, in proporzione, la parte di conservatore che rimane senza liquido.

### MOVIMENTO DEL GALLEGGIANTE

Può essere nel senso radiale del conservatore (tipo "LA") o nel senso assiale (tipo "LB") come si può vedere dal disegno (Fig. 1 e 2). Nel tipo "LB" è prevista una versione detta a "galleggiante rotolante" per applicazioni in conservatori con membrana di azoto.

### ASTA DEL GALLEGGIANTE

È completamente filettata. Se non viene specificatamente precisata la lunghezza (quota R del disegno fig.1 e 2) viene consegnata nella misura standard indicata a tabella. L'asta del livello con "galleggiante rotolante" è in tubo di alluminio.

### SEGNALAZIONE ELETTRICA

Su questi indicatori di livello sono applicati dei microinterruttori elettrici per le segnalazioni del minimo e massimo livello olio.

### CARATTERISTICHE ELETTRICHE:

- Alimentazione: 24 - 220 V c.a. o c.c.
- Potere di interruzione: 3 A 125/250 V ac (resistivo)  
0,5 A 125 V dc per carico induttivo L/R = 40 ms  
0,25 A 250 V dc per carico induttivo L/R = 40 ms

### SEGNALAZIONE DI INTERVENTO

I microinterruttori elettrici intervengono con un angolo di 5° in anticipo rispetto alle segnalazioni di minimo o massimo livello d'olio presente nel conservatore. Nel caso di doppio contatto sul Min e/o MAX l'intervento del secondo contatto avviene circa 5° dopo l'intervento del primo contatto. Sugli indicatori di livello è possibile, dopo l'installazione, verificare il corretto funzionamento dei microinterruttori e in generale il buon funzionamento di tutti gli organi interni dell'indicatore procedendo come segue:

- Togliere il tappo posto al centro del quadrante sulla parte anteriore dell'indicatore di livello svitandolo in senso antiorario.
- Inserire un cacciavite ad intaglio nell'apposita sede e far ruotare il disco indicatore fino alla avvenuta chiusura/apertura del circuito elettrico collegato.
- Richiudere il tappo facendo particolare attenzione nel posizionare correttamente l'anello di tenuta (O.R.) sotto il tappo e serrare con una certa forza il tappo stesso.

### RESISTENZA ALLE VIBRAZIONI ESEGUITE SUI CONTATTI ELETTRICI

Sono state eseguite delle prove secondo le modalità del grafico (N° 10 cicli) sotto riportato con una ampiezza di oscillazioni di 2 mm e nelle condizioni normali di esercizio. Nessun segnale di chiusura /apertura dei contatti è stato rilevato.

### NOTE

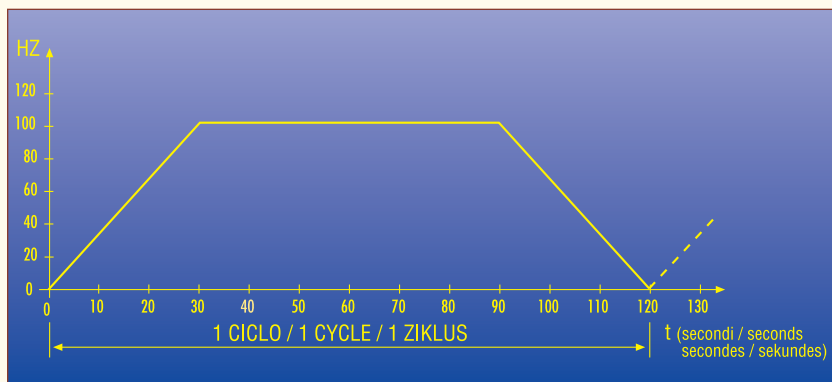
Bulloneria esterna in acciaio inox.

Verniciatura esterna di colore grigio RAL 7001

Grado di protezione: IP 54

**Temperatura di esercizio.** Tutti gli indicatori di livello sono adatti per funzionare con:

- Temperatura dell'olio comprese fra: -25°C e +120°C
- Temperatura ambientale compresa fra: -25°C e +60°C.



INDICAZIONI PER IL MONTAGGIO

Gli indicatori di livello aventi il movimento del galleggiante nel senso radiale del recipiente (tipo "LA") vanno applicati spostati rispetto l'asse orrizzontale del conservatore (quota "S" fig. 1) in modo da avere l'esatta indicazione del Minimo e Massimo livello d'olio. Quelli con il movimento nel senso assiale (tipo "LB") vanno applicati al centro del conservatore. Le misure degli spostamenti (quota "S") e la lunghezza dell'asta con galleggiante (quota "R") si ricavano dalle formule riportate sotto le fig.1 e 2. E' buona norma controllare il funzionamento dell'indicatore dopo aver eseguito il montaggio sul conservatore. Per ulteriori e dettagliate informazioni far riferimento alla scheda tecnica / informativa fornita a corredo.

PROVE E COLLAUDI

Gli indicatori di livello sono sottoposti alla prova di isolamento verso massa con le seguenti modalit : 2,5 kV AC 50/60 Hz per 72 secondi. I corpi degli indicatori di livello, superato il controllo dimensionale e privi degli organi interni, vengono collaudati a tenuta idraulica allo scopo di eliminare quelli che presentano perdite. Il collaudo definitivo si effettua quando l'indicatore di livello   completamente montato. Si controlla scrupolosamente la sensibilit  di tutti i movimenti di segnalazione e l'accuratezza dell'esecuzione del montaggio degli stessi.

SIGLE PER L'IDENTIFICAZIONE

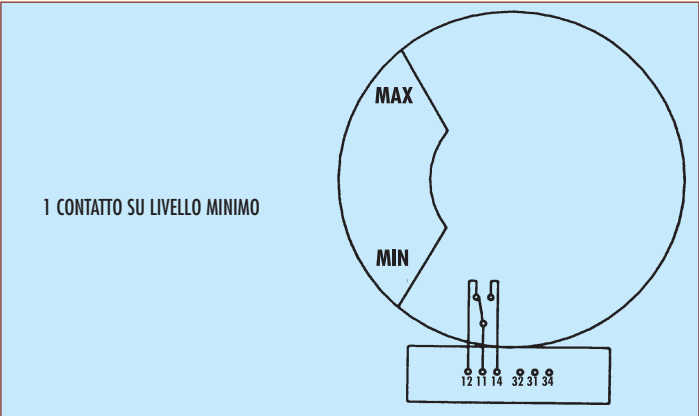
La sigla che identifica completamente il tipo di indicatore di livello   composta da una serie di lettere e cifre che hanno il seguente riscontro logico:

1 (lettera)	L	Indicatore di livello
2 (lettera)	A	Movimento del galleggiante radiale (fig. 1)
	B	Movimento del galleggiante assiale (fig. 2)
3 & 4 (cifra)	14	Dimensione dell'indicatore di livello = � 140 mm
	22	Dimensione dell'indicatore di livello = � 220 mm
	34	Dimensione dell'indicatore di livello = � 340 mm
5 (lettera)	K	Schema elettrico con 1 contatto sul minimo
	Y	Schema elettrico con 2 contatti sul minimo
	X	Schema elettrico con 1 contatto sul minimo + 1 contatto sul massimo
	W	Schema elettrico con 2 contatti sul minimo + 2 contatti sul massimo
6 (lettera)	O	Verniciatura ordinaria
	S	Verniciatura per ambienti corrosivi
7 (lettera)	N	Indicatore di livello standard COMEM
	S	Indicatore di livello specifico per cliente

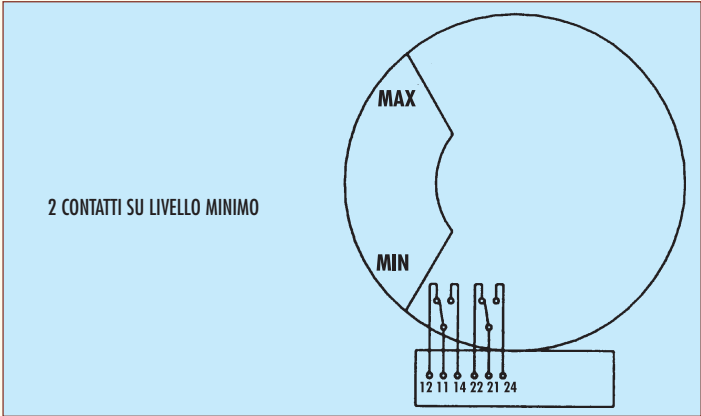
**Esempio: LA14XON**  
Indicatore di livello con movimento radiale con diametro da 140 mm avente schema elettrico con 1 contatto sul minimo e 1 contatto sul massimo, verniciato per ambienti normali e realizzato con quadrante e lunghezza asta come da standard COMEM.

SCHEMI ELETTRICI

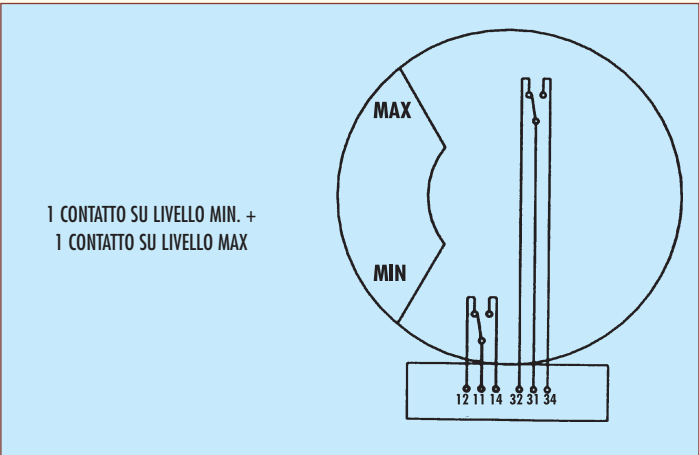
SCHEMA TIPO "K"



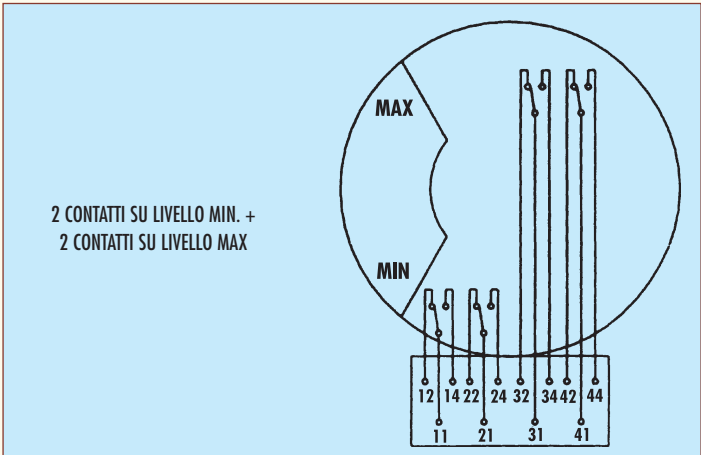
SCHEMA TIPO "Y"



SCHEMA TIPO "X"



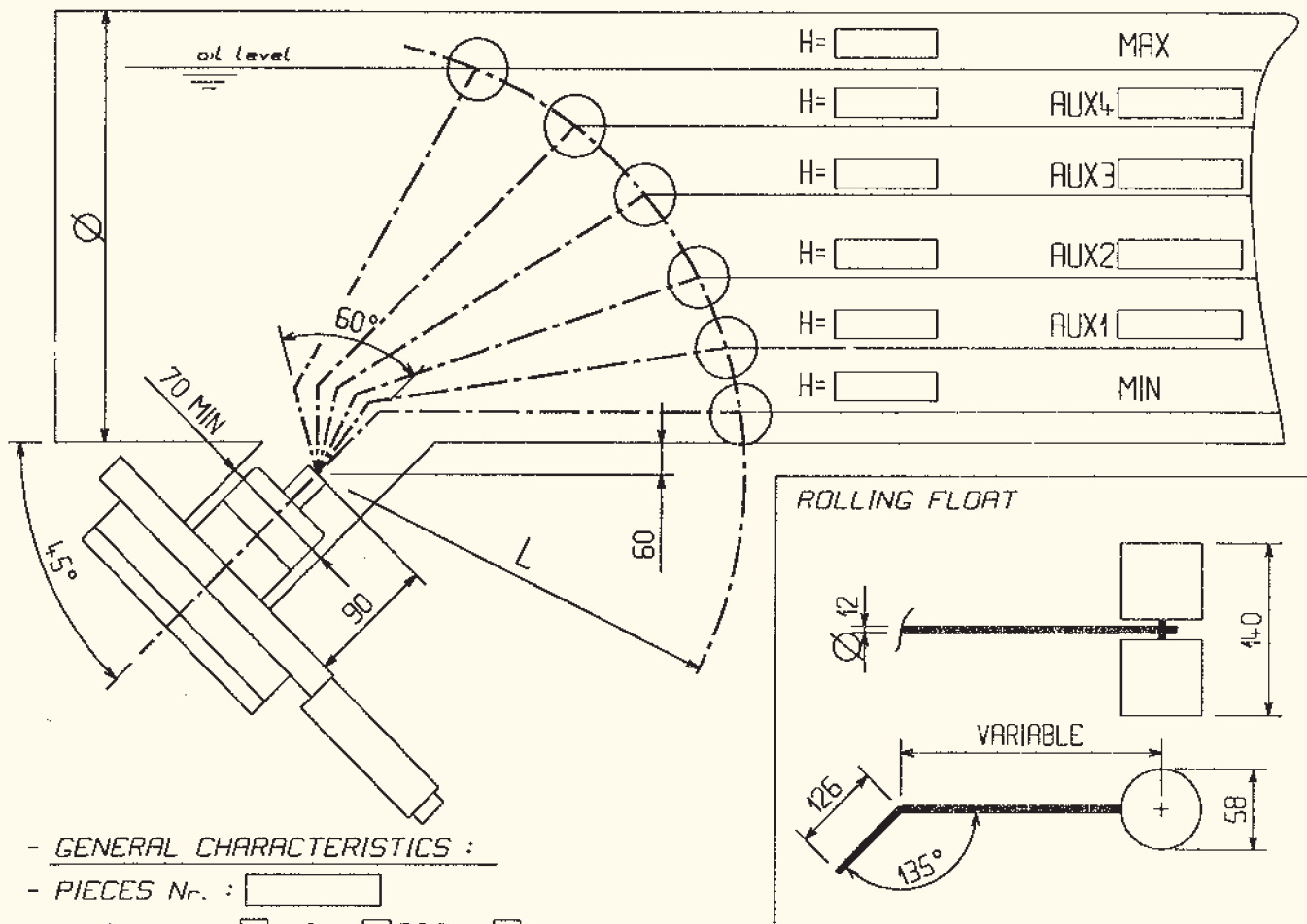
SCHEMA TIPO "W"



**TECHNICAL SPECIFICATION  
FOR OIL LEVEL INDICATORS  
WITH ROLLING FLOAT  
TYPE LB R=1:2**

TECHNICAL DATA : FOLLOWING INFORMATION SHOULD BE SPECIFIED :

- OIL LEVELS IN THE CONSERVATOR THAT NEED TO BE SHOWN
- TEMPERATURE VALUES AUX1,2... NEEDED TO BE SHOWN ON THE GAUGE DISK



GENERAL CHARACTERISTICS :

- PIECES Nr. :

- DIMENSIONS : ☐ 140 ☐ 220 ☐ 340

- CONSERVATOR DIAMETER Ø =

- CONSERVATOR LENGTH L =

- ROLLING FLOAT LENGTH .....  $L = \sqrt{15876 + \left(\frac{H_{max} - 61}{0.866}\right)^2} + 178 \cdot \frac{H_{max} - 61}{0.866}$

- NUMBER OF CONTACTS : ☐ 1 CONTACT

☐ 2 CONTACTS =

☐ 4 CONTACTS

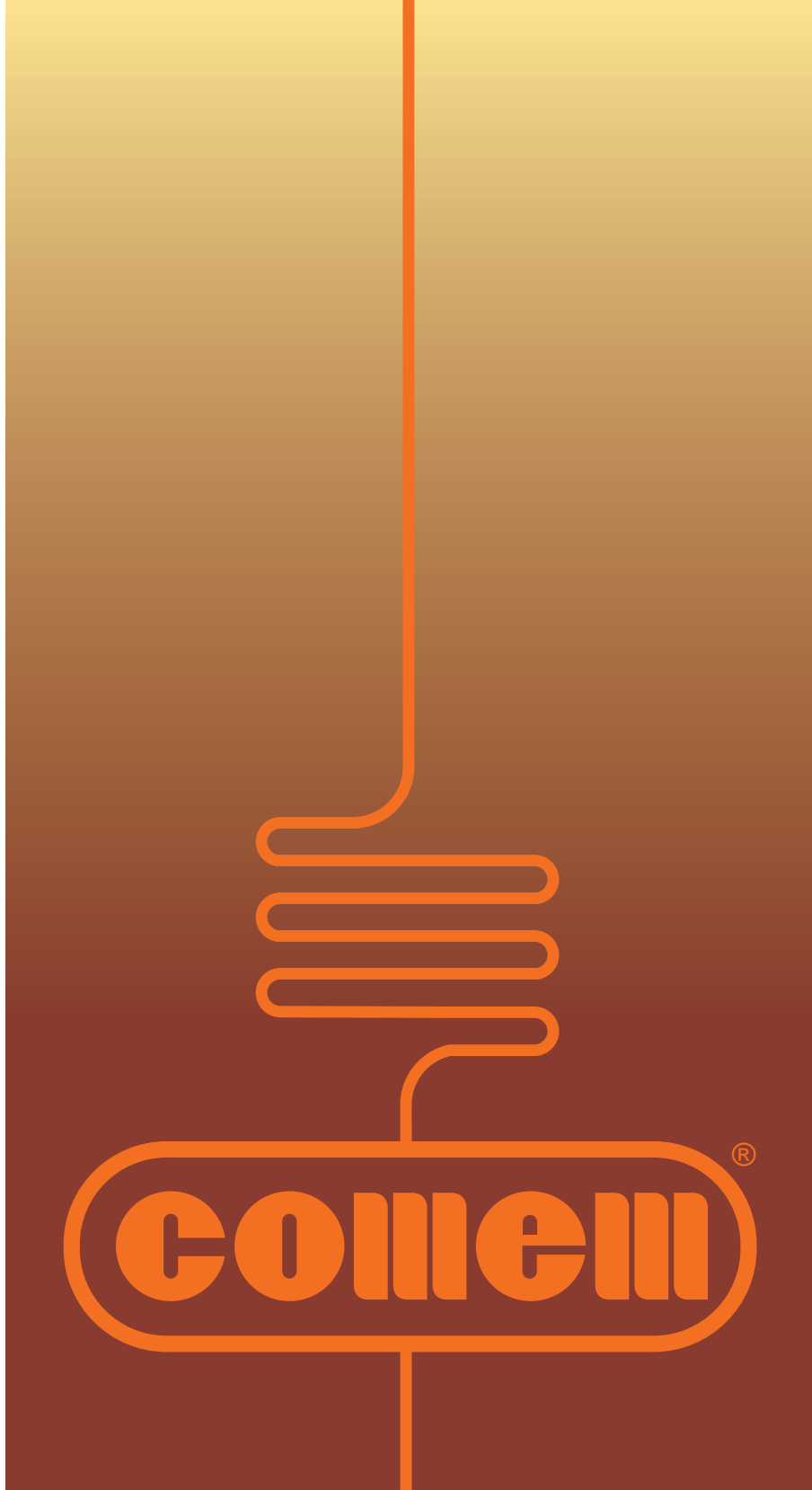
- CONTACTS RELEASE : ☐ MIN ☐ AUX1 ☐ AUX2 ☐ AUX3 ☐ AUX4 ☐ MAX

GAUGE DISK MATERIAL :

☐ POLYCARBONATE ☐ MINERAL GLASS ( CORROSIVE ENVIROMENT ) ☐ AS PER SPECIFICATION

PROTECTIVE COATING (GREY COATING RAL7001) :

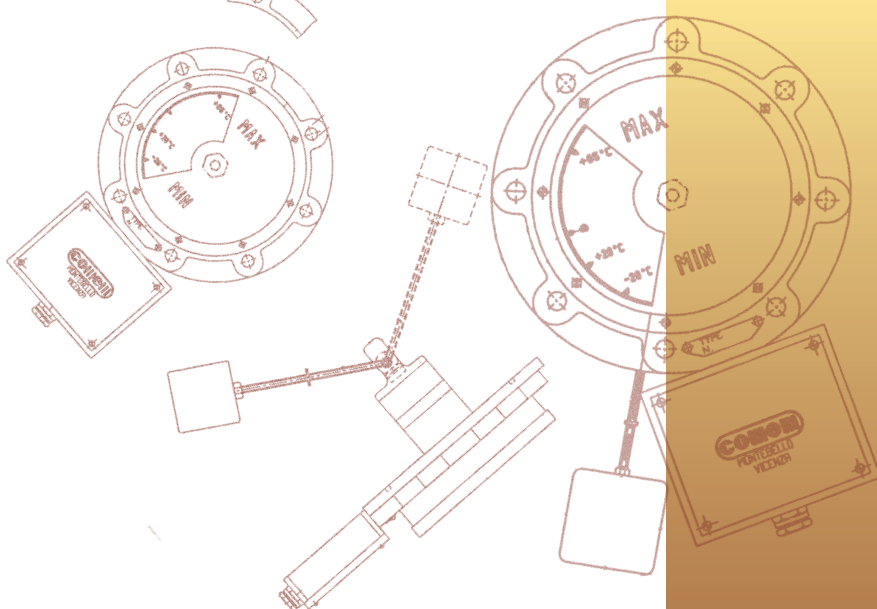
☐ NORMAL ☐ SPECIAL ( CORROSIVE ENVIROMENT ) ☐ AS PER SPEX.



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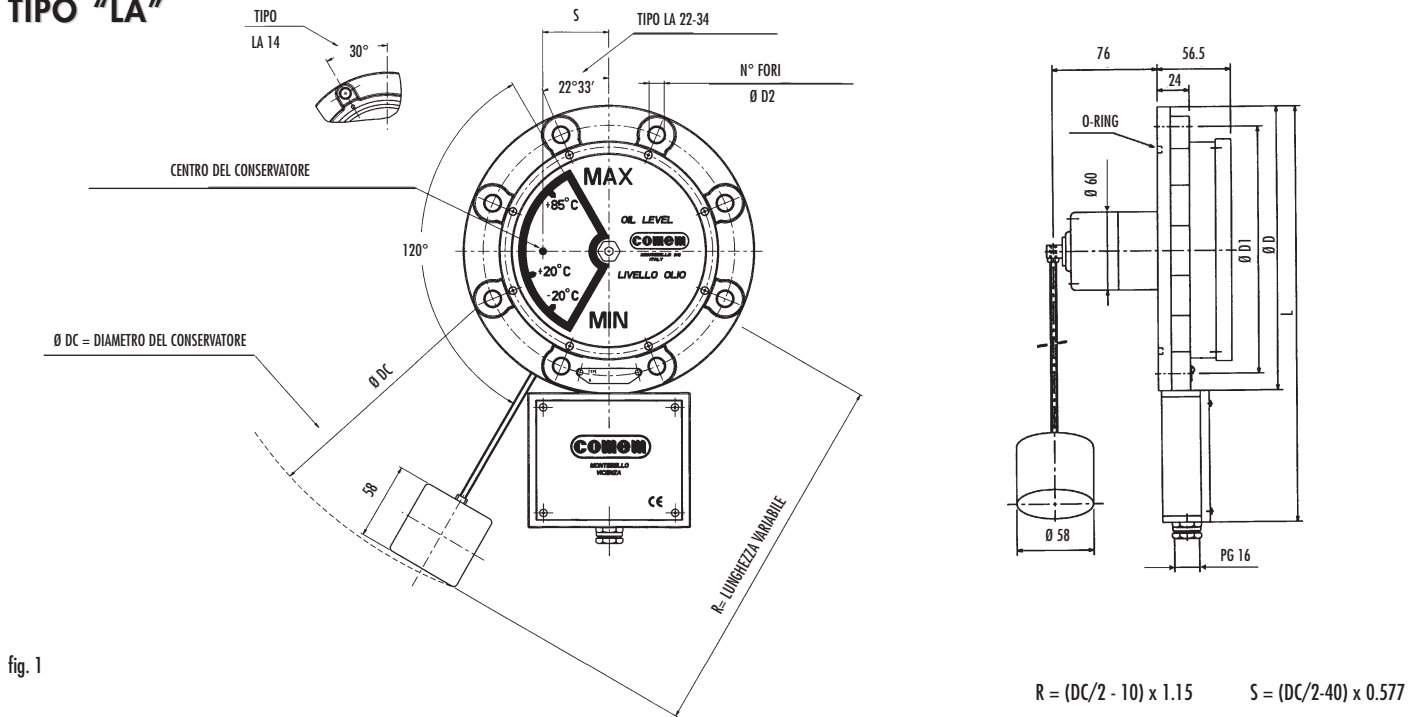
INDICATORI  
DI LIVELLO A GIUNTO  
MAGNETICO  
**L 14 - L 22 - L 34**

**comen**®

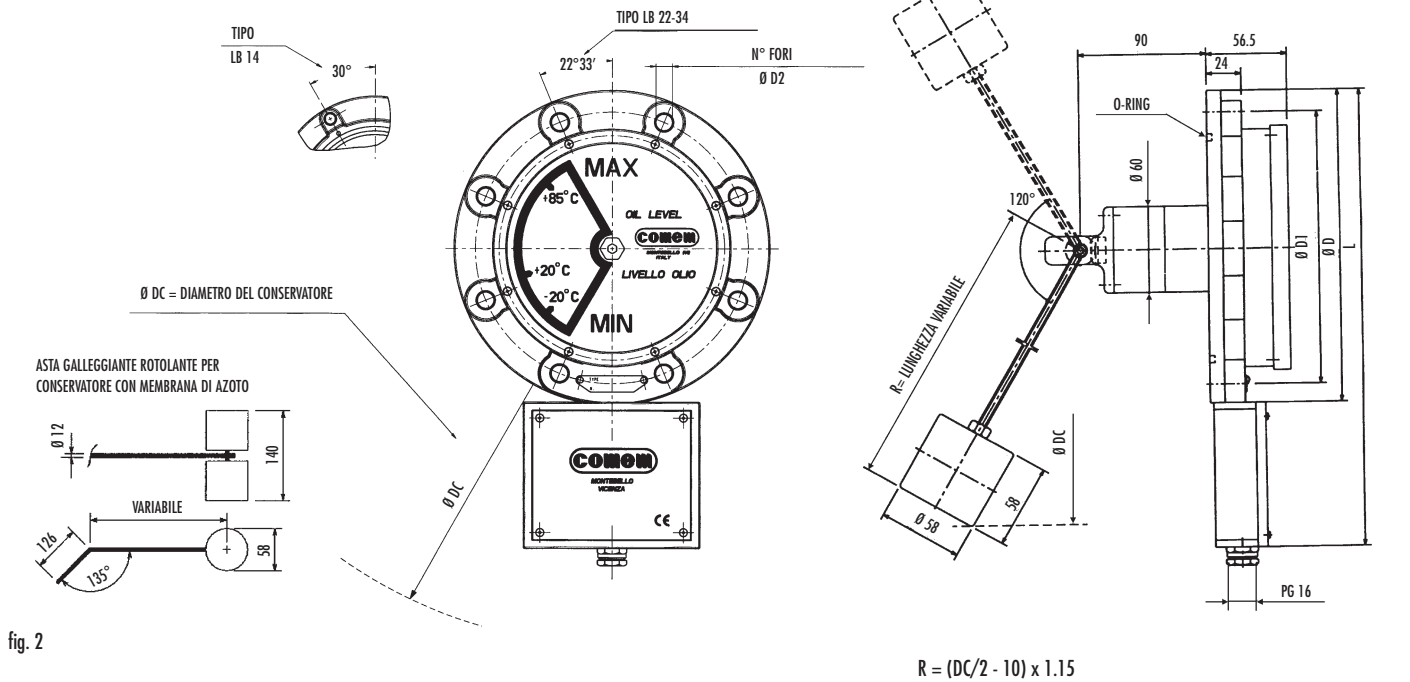
## INDICATORI DI LIVELLO A GIUNTO MAGNETICO GRANDEZZA Ø 140/220/340



## TIPO "LA"



## TIPO "LB"



LIVELLO TIPO	Ø D	Ø D1	Ø D2	N° FORI	L	O.RING TIPO	PESO kg	R STANDARD
LA14	140	125	7	6	245	O.R. 186 (6362)	1.40	max. 370
LA22	220	190	11.5	8	325	O.R. 221	2.30	max. 550
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LB34	340	305	18	8	445	O.R. 248 (81000)	6.30	max. 710

**DIMENSIONI IN MILLIMETRI**

## INDICATORI DI LIVELLO A GIUNTO MAGNETICO

Gli indicatori di livello a giunto magnetico sono costituiti da un robusto corpo in lega d'alluminio a tenuta idraulica, verniciato contro la corrosione. Il movimento tra asta del galleggiante e disco indicatore avviene mediante accoppiamento magnetico per una angolazione di 120°. In questo modo si ottiene che ad ogni variazione di livello del liquido si ha una corrispondente rotazione del magnete con conseguente indicazione di variazione sul quadrante dell'indicatore. Il disco indicatore è colorato in bianco e rosso. A chiusura del sistema è applicato un disco in policarbonato serigrafato con tacche di riferimento corrispondenti ai livelli che l'olio dovrebbe raggiungere alle temperature in gradi centigradi di: - 20°C, + 20°C, + 85°C.

**Nota:** Su richiesta possono essere eseguiti quadranti speciali.

### LETTURA DELLE INDICAZIONI DEI VARI LIVELLI DI LIQUIDO

- **Minimo livello:** quando si vede totalmente il colore rosso.
- **Massimo livello:** quando si vede totalmente il colore bianco.
- Indicazioni intermedie tra **MAX** e **MIN**: si vedrà parte di colore bianco e parte di colore rosso. Si deve tenere presente che la quantità di colore rosso che si vede indica, in proporzione, la parte di conservatore che rimane senza liquido.

### MOVIMENTO DEL GALLEGGIANTE

Può essere nel senso radiale del conservatore (tipo "LA") o nel senso assiale (tipo "LB") come si può vedere dal disegno (Fig. 1 e 2). Nel tipo "LB" è prevista una versione detta a "galleggiante rotolante" per applicazioni in conservatori con membrana di azoto.

### ASTA DEL GALLEGGIANTE

È completamente filettata. Se non viene specificatamente precisata la lunghezza (quota R del disegno fig.1 e 2) viene consegnata nella misura standard indicata a tabella. L'asta del livello con "galleggiante rotolante" è in tubo di alluminio.

### SEGNALAZIONE ELETTRICA

Su questi indicatori di livello sono applicati dei microinterruttori elettrici per le segnalazioni del minimo e massimo livello olio.

### CARATTERISTICHE ELETTRICHE:

- Alimentazione: 24 - 220 V c.a. o c.c.
- Potere di interruzione: 3 A 125/250 V ac (resistivo)  
0,5 A 125 V dc per carico induttivo L/R = 40 ms  
0,25 A 250 V dc per carico induttivo L/R = 40 ms

### SEGNALAZIONE DI INTERVENTO

I microinterruttori elettrici intervengono con un angolo di 5° in anticipo rispetto alle segnalazioni di minimo o massimo livello d'olio presente nel conservatore. Nel caso di doppio contatto sul Min e/o MAX l'intervento del secondo contatto avviene circa 5° dopo l'intervento del primo contatto. Sugli indicatori di livello è possibile, dopo l'installazione, verificare il corretto funzionamento dei microinterruttori e in generale il buon funzionamento di tutti gli organi interni dell'indicatore procedendo come segue:

- Togliere il tappo posto al centro del quadrante sulla parte anteriore dell'indicatore di livello svitandolo in senso antiorario.
- Inserire un cacciavite ad intaglio nell'apposita sede e far ruotare il disco indicatore fino alla avvenuta chiusura/apertura del circuito elettrico collegato.
- Richiudere il tappo facendo particolare attenzione nel posizionare correttamente l'anello di tenuta (O.R.) sotto il tappo e serrare con una certa forza il tappo stesso.

### RESISTENZA ALLE VIBRAZIONI ESEGUITE SUI CONTATTI ELETTRICI

Sono state eseguite delle prove secondo le modalità del grafico (N° 10 cicli) sotto riportato con una ampiezza di oscillazioni di 2 mm e nelle condizioni normali di esercizio. Nessun segnale di chiusura /apertura dei contatti è stato rilevato.

### NOTE

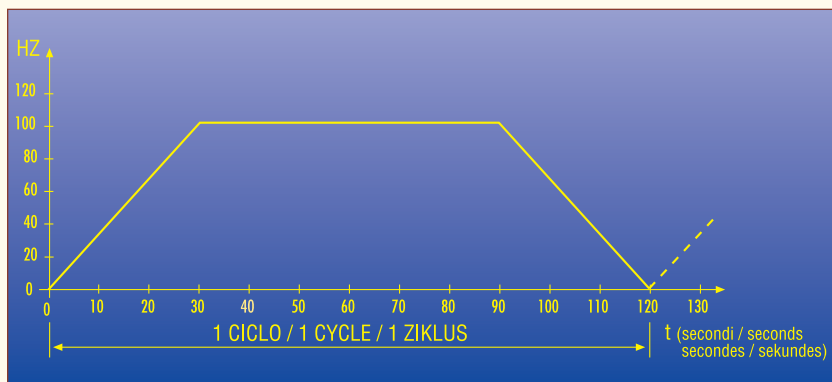
Bulloneria esterna in acciaio inox.

Verniciatura esterna di colore grigio RAL 7001

Grado di protezione: IP 54

**Temperatura di esercizio.** Tutti gli indicatori di livello sono adatti per funzionare con:

- Temperatura dell'olio comprese fra: -25°C e +120°C
- Temperatura ambientale compresa fra: -25°C e +60°C.



INDICAZIONI PER IL MONTAGGIO

Gli indicatori di livello aventi il movimento del galleggiante nel senso radiale del recipiente (tipo "LA") vanno applicati spostati rispetto l'asse orrizzontale del conservatore (quota "S" fig. 1) in modo da avere l'esatta indicazione del Minimo e Massimo livello d'olio. Quelli con il movimento nel senso assiale (tipo "LB") vanno applicati al centro del conservatore. Le misure degli spostamenti (quota "S") e la lunghezza dell'asta con galleggiante (quota "R") si ricavano dalle formule riportate sotto le fig.1 e 2. E' buona norma controllare il funzionamento dell'indicatore dopo aver eseguito il montaggio sul conservatore. Per ulteriori e dettagliate informazioni far riferimento alla scheda tecnica / informativa fornita a corredo.

PROVE E COLLAUDI

Gli indicatori di livello sono sottoposti alla prova di isolamento verso massa con le seguenti modalit : 2,5 kV AC 50/60 Hz per 72 secondi. I corpi degli indicatori di livello, superato il controllo dimensionale e privi degli organi interni, vengono collaudati a tenuta idraulica allo scopo di eliminare quelli che presentano perdite. Il collaudo definitivo si effettua quando l'indicatore di livello   completamente montato. Si controlla scrupolosamente la sensibilit  di tutti i movimenti di segnalazione e l'accuratezza dell'esecuzione del montaggio degli stessi.

SIGLE PER L'IDENTIFICAZIONE

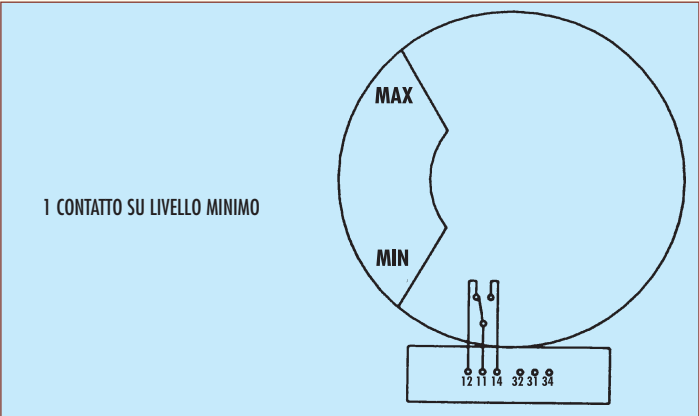
La sigla che identifica completamente il tipo di indicatore di livello   composta da una serie di lettere e cifre che hanno il seguente riscontro logico:

1 (lettera)	L	Indicatore di livello
2 (lettera)	A	Movimento del galleggiante radiale (fig. 1)
	B	Movimento del galleggiante assiale (fig. 2)
3 & 4 (cifra)	14	Dimensione dell'indicatore di livello = � 140 mm
	22	Dimensione dell'indicatore di livello = � 220 mm
	34	Dimensione dell'indicatore di livello = � 340 mm
5 (lettera)	K	Schema elettrico con 1 contatto sul minimo
	Y	Schema elettrico con 2 contatti sul minimo
	X	Schema elettrico con 1 contatto sul minimo + 1 contatto sul massimo
	W	Schema elettrico con 2 contatti sul minimo + 2 contatti sul massimo
6 (lettera)	O	Verniciatura ordinaria
	S	Verniciatura per ambienti corrosivi
7 (lettera)	N	Indicatore di livello standard COMEM
	S	Indicatore di livello specifico per cliente

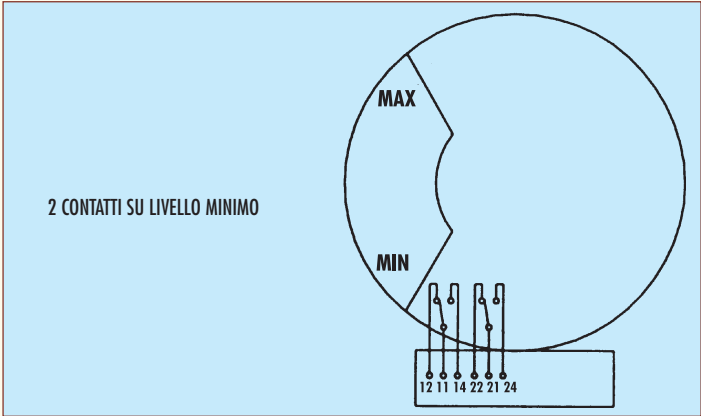
**Esempio: LA14XON**  
Indicatore di livello con movimento radiale con diametro da 140 mm avente schema elettrico con 1 contatto sul minimo e 1 contatto sul massimo, verniciato per ambienti normali e realizzato con quadrante e lunghezza asta come da standard COMEM.

SCHEMI ELETTRICI

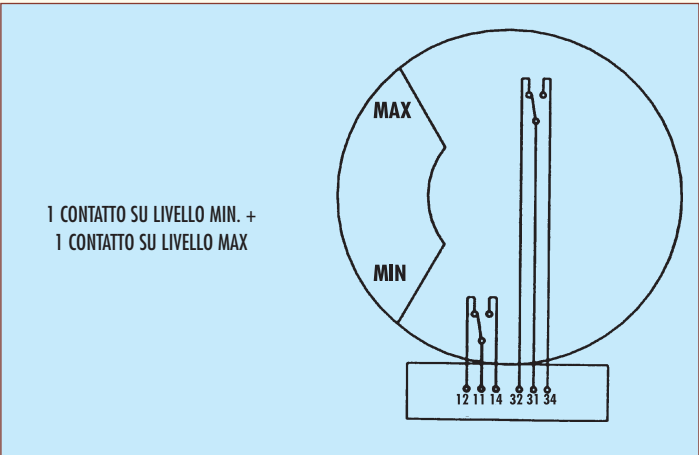
SCHEMA TIPO "K"



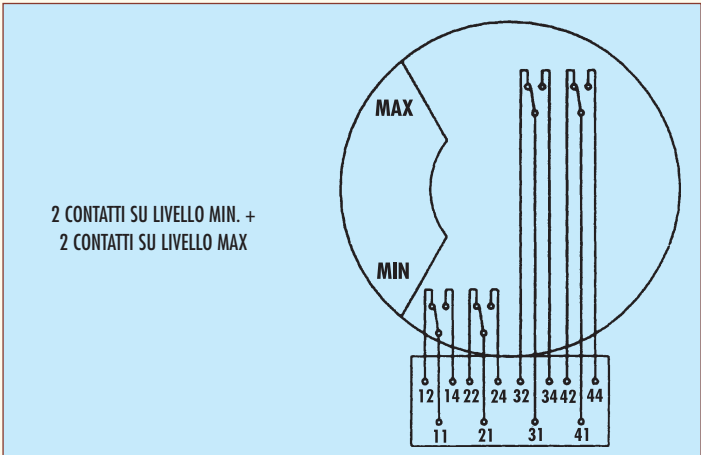
SCHEMA TIPO "Y"



SCHEMA TIPO "X"



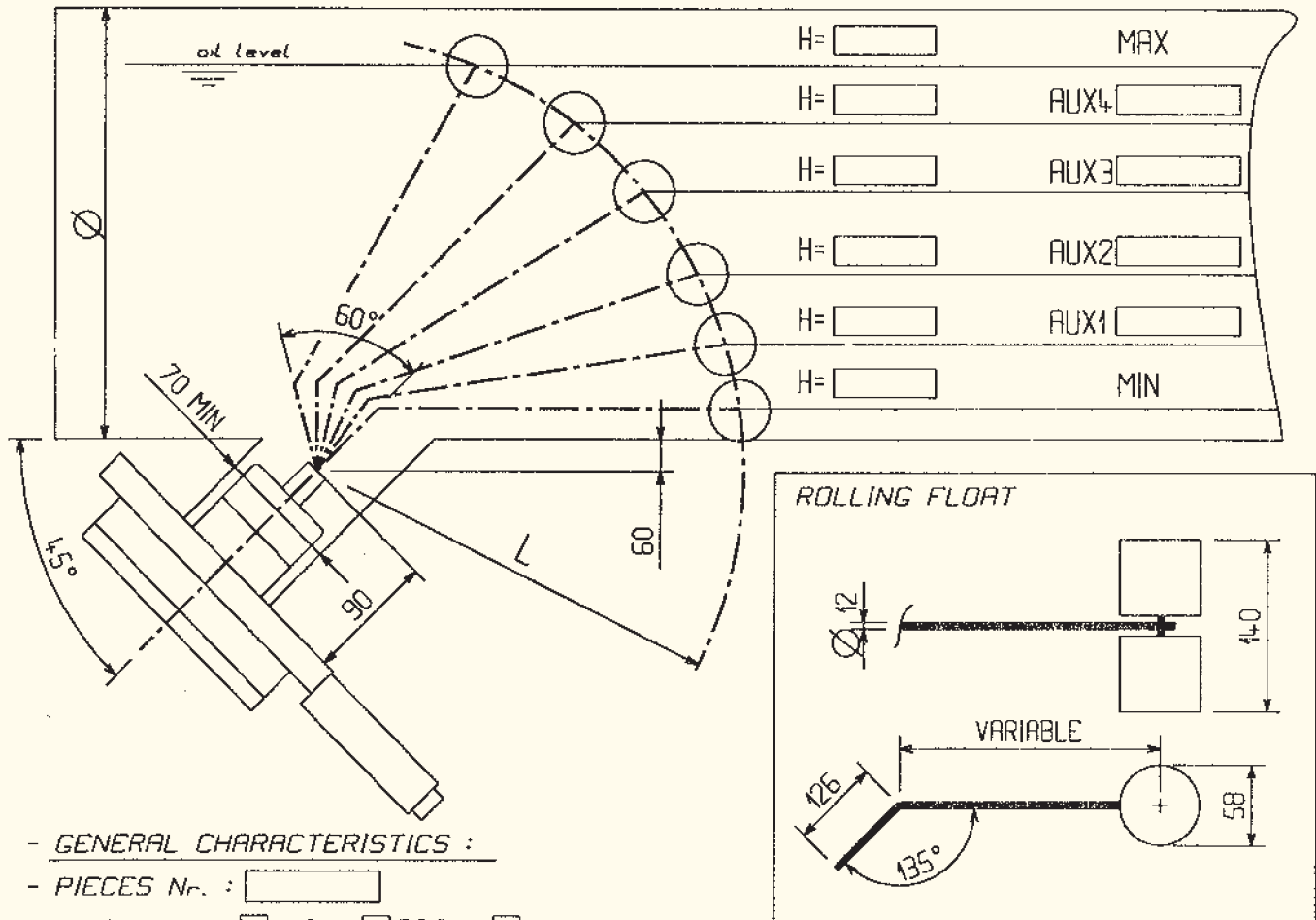
SCHEMA TIPO "W"



**TECHNICAL SPECIFICATION  
FOR OIL LEVEL INDICATORS  
WITH ROLLING FLOAT  
TYPE LB R=1:2**

TECHNICAL DATA : FOLLOWING INFORMATION SHOULD BE SPECIFIED :

- OIL LEVELS IN THE CONSERVATOR THAT NEED TO BE SHOWN
- TEMPERATURE VALUES AUX1,2... NEEDED TO BE SHOWN ON THE GAUGE DISK



GENERAL CHARACTERISTICS :

- PIECES Nr. :

- DIMENSIONS : ☐ 140 ☐ 220 ☐ 340

- CONSERVATOR DIAMETER Ø =

- CONSERVATOR LENGTH L =

- ROLLING FLOAT LENGTH .....  $L = \sqrt{15876 + \left(\frac{H_{max} - 61}{0.866}\right)^2} + 178 \cdot \frac{H_{max} - 61}{0.866}$

- NUMBER OF CONTACTS : ☐ 1 CONTACT

☐ 2 CONTACTS =

☐ 4 CONTACTS

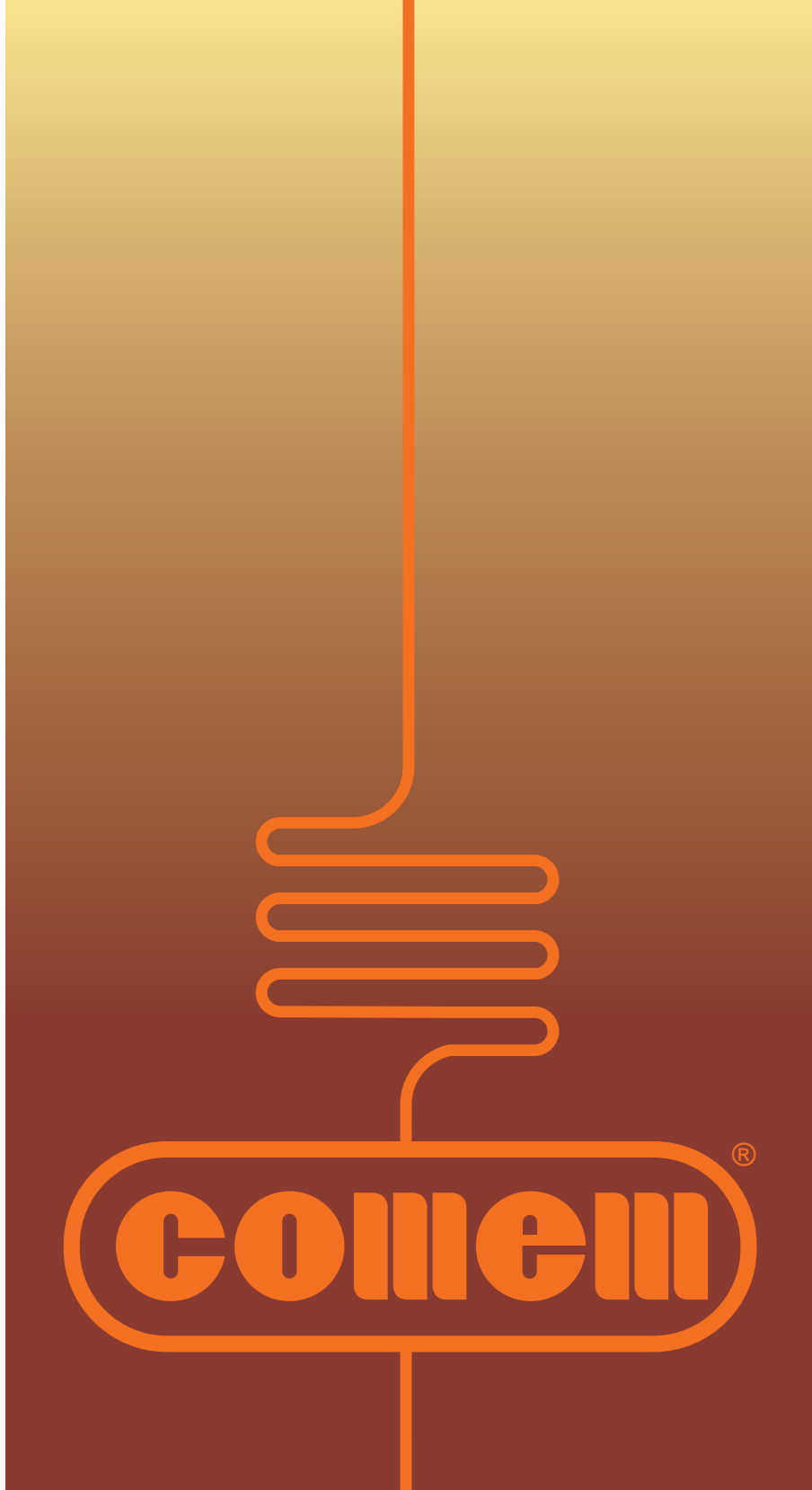
- CONTACTS RELEASE : ☐ MIN ☐ AUX1 ☐ AUX2 ☐ AUX3 ☐ AUX4 ☐ MAX

GAUGE DISK MATERIAL :

☐ POLYCARBONATE ☐ MINERAL GLASS ( CORROSIVE ENVIROMENT ) ☐ AS PER SPECIFICATION

PROTECTIVE COATING (GREY COATING RAL7001) :

☐ NORMAL ☐ SPECIAL ( CORROSIVE ENVIROMENT ) ☐ AS PER SPEX.



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## AKM 345 Gen2

Oil Temperature Indicator AKM OTI Type 34

Winding Temperature Indicator AKM WTI Type 35

Document ID: IST-103-1-EN







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## Contents

<b>1.</b>	<b>General.....</b>	<b>1</b>
<b>2.</b>	<b>Installation .....</b>	<b>1</b>
<b>3.</b>	<b>Calibration Check.....</b>	<b>1</b>
<b>4.</b>	<b>Switch Setting .....</b>	<b>1</b>
4.1.	(Optional) Adjustable Switch Differential Setting Instructions.....	2
<b>5.</b>	<b>Technical Data – Matching Resistance TD50/TD76.....</b>	<b>3</b>
5.1.	Instructions for Adjusting Matching resistance.....	4
5.2.	Temperature Gradient Graph for WTI with External 1A and 5A Matching Unit .....	5
5.3.	Wiring the AKM345 Double Gradient Option.....	6
5.3.1.	Background .....	6
5.3.2.	Wiring Recommendations .....	6
5.4.	Using the 5 Amp Internal CT Option .....	7
5.5.	Setting the Matching Resistance.....	7
5.5.1.	Method A .....	7
5.5.2.	Method B .....	7
<b>6.</b>	<b>Mounting Styles and Dimensions.....</b>	<b>9</b>
6.1.	Seismic Mount .....	9
6.2.	Universal Mount.....	9
6.3.	Anti-Vibration (Standard) Mount.....	10
<b>7.</b>	<b>Front Cover Removal.....</b>	<b>11</b>
<b>8.</b>	<b>Contact Rating / Breaking capacity .....</b>	<b>12</b>
<b>9.</b>	<b>Terminal Block Arrangements .....</b>	<b>13</b>
<b>10.</b>	<b>Pocket/Well Installation .....</b>	<b>15</b>
<b>11.</b>	<b>Probe Types.....</b>	<b>16</b>
<b>12.</b>	<b>Maintenance .....</b>	<b>17</b>
12.1.	Protection Class IP 65 .....	17
12.2.	Mountings with Rubber Dampers - Seismic Type and Universal Type ...	17
<b>13.</b>	<b>Gen2 With Transmitter.....</b>	<b>18</b>
13.1.	Technical Data .....	18
13.2.	Installation Instructions .....	18



## Figures

Figure 1 – Switch Setting Scale .....	2
Figure 2 – TD Adjusting Schematic.....	3
Figure 3 – Temperature Gradient Graph .....	4
Figure 4 – Guideline for Adjustment of Heating Current.....	5
Figure 4.1 – Guideline for wiring Double Gradient Option .....	6
Figure 4.2 – TD50 / 5 Amp Wiring Example.....	8
Figure 5 – Siesmic Mount.....	9
Figure 6 – Universal Mount .....	9
Figure 7 – Anti-Vibration (Standard) Mount.....	10
Figure 8 – Cover Hinge Side View .....	11
Figure 9 – Front Cover Removal.....	11
Figure 10 – Switch Selection.....	12
Figure 11 – 2 to 4 Switches w/Optional Heater and Remotes .....	13
Figure 11.1 – 2 to 4 Switches w/Optional Heater and Remotes (TD50 5 Amp) .....	13
Figure 11.2 – 2 to 4 Switches w/Optional Heater and Remotes (Double Gradient) .....	13
Figure 12 – 5 to 6 Switches only .....	14
Figure 13 – 5 to 6 Switches w/Optional heater and Remotes.....	14
Figure 14 – Pocket/Well Installation .....	15
Figure 15 – 4-20mA Suggested Wiring TD111 .....	19
Figure 15.1 – 0-1mA Suggested Wiring TD119-1 .....	20
Figure 15.2 – 0-5mA Suggested Wiring TD119-2.....	21
Figure 15.3 – 0-10mA Suggested Wiring TD119-3.....	22
Figure 15.4 – 0-20mA Suggested Wiring TD119-4.....	23
Figure 15.5 – 4-20mA & 0-5V DC Suggested Wiring TD119-5.....	24
Figure 15.6 – 4-20mA & 0-10V DC Suggested Wiring TD119-5.....	25
Figure 15.7 – Suggested Wiring TD66 CU10/PT100 .....	26



## 1. General

The AKM345 next generation, GEN2 for short, is a world class, robust CE approved fully weather proofed temperature indicator, used globally for electricity transformers. It is designed and manufactured for long and trouble free outdoor operation under all conditions.



To secure maintenance-free operation, the installation on the transformer must be made with care.

## 2. Installation

- Before installation check for possible damage from transport handling.
- Do not carry the instrument by the capillary. Do not twist the capillary when unwinding it, or bend too sharply – min radius 25 mm. Clamp it along its entire length at approx 400 mm intervals. Excess capillary can be wound in a spiral with min diam. 100 mm.
- Leave at least 15% thermal expansion space in oil filled pockets.
- The non-vibration mountings included must be used to prevent mechanical wear out caused by transformer vibrations.
- Installation shall prevent instrument casing temperatures over +70°C for standard types.

## 3. Calibration Check

- Each instrument is factory calibrated and no further calibration is required.
- Check calibration put the bulb in boiling water (+100°C) or in a well stirred bath (min water or oil volume 5 litres) with a control thermometer. Read the thermometer after 15 minutes. If indication error is larger than 5°C we recommend contacting local agent or manufacturer for further assistance.

## 4. Switch Setting

- Switches are factory calibrated.
- Each switch is individually adjustable and provided with a scale.
- Open instrument front cover by loosening the two lower retaining bolts.
- Loosen the knurled-head screw on the red pointer.
- Hold the screw in position and rotate the scale drum until the red pointer under the knurled screw points at the desired contact point on the scale.



- Tighten the screw in this position.
- Check that contact is obtained by slowly turning the shaft of the drum so that the pointer of the temperature gauge moves towards higher values on the scale. The shaft of the drum must not be turned in the other direction since the calibration of the instrument may change. When checking the instrument must be in a vertical position.

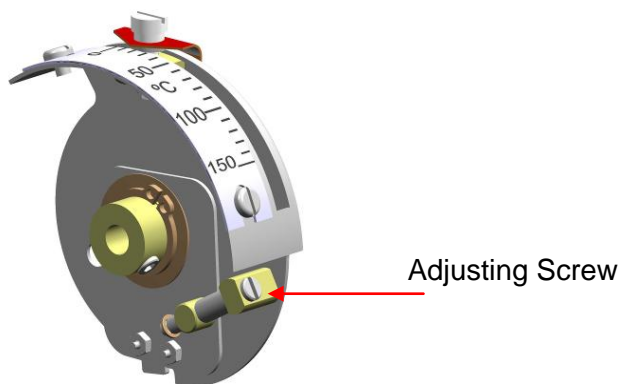
#### 4.1. (Optional) Adjustable Switch Differential Setting Instructions

- Adjust alarm set point as described above.
- Adjust the multi-turn adjusting screw located beneath the switch scale plate fully clockwise. At this point the differential will be set at 5°C. (When turned fully anti-clockwise the differential is set at 25°C)
- Pull down the brass test lever (located on the right hand side) slowly to verify correct alarm and differential setting. For example if the alarm is set at 50°C and the adjusting screw is set fully anti-clockwise, the switch will energize at 50°C on rising temperature. It will de-energize on lowering temperature at 25°C.



**Never force the test lever upwards.**

- Fine-tune differential setting by gradually turning the adjusting screw.



**Figure 1 – Switch Setting Scale**

## 5. Technical Data – Matching Resistance TD50/TD76

	TD50	TD76	TD50/5 Amp
<b>Max Cont. Input at 100% Load</b>	2.2 A from CT	2.65 A from CT	5.0 A from CT
<b>Adj. Range</b>	0 - 80% of Input Current from CT	45 - 85% of Input Current from CT	0 - 35% of Input Current from CT
<b>Insulation</b>	2kV, 50Hz, 60s to Earth	2kV, 50Hz, 60s to Earth	2kV, 50Hz, 60s to Earth
<b>I<sub>3</sub> Resistance</b>	0 - 11Ω	1.75 - 13Ω	0 - 11Ω

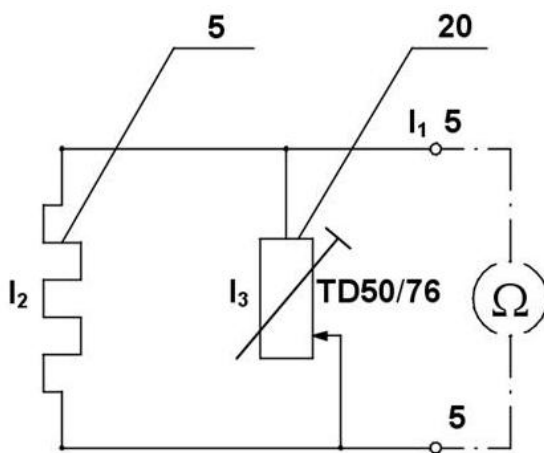


Figure 2 – TD Adjusting Schematic



## 5.1. Instructions for Adjusting Matching Resistance

1. Check or calculate current in A from Your Current Transformer (at bushing) at 100 % transformer load.
2. Check the required Winding Temperature gradient in °C or K.
3. Use the graph in Fig.3 for the CT current and gradient to determine the required resistance setting in Ohms. Take note of this value.
4. Connect a multi meter, (Example: Fluke) set for resistance measurement to the terminals 5-5 inside the WTI.
5. Adjust the matching resistance TD50 or TD76 until you reach the required resistance value. For TD50/5A see section 5.4.
6. Secure the lock nut on the matching resistance for this setting.
7. Check operation and make final adjustments if necessary.
8. Please consult Customer Service for additional information.

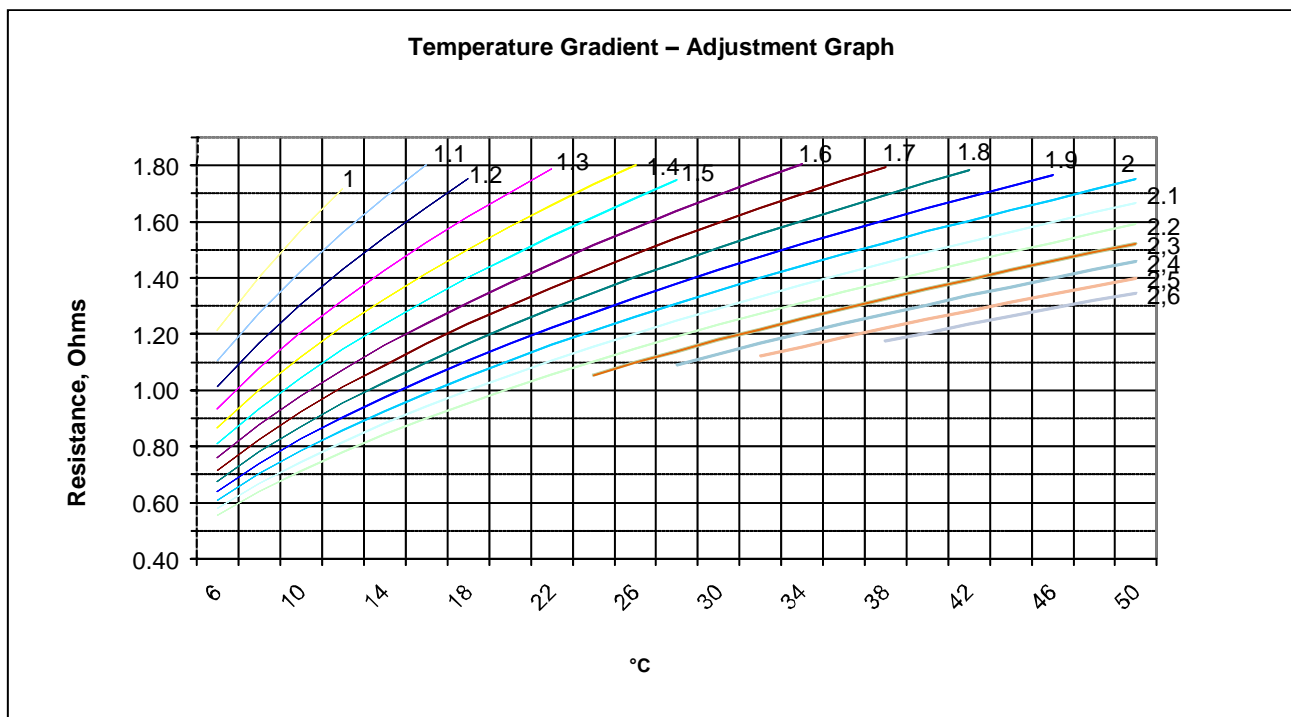


Figure 3 – Temperature Gradient Graph



5.2. Temperature Gradient Graph for WTI with External 1A and 5A Matching Unit

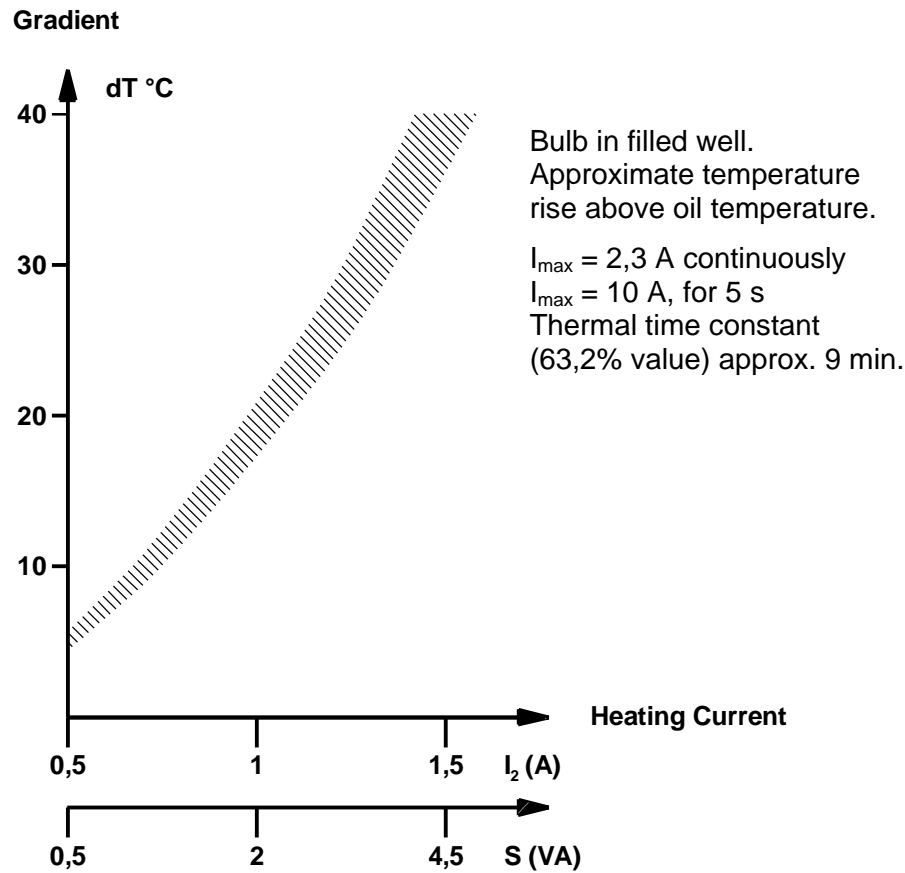


Figure 4 – Guideline for Adjustment of Heating Current



Keep cover mounted, feed a stable current and wait 45 min, before reading winding temperature.

	Gradient °C for bulb type 11, 12, 15 and 18										
	10	12	14	16	18	20	22	24	26	28	30
Oil temp. 30°C	0,72	0,79	0,86	0,92	0,99	1,04	1,1	1,15	1,21	1,26	1,31
	Heating Current Amp. I2 ±5%										





## 5.3. Wiring the AKM345 Double Gradient Option

### 5.3.1. Background

The Double Gradient option allows for setting two separate winding simulations in the same Winding Temperature Indicating Thermometer. The CT input is provided with two independently adjustable potentiometers for determining the heater current. Switching between the heater currents is performed external to the thermometer.

### 5.3.2. Wiring Recommendations

The potentiometers are wired to the 56 and 57 terminal block positions. The CT input is wired to the 5-5 positions as shown.

- To activate the 56 Gradient, jumper between the right 5-5 and 56 terminal block position.
- To activate the 57 Gradient, jumper between the right 5-5 and 57 terminal block position.

An example of external switch wiring is shown below.

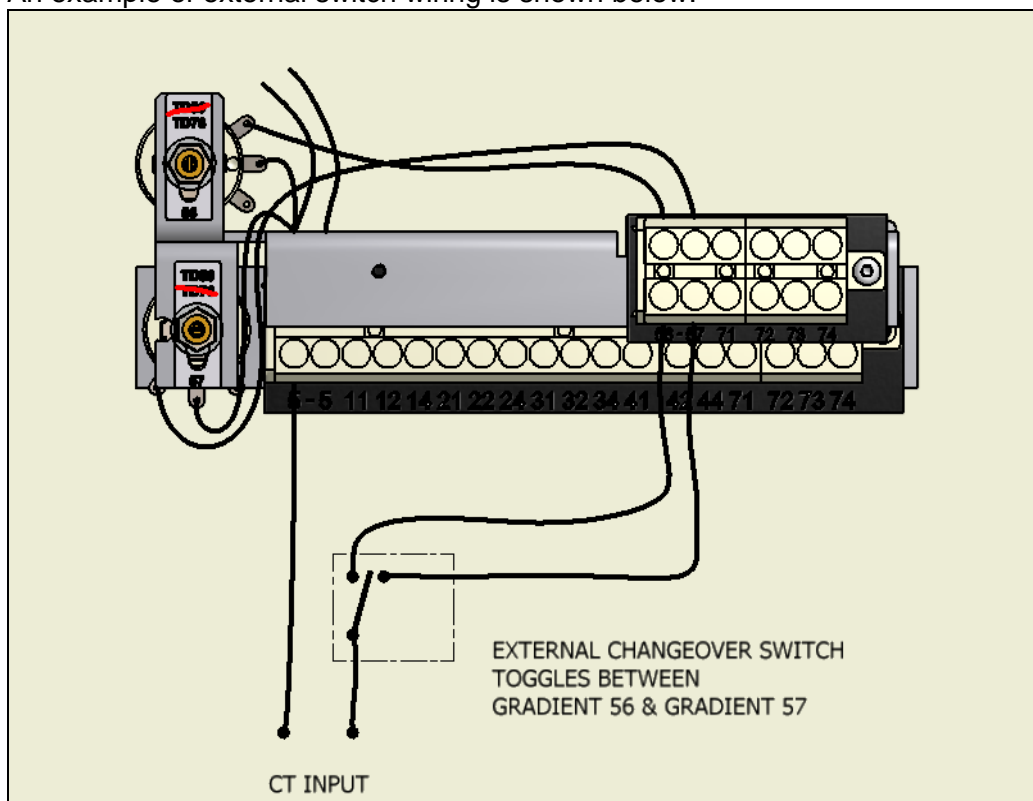


Figure 4.1 – Guideline for wiring Double Gradient Option



## 5.4. Using the 5 Amp Internal CT Option

The AKM 345 TD50(5 AMP) option allows for the input of up to 5 amps winding temperature simulation current without the expense or additional wiring required by an external matching unit. It is available with up to 4 switches. The 5 amp option employs an internal CT which accepts 5 amps at the primary and outputs 2.2 amps at the secondary. The secondary current is in parallel with a standard TD50 matching resistance and heater. For temperature rise calculations please refer to Figure 3.

- **Accuracy of 2.2A output at 5A input:**
  - +/-5% at 0 - 1.6  $\Omega$  secondary load
  - +/-10% at 1.6 - 1.8  $\Omega$  secondary load
- **Max continuous primary current: 6A**
- **Max primary current: 10 a for 2 minutes**

## 5.5. Setting the Matching Resistance

There are two methods of setting the matching resistance depending on the accuracy required. Use **Method A** for maximum ease of use and **Method B** for maximum accuracy.

### 5.5.1. Method A

- Disconnect the white separable connector and using an ohmmeter at the "R" pins, adjust the matching resistance to meet the target R5-5 value which will provide the desired heater current (see Section 5.1 instructions).
- Re-connect the white separable connector. After the matching resistance has been set and the white connector is re-mated, the winding simulation input current is wired to the terminal block at the 5-5 positions as shown.

### 5.5.2. Method B

- Disconnect the white separable connector and using an ohmmeter at the "R" pins, adjust the matching resistance to meet the target R5-5 value which will provide the desired heater current (see Section 5.1 instructions).
- Jumper between one pin of the "R" connector and one pin of the "I" connector, and connect an ammeter between the remaining two pins, as shown.
- Input the desired primary current at positions 5-5 on the terminal block and note the current flowing in the circuit. You now have the exact ratio of input to output current at secondary load. Disconnect power before disconnecting the ammeter and jumper— the secondary leads must always be connected in-circuit or shorted when the CT is powered.
- Using the measured secondary current, re-calculate the desired R5-5 value which will provide the exact heater current necessary for the desired winding simulation. Using an ohmmeter at the "R" pins, adjust the matching resistance to meet this R5-5 value.



- Re-connect the white separable connector. After the matching resistance has been set and the white connector is re-mated, the winding simulation input current is wired to the terminal block at the 5-5 positions as shown.

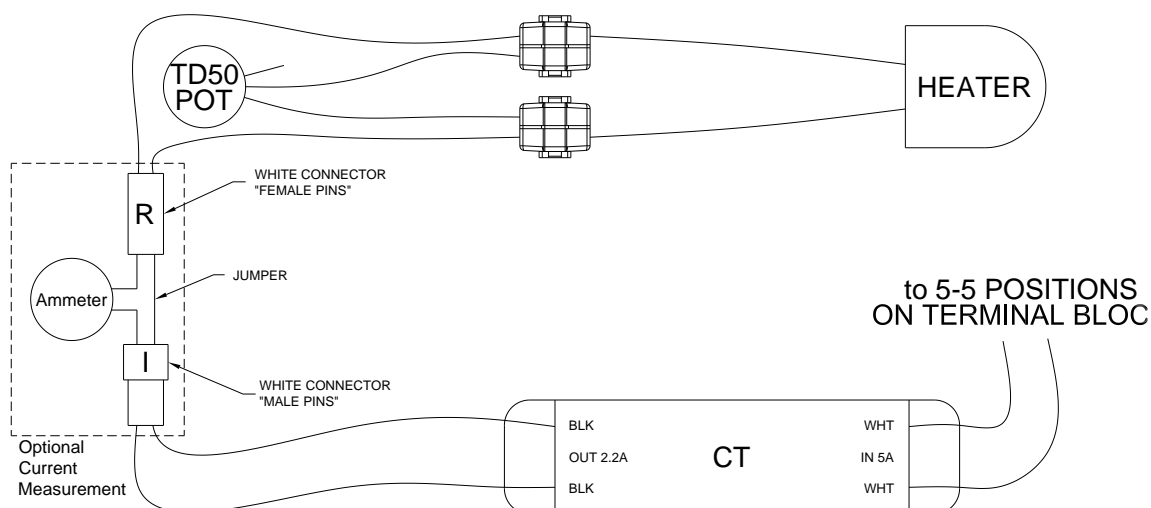


Figure 4.2 – TD50 / 5 Amp Wiring Example

## 6. Mounting Styles and Dimensions

### 6.1. Seismic Mount

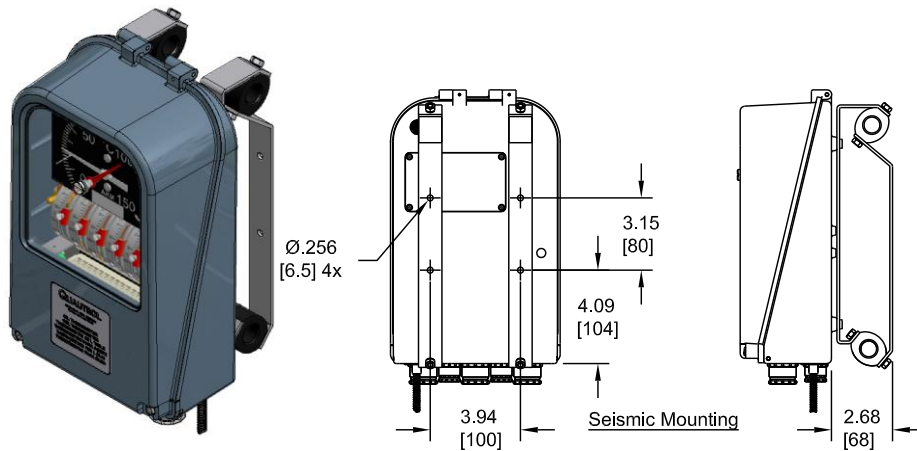


Figure 5 – Seismic Mount



Special mounting for high amplitude, low frequency conditions

### 6.2. Universal Mount

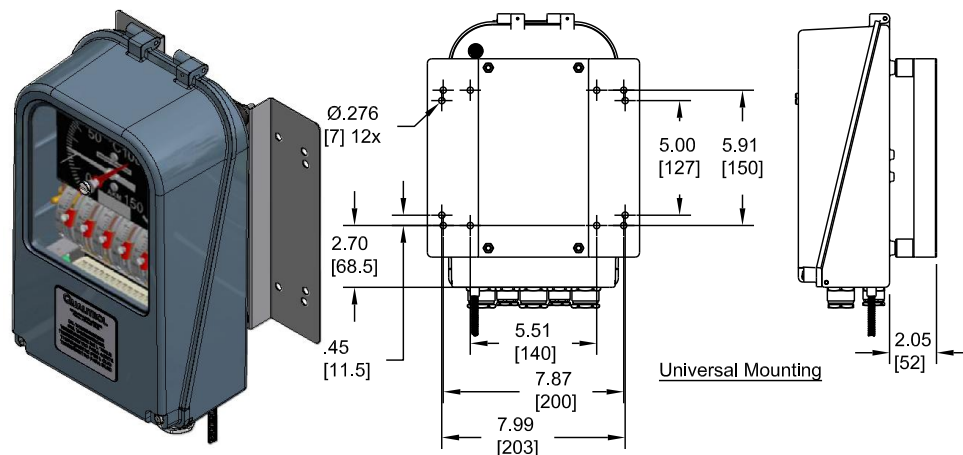


Figure 6 – Universal Mount



Adaptor plate for many different mounting bolt patterns

### 6.3. Anti-Vibration (Standard) Mount

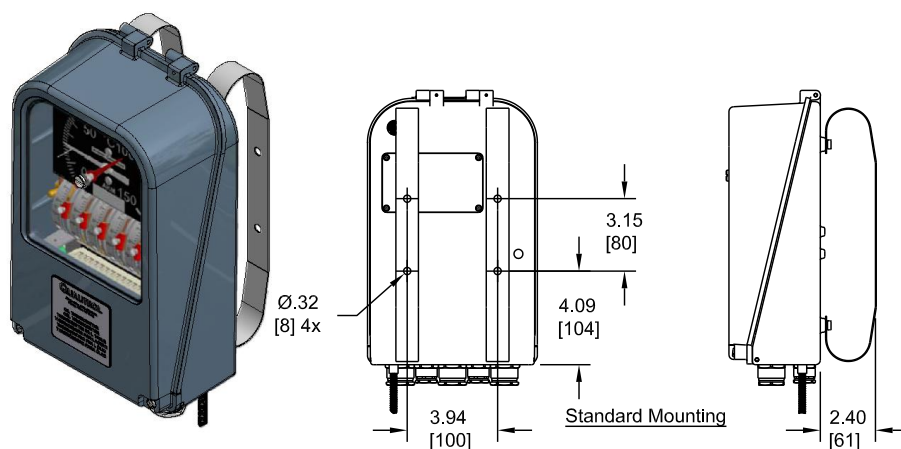


Figure 7 – Anti-Vibration (Standard) Mount



Standard mounting, highest instrument isolation available

## 7. Front Cover Removal

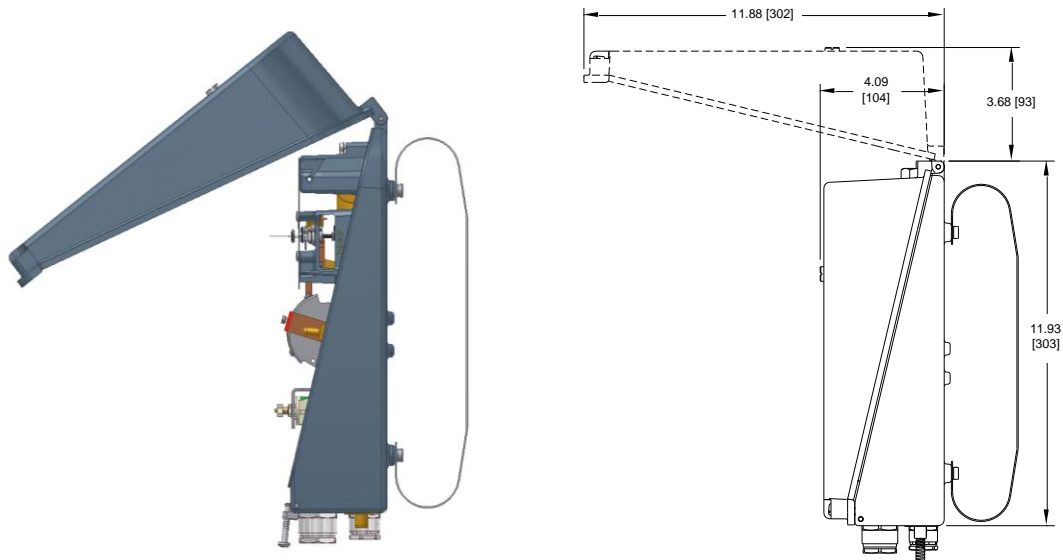


Figure 8 – Cover Hinge Side View

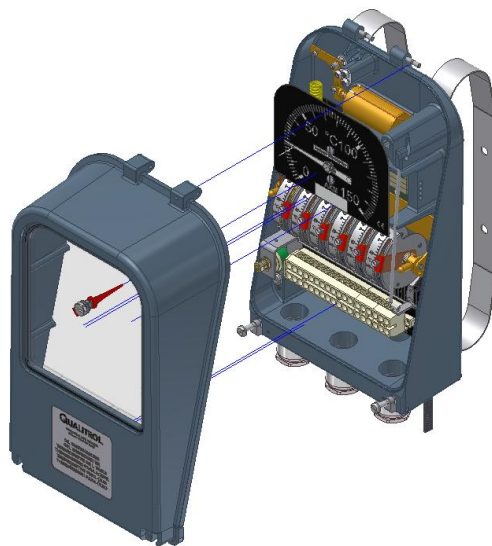


Figure 9 – Front Cover Removal

Cable glands: M25 (max 3) and M20 (max 2)



After unlocking the front cover, lift the front cover up fully, slide the top cover to the right and remove. To refit, reverse the above instructions.



## 8. Contact Rating / Breaking capacity

	RATED VOLTAGE	RESISTIVE LOAD	INDUCTIVE LOAD
STANDARD SWITCH	125 VAC	15 A	15 A
	250 VAC	15 A	15 A
	30 VDC	15 A	10 A
	125 VDC	0.75 A	0.4 A
	250 VDC	0.3 A	0.3 A
MBO	125 VAC	10 A	6 A
	250 VAC	3 A	1.5 A
	30 VDC	10 A	10 A
	125 VDC	10 A	6 A
	250 VDC	3 A	1.5 A
GOLD	30 VDC	0.1 A	-
	125 VDC	0.1 A	-
DPDT	125 VAC	10 A	6 A
	250 VAC	10 A	4 A
	30 VDC	10 A	4 A
	125 VDC	0.5 A	0.05 A
	250 VDC	0.25 A	0.03 A
GW	125 VAC	15 A	15 A
	250 VAC	15 A	15 A
	30 VDC	6 A	5 A
	125 VDC	0.5 A	0.05 A
	250 VDC	0.25 A	0.03 A

Figure 10 – Switch Selection

- **MBO** = Magnetic Blow Out, high DC switching, minimum Electrical Operations = 100,000 Cycles, all others 500,000 cycles minimum.
- **GOLD** = Typically used for low current low voltage applications, e.g., SCADA or computer connections.
- **DPDT** = Double Pole Double Throw, 2 x changeover contacts.
- **GW** = Similar to Gold and used for high DC voltage and low current applications.



Switch Selection: Select switch type (default is 15A), this will be applied to all switches. Select the number of switches to be adjustable, (default is 0), then select the switch differential of the remaining switches. This will automatically default to 12± 2°C.



## 9. Terminal Block Arrangements

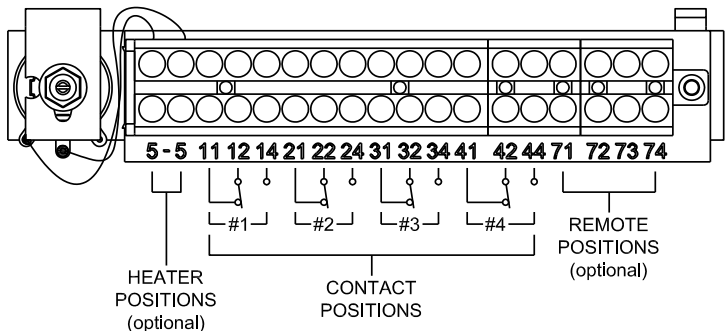


Figure 11 – 2 to 4 Switches w/Optional Heater and Remotes

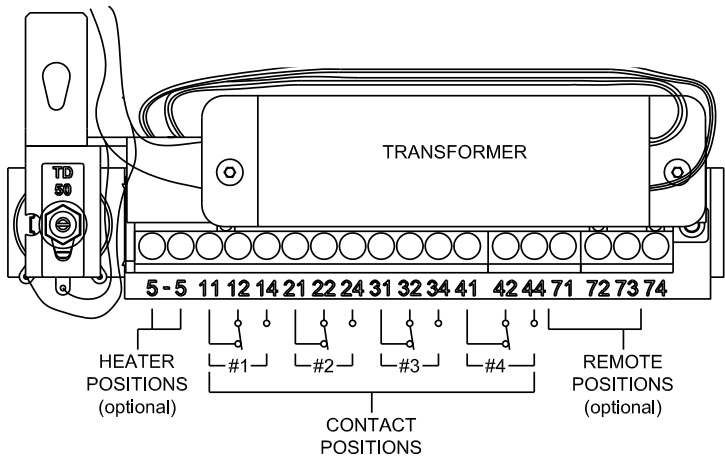


Figure 11.1 – 2 to 4 Switches w/Optional Heater and Remotes (TD50 5 Amp)

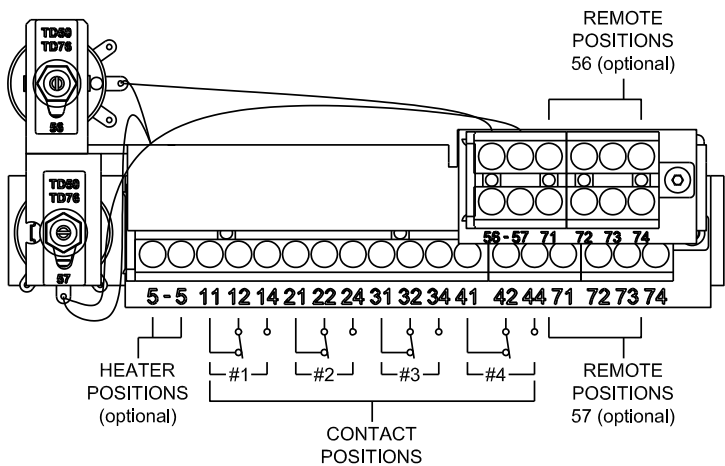
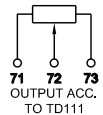
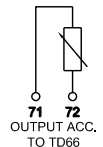
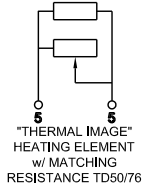
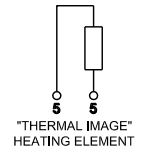


Figure 11.2 – 2 to 4 Switches w/Optional Heater and Remotes (Double Gradient)





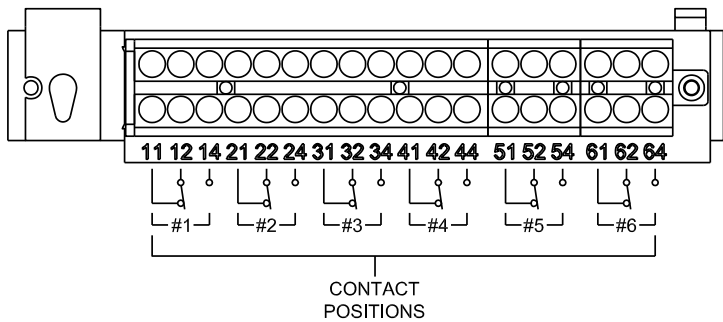


Figure 12 – 5 to 6 Switches only

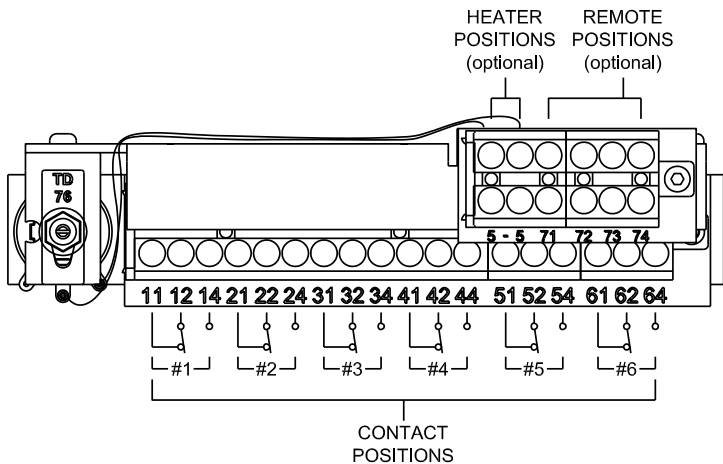


Figure 13 – 5 to 6 Switches w/Optional heater and Remotes



For options not shown, please consult Configuration Form or contact QUALITROL Customer Service Centre.

## 10. Pocket/Well Installation

INSTALLATION IN POCKET/WELL (EXAMPLE)

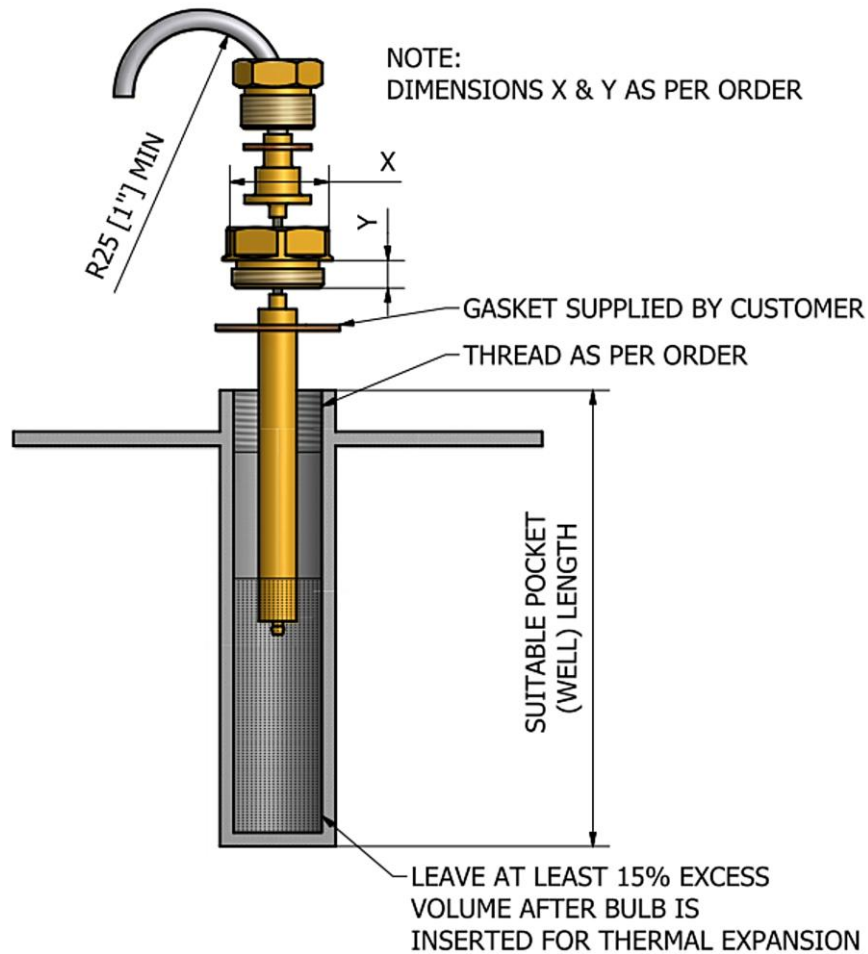


Figure 14 – Pocket/Well Installation



## 11. Probe Types

11	<p>Technical drawing of probe type 11. The cross-section shows a probe tip with a diameter of <math>\varnothing.37[9.5]</math> and a length of <math>1.26[32]</math>. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>1.97[50]</math>, <math>4.65[118]</math>, and <math>5.98[152]</math>.</p>
12	<p>Technical drawing of probe type 12. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>G3/4</math>, <math>4.65[118]</math>, <math>.47[12]</math>, and <math>5.98[152]</math>.</p>
13	<p>Technical drawing of probe type 13. The cross-section shows a probe tip with a diameter of <math>\varnothing.39[10]</math> and a length of <math>.47[12]</math>. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>.79[20]</math>, <math>.24[6]</math>, <math>2x</math>, <math>1.97[50]</math>, <math>.39[10]</math> OVAL, and <math>12.87[327]</math>.</p>
14	<p>Technical drawing of probe type 14. The cross-section shows a probe tip with a diameter of <math>\varnothing.32[8]</math> and a length of <math>.47[12]</math>. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>.79[20]</math>, <math>.24[6]</math>, <math>2x</math>, <math>1.97[50]</math>, <math>.39[10]</math> OVAL, and <math>12.87[327]</math>.</p>
15	<p>Technical drawing of probe type 15. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>G1</math>, <math>4.65[118]</math>, <math>.39[10]</math>, and <math>6.30[160]</math>.</p>
16	<p>Technical drawing of probe type 16. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>\#7/8-14</math> UNF, <math>5.34[136]</math>, <math>\varnothing.479/.483</math> [12.16/12.26], <math>.63[16]</math>, <math>.87[22]</math>, and <math>5.91[150]</math>.</p>
18	<p>Technical drawing of probe type 18. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>G3/4</math>, <math>4.65[118]</math>, <math>.12[3]</math>, <math>1.10[28]</math>, and <math>6.14[156]</math>.</p>
19	<p>Technical drawing of probe type 19. The side view shows a probe body with a maximum radius of <math>R1.00[25]</math>, a length of <math>1.30[33]</math>, and a diameter of <math>\varnothing.55[14]</math>. Other dimensions include <math>G1</math>, <math>5.51[140]</math>, <math>\varnothing.47[12]</math>, <math>.40[10]</math>, and <math>6.30[160]</math>.</p>



## 12. Maintenance

For the below mentioned executions, a regular control is suggested and if so required, also certain maintenance.

### 12.1. Protection Class IP 65

To eliminate the risk of condensation build up inside the instrument, the instruments are provided with two desiccant capsules. These can get saturated after a time in operation and a replacement will become necessary. The colour of the gel will change from pink (when new) into white (after saturation). If condensation is occurring inside the instrument, replacement of the capsules will be necessary; part number - **47126**.

### 12.2. Mountings with Rubber Dampers - Seismic Type and Universal Type

The vibration dampers on these mountings are made of Natural Rubber, NR, (also called Isopren). The expected life time of these parts is estimated to be a minimum of eight years. Since Natural Rubber will age faster when exposed to direct sunlight, high ambient temperatures or corrosive environments, we recommend a regular check of these parts. When the rubber dampers become old they should be replaced.



Please also note that it is important to mount these parts without any torsional stress.



## 13. Gen2 With Transmitter

General AKM contact thermometers Series 34/Gen2 for oil temperature and Series 35/Gen2 for winding temperature can be supplied with a transmitter for remote indication or recording.

This gives several advantages over the conventional method with a separate resistance thermometer, e.g., lower costs, no errors due to different time constants and connecting wires to indicator.

### 13.1. Technical Data

- **Housing:** The transmitter is mounted inside the instrument (well protected).
- **Nominal supply voltage:** 20 - 40V DC.
- **Output:** 4 -20mA for dial measurement range.
- **Load:** 500Ω max at 24V DC. User adjustable output can be used to calibrate output directly to load - consult factory.
- **Accuracy:** (Relative to local indication)  $\pm 2^{\circ}\text{C}$ .
- **Ambient temperature:**  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .
- **Isolation:** SWC per IEEE C37.90.1: 2.5kV oscillatory and 5 kV fast transient in both transverse and common modes.
- **Insulation test:** 2000 V, 50Hz, 60s to earth acc. To IEC 60-2.



Terminals 71, 72, and 73 must be short-circuited during insulation test, and the test voltage shall be raised gradually.

### 13.2. Installation Instructions



Qualitrol recommends using a separate shielded cable for the wiring to transmitters. This will help assure safe and trouble free operation. The cable should ONLY contain the signals and power supply for the TD Transmitter.



See Figures 15 to 15.7 for suggested wiring TD111, TD119 and TD66.

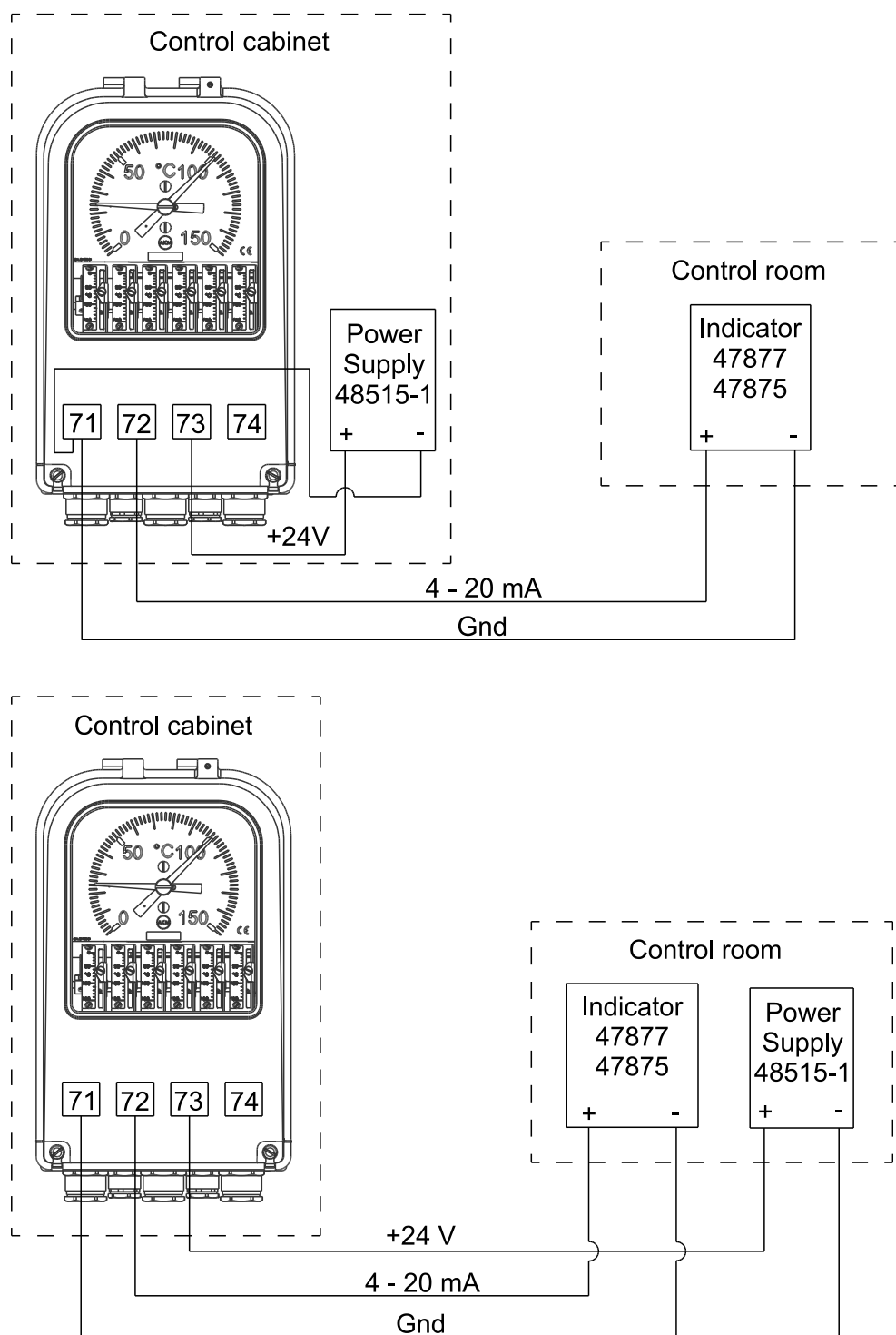


Figure 15 – 4-20mA Suggested Wiring TD111

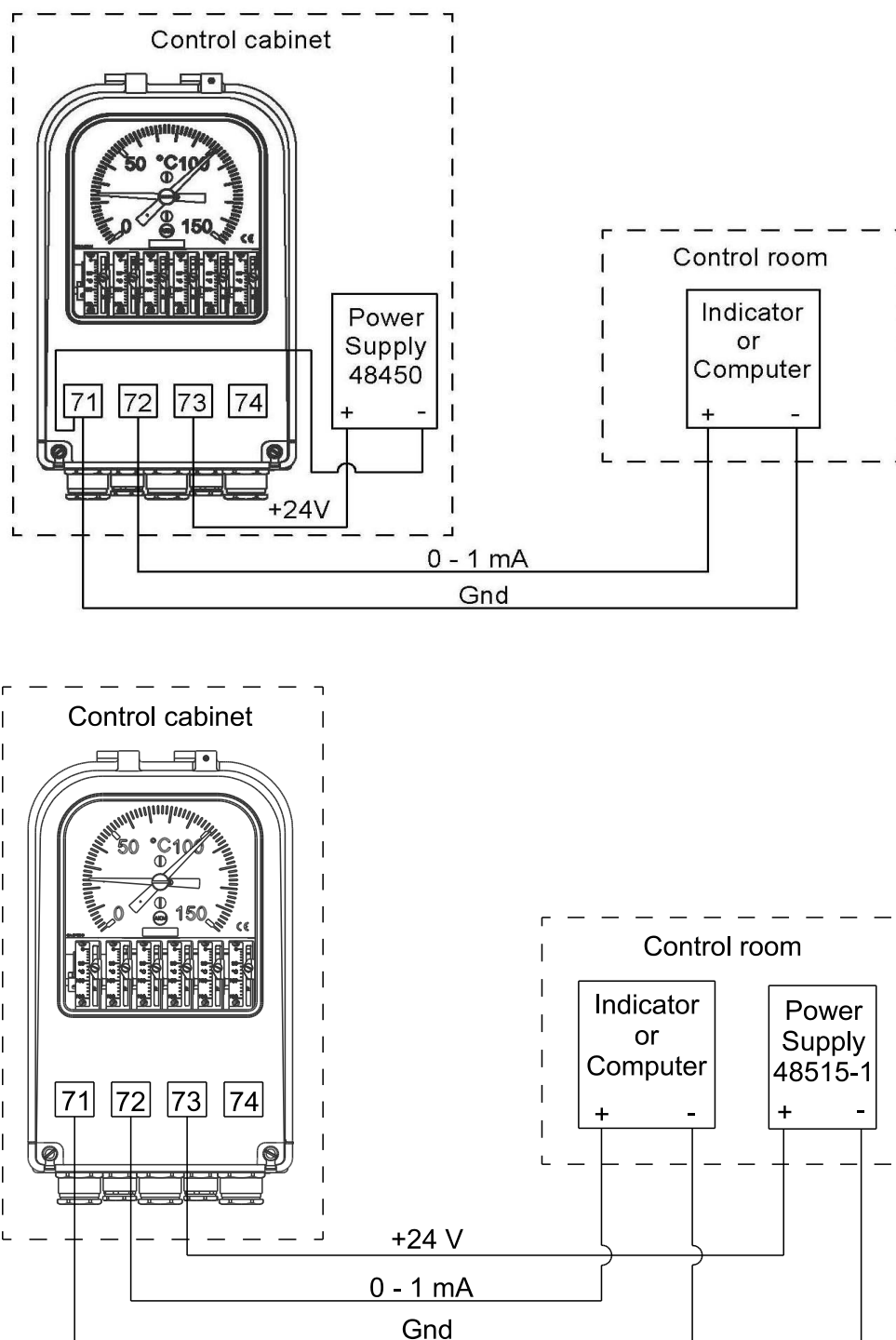


Figure 15.1 – 0-1mA Suggested Wiring TD119-1

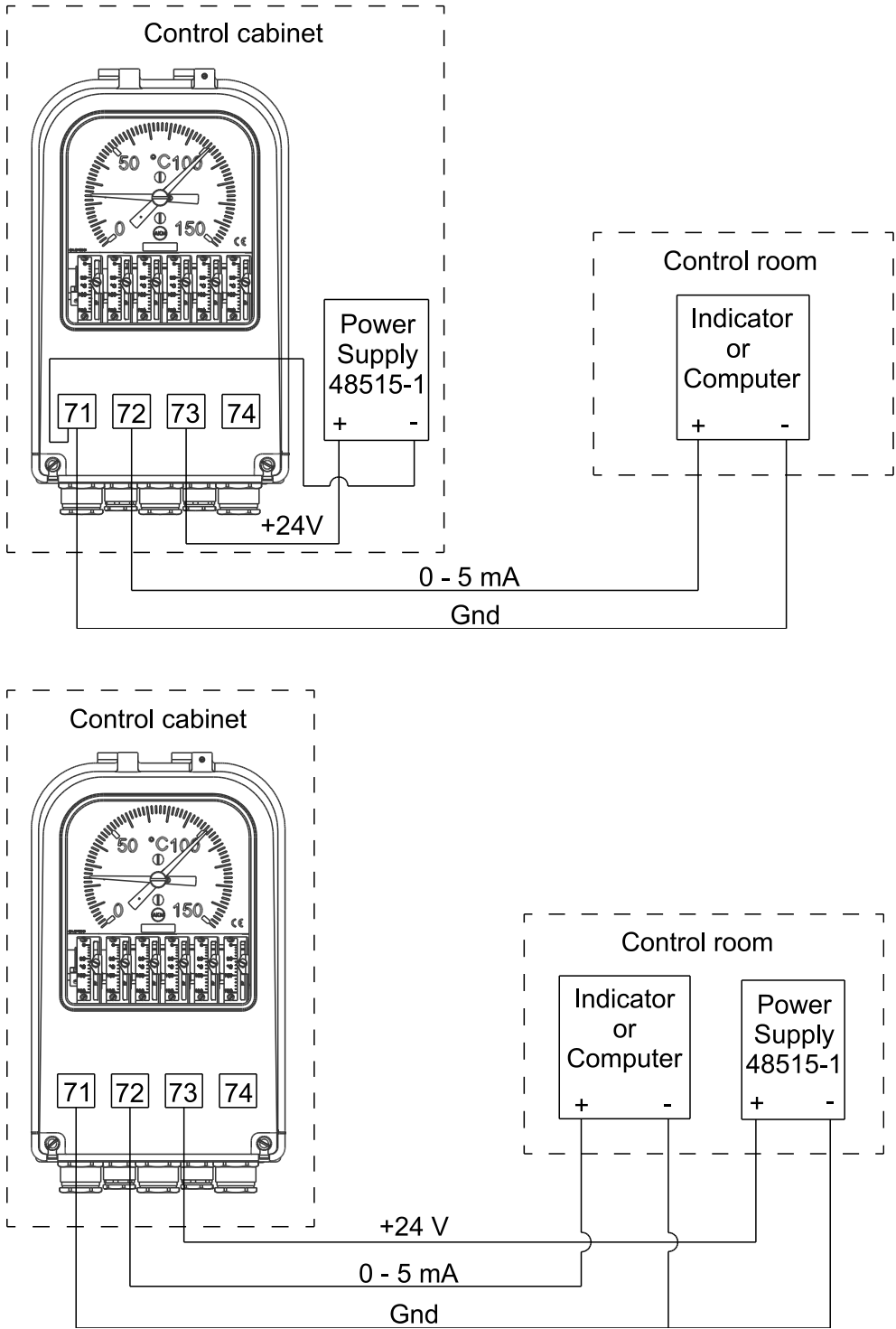


Figure 15.2 – 0-5mA Suggested Wiring TD119-2



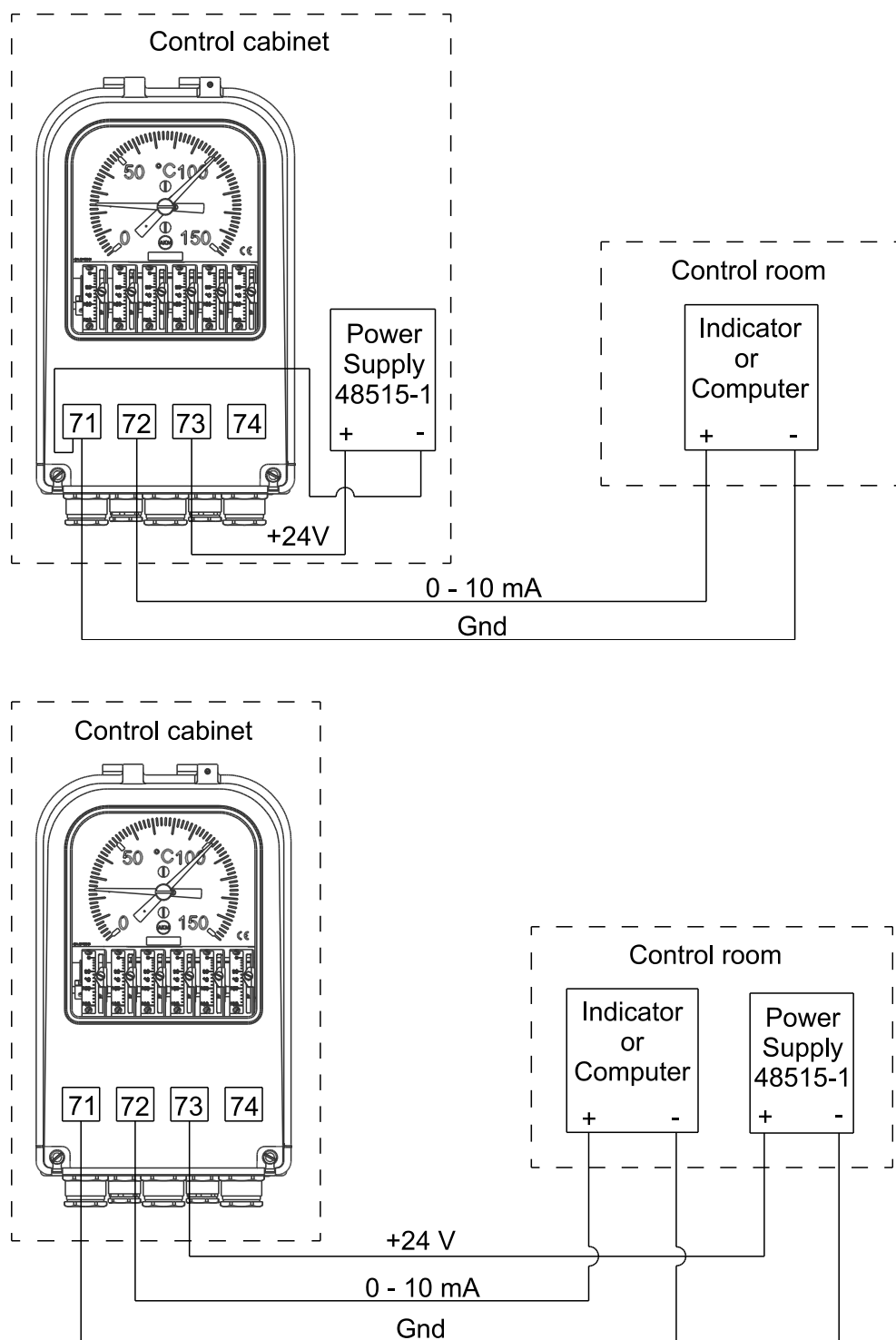


Figure 15.3 – 0-10mA Suggested Wiring TD119-3

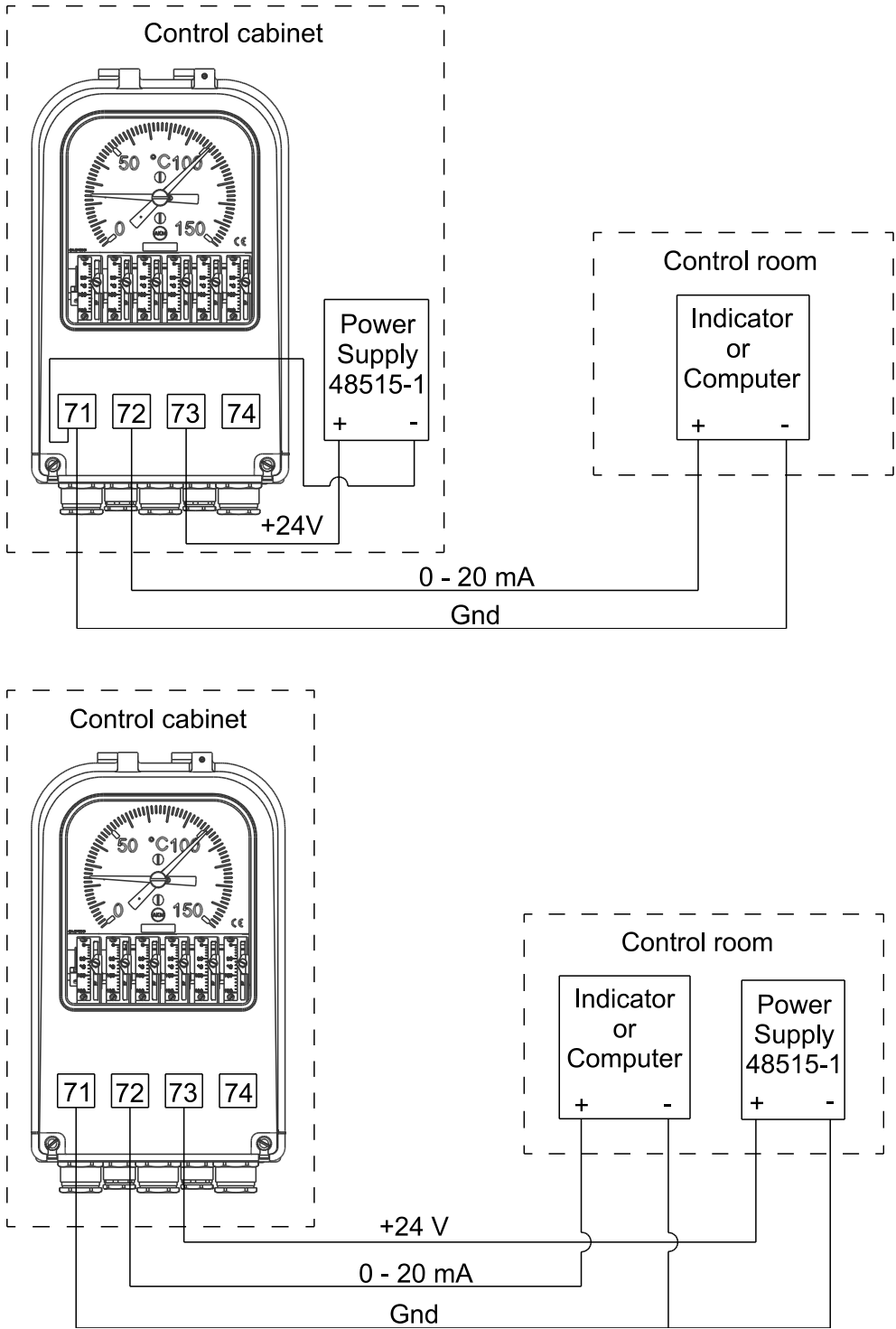


Figure 15.4 – 0-20mA Suggested Wiring TD119-4

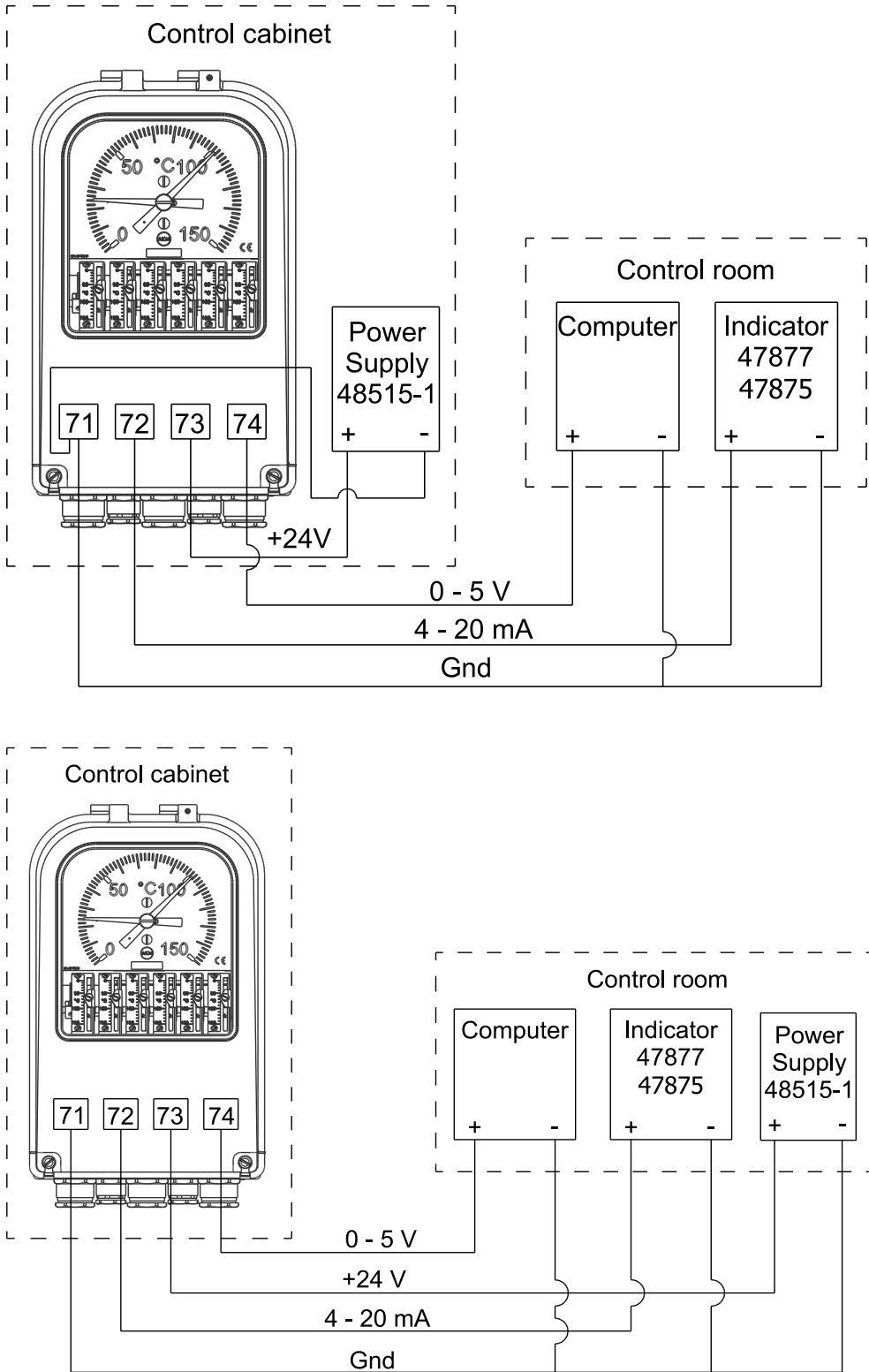


Figure 15.5 – 4-20mA & 0-5V DC Suggested Wiring TD119-5

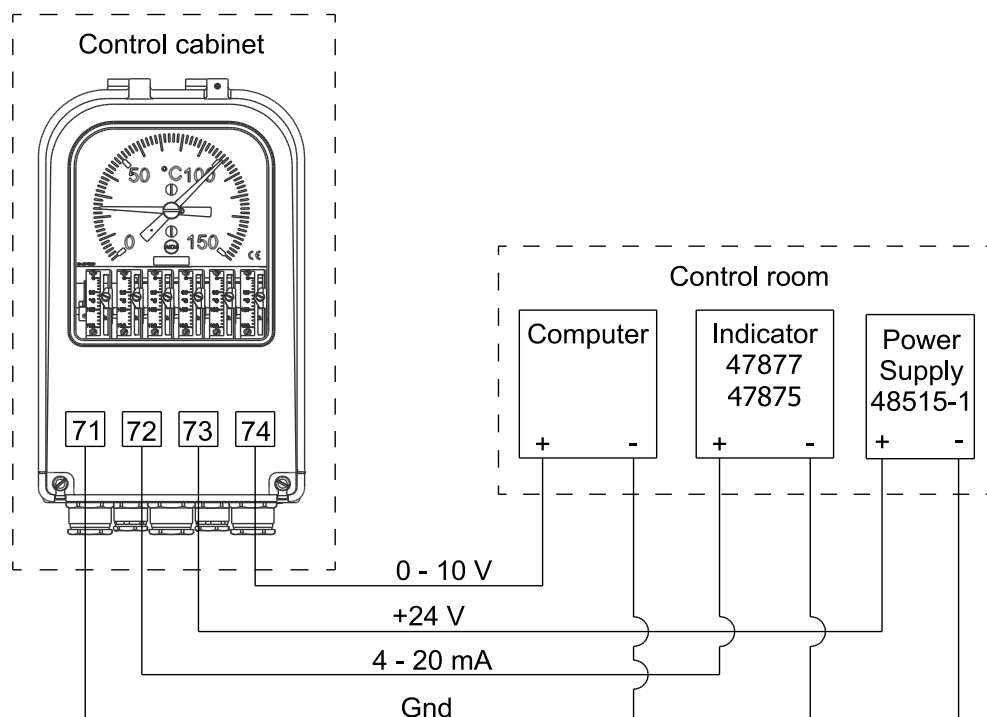
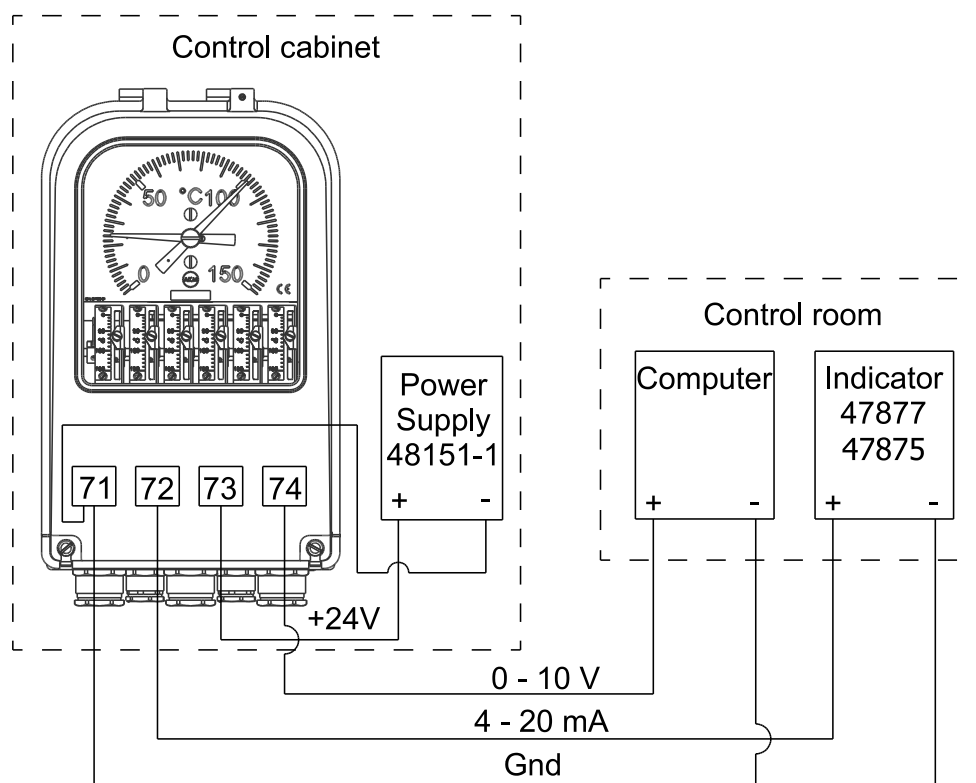


Figure 15.6 – 4-20mA & 0-10V DC Suggested Wiring TD119-5

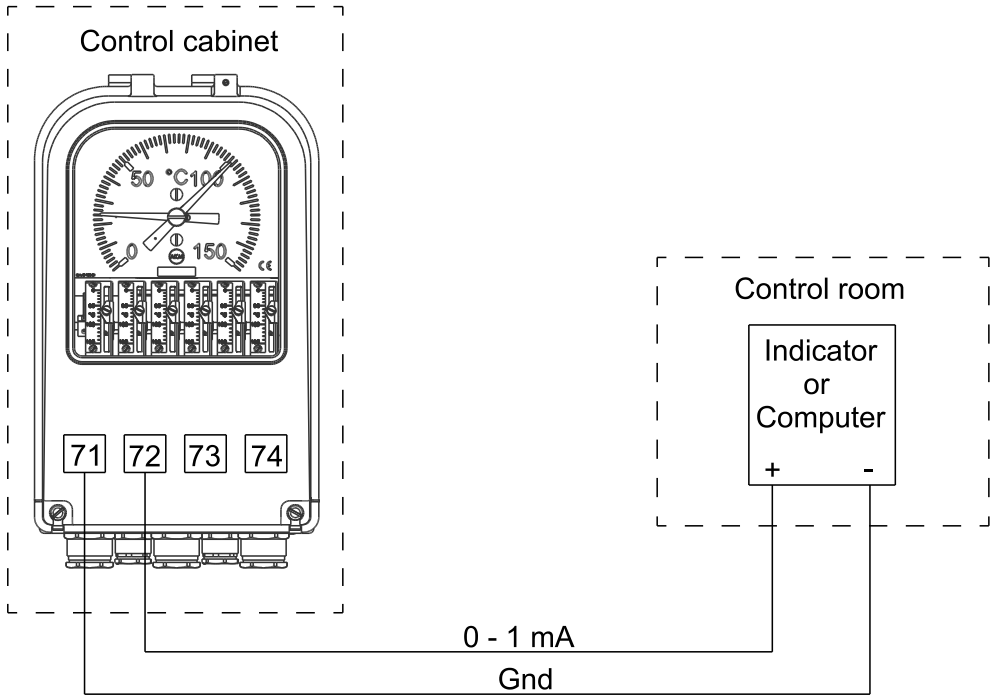


Figure 15.7 – Suggested Wiring TD66 CU10/PT100





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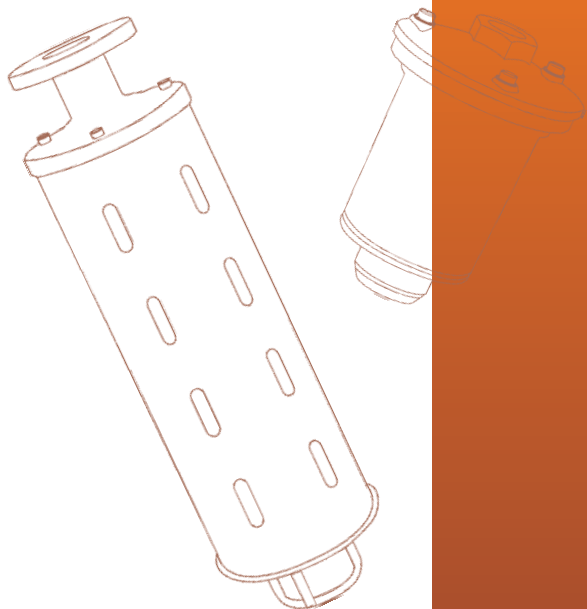
QUALITROL® provides accelerated delivery on many products and services including replacements, spare parts and repairs.

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### **About QUALITROL®**

QUALITROL® manufactures substation and transformer monitoring and protection devices used by electric utilities and manufacturing companies. It is the global leader in sales and installations of transformer asset protection equipment, fault recorders and fault locators. Established in 1945, QUALITROL® produces thousands of different types of products on demand, each customized to customers' unique requirements.

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**DEUMIDIFICATORI  
D'ARIA**

**comem**<sup>®</sup>



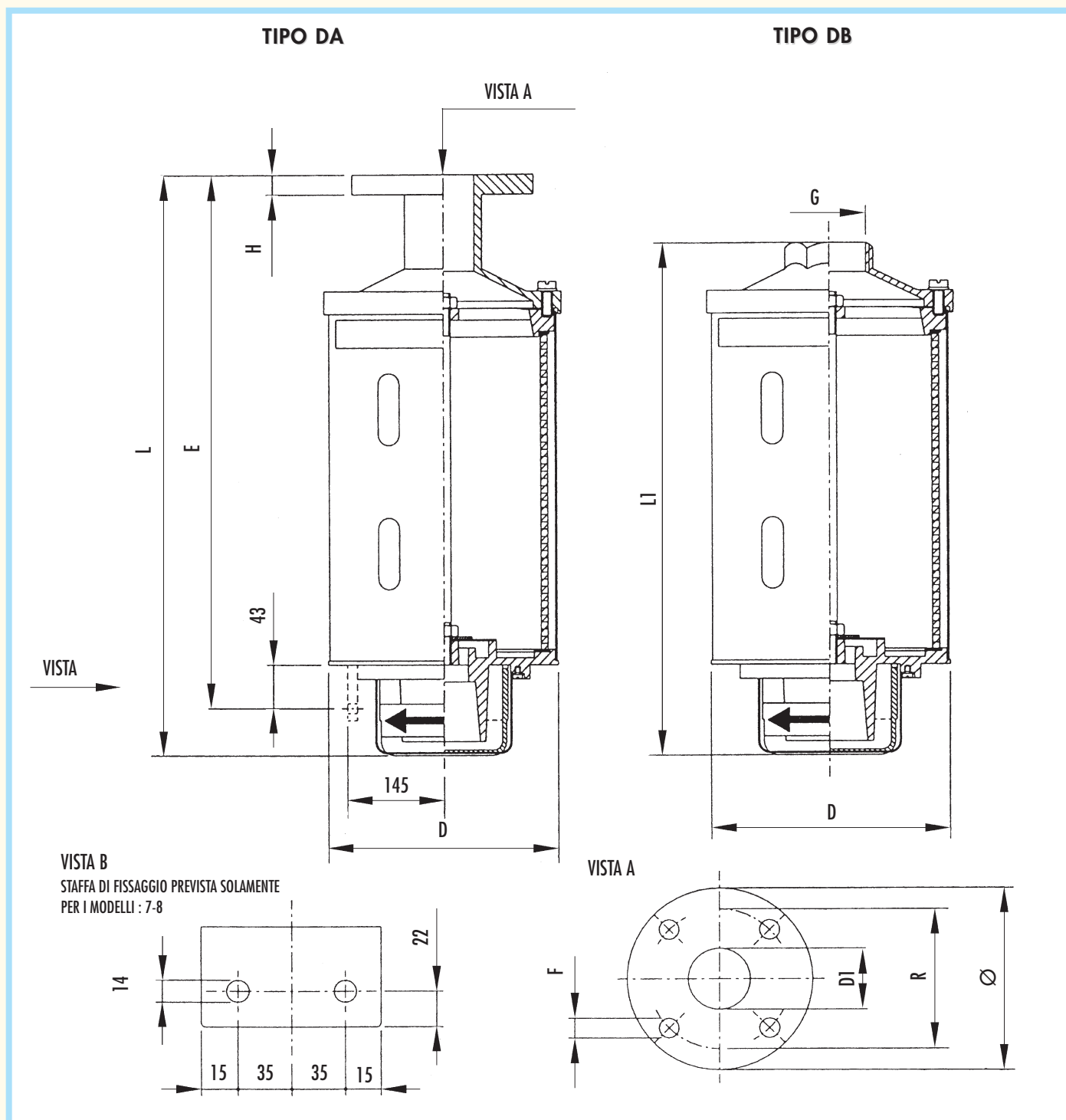
## DEUMIDIFICATORE IDRAULICO CON FLANGIA



## DEUMIDIFICATORE MECCANICO CON FILETTATURA FEMMINA

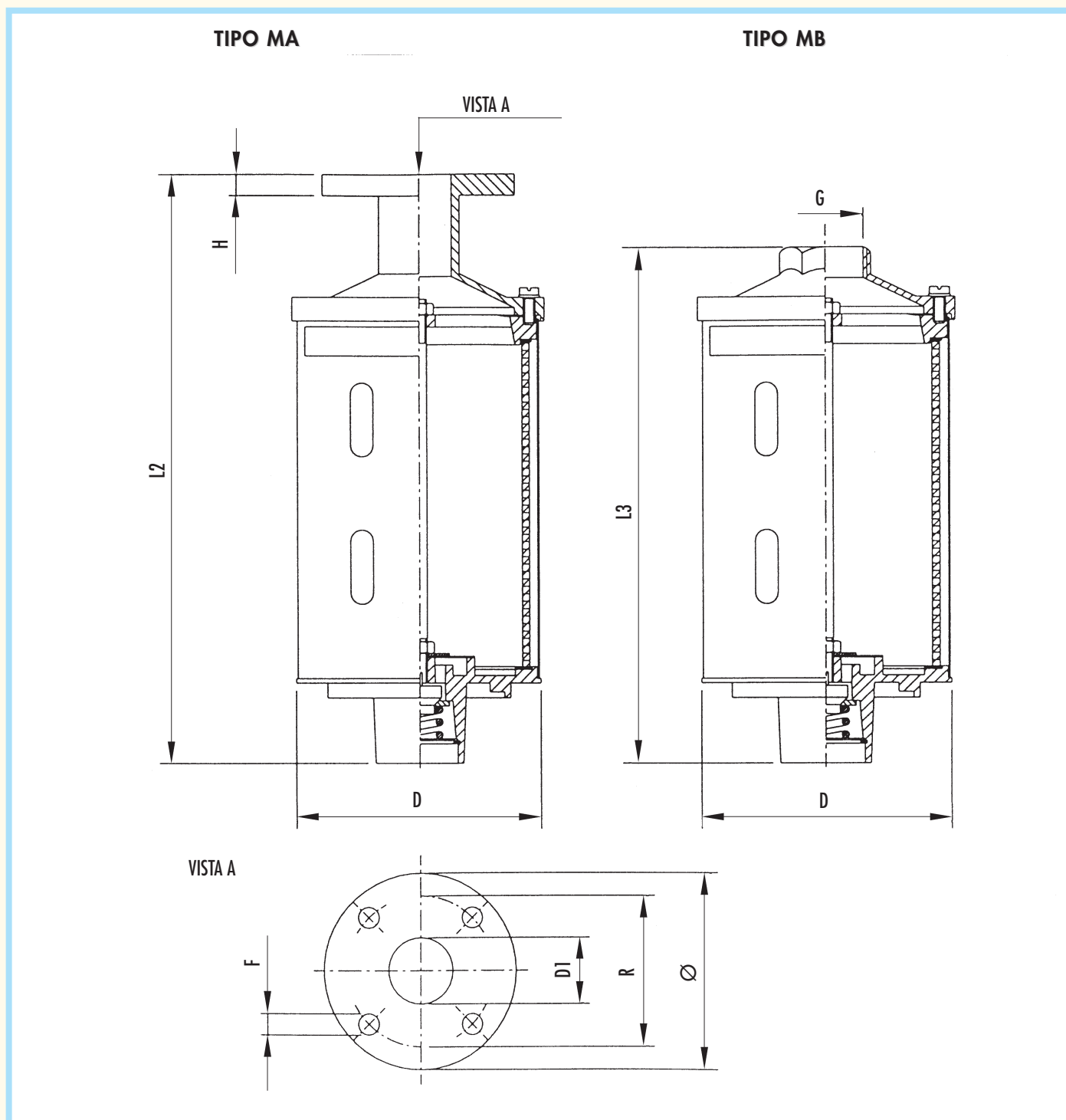


## TABELLA RIASSUNTIVA DEUMIDIFICATORI TIPO: **DA-DB**



Tipo	L Toll. ± 5	L1 Toll. ± 5	D1	H	Ø	R	F	G UNI-ISO 228	E	D Toll. ± 5	Peso Tipo/ <b>DA</b> kg	Peso Tipo <b>DB</b> kg
2	265	210	30	12	100	75	12	G 1"	-	140	3	2.7
3	360	310	44	14	130	100	14	G 1"½	-	175	5.4	4.95
4	610	560	44	14	130	100	14	G 1"½	-	175	9.35	8.75
5	675	625	57	15	140	110	14	G 2"	-	220	16.7	16.5
6	895	845	57	15	140	110	14	G 2"	-	220	22.5	22.2
7	840	-	57	15	140	110	14	-	728	330	40,6	-
8	1225	-	57	15	140	110	14	-	1113	330	65,3	-

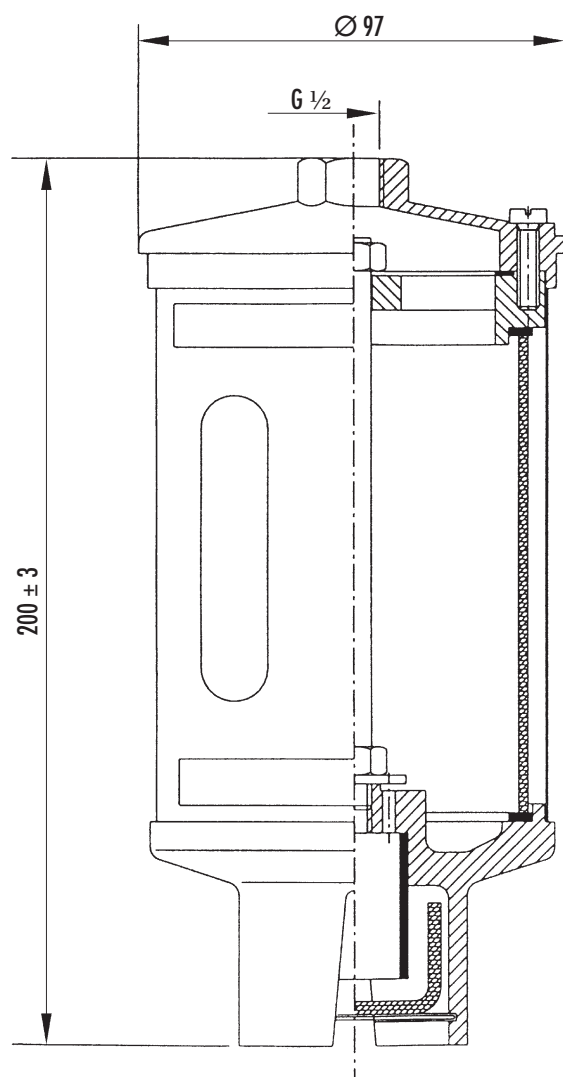
## TABELLA RIASSUNTIVA DEUMIDIFICATORI TIPO: **MA-MB**



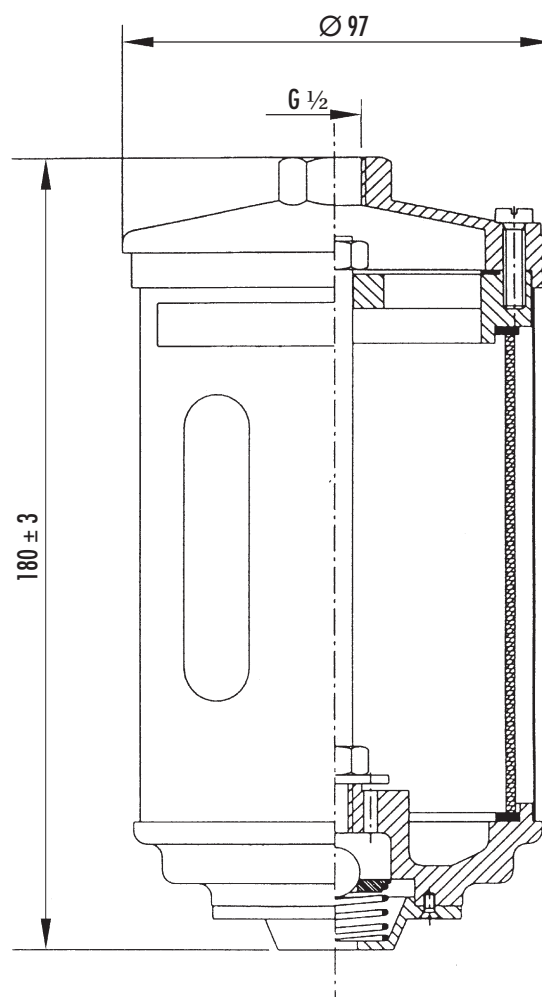
Tipo	L2 Toll. $\pm 5$	L3 Toll. $\pm 5$	D1	H	$\varnothing$	R	F	G UNI-ISO 228	D Toll. $\pm 5$	Peso Tipo <b>MA</b> kg	Peso Tipo <b>MB</b> kg
2	260	210	30	12	100	75	12	G 1"	140	2.7	2.5
3	350	300	44	14	130	100	14	G 1 1/2"	175	5.2	5
4	600	550	44	14	130	100	14	G 1 1/2"	175	8	7.8
5	660	615	57	15	140	110	14	G 2"	220	16.5	16.2
6	880	835	57	15	140	110	14	G 2"	220	22.5	22.2

## TABELLA RIASSUNTIVA DEUMIDIFICATORI TIPO: **1 DB-MB**

TIPO 1DB



TIPO 1MB



COD.	Tipo	SILICA GEL dm <sup>3</sup>	Peso kg
1EM01DB000	EM1DB	0.5	1.15
1EM01MB000	EM1MB	0.5	1.15
1EC01DB000	EC1DB	0.5	1.3
1EC01MB000	EC1MB	0.5	1.3

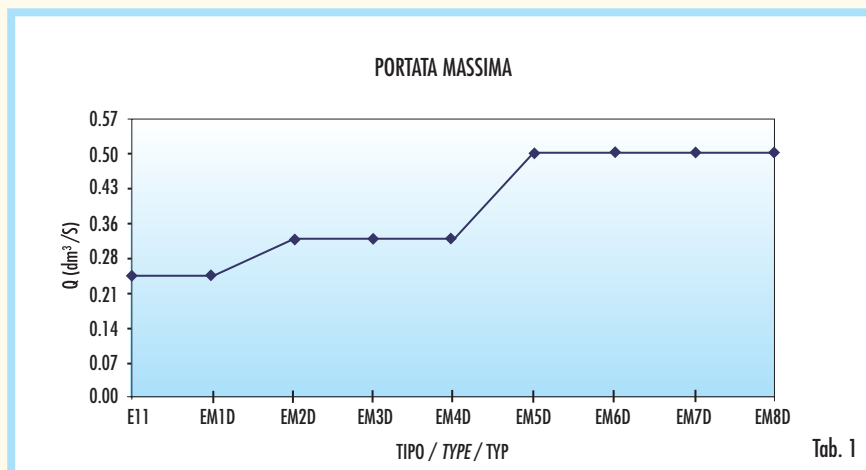
## DEUMIDIFICATORI D'ARIA PER TRASFORMATORI

Sono contenitori trasparenti per sali di ossido di silicio, detto gel di silice, chimicamente puro con indicatore colorato.

Attraverso di essi deve passare l'aria aspirata all'interno del trasformatore a seguito delle contrazioni termiche della massa d'olio. Il gel di silice ha lo scopo di assorbire l'umidità dell'aria ed evitare così la contaminazione dell'olio, mentre il colorante segnala il grado di saturazione raggiunto.

Le variazioni del colore sono riportate sull'etichetta del deumidificatore.

Il sale saturo di umidità contenuto nel deumidificatore deve essere sostituito con altro nuovo o rigenerato. Particolare proprietà del gel di silice è il suo alto potere di assorbimento dell'umidità atmosferica. Per la scelta del tipo di deumidificatore da utilizzare vedi tabella nr. 3

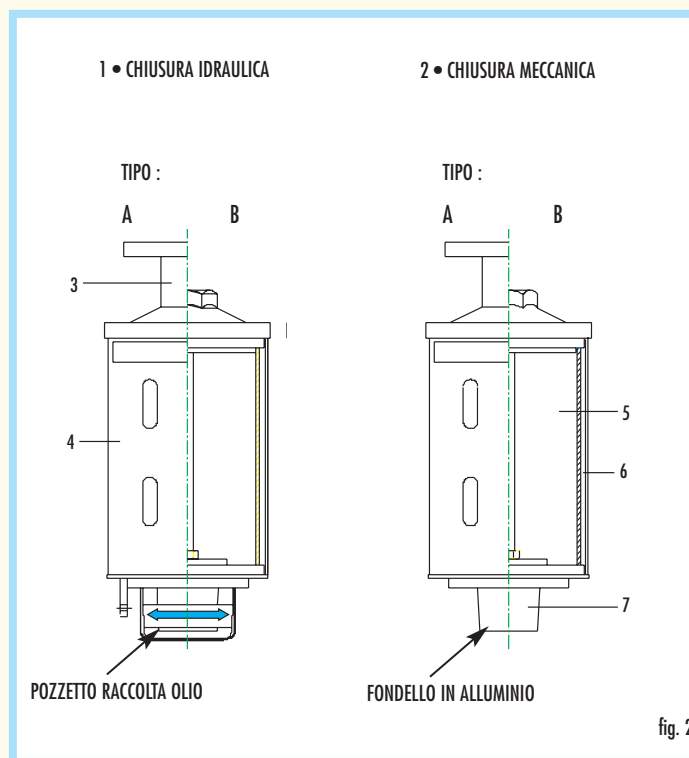


## DESCRIZIONE COSTRUTTIVA

Le parti superiore (3) ed inferiore (7) (vedi fig. 2) sono costituite da compatte fusioni in lega d'alluminio, resistenti alla corrosione. Il tubo trasparente (6), contenente i sali (5), è in policarbonato resistente, agli olii per trasformatori, ai raggi UVA, ad atmosfere leggermente corrosive, ai climi tropicali e marini. Su richiesta è possibile fornire lo stesso in vetro temperato, particolarmente adatto per applicazioni in climi desertici (ove possono verificarsi tempeste di sabbia) o atmosfere fortemente acide. Questo tubo-contenitore è protetto contro gli urti accidentali, da un cilindro in acciaio inox (4) forato in modo da permettere il controllo visivo dei sali. Nella parte inferiore (7) si trova il sistema di chiusura che impedisce all'aria esterna il continuo contatto coi sali.

Questa chiusura può essere idraulica (1), o meccanica (2) e permette il passaggio dell'aria nei due sensi (entrata o uscita) solamente quando si manifesta una differenza di pressione fra l'interno del trasformatore e l'esterno. I valori di perdita di carico della pressione nell'attraversamento dell'aria negli deumidificatori sono i seguenti: 0,003 kg/cm² per l'aria in entrata e 0,005 kg/cm² per l'aria in uscita. Tra i sali ed il sistema di chiusura c'è un labirinto. Questo ha il duplice scopo di diffondere uniformemente l'aria entrante ed evitare che l'eventuale polvere dei sali possa danneggiare il sistema di chiusura.

I deumidificatori di grandezza da 1 a 6 sono disponibili sia con chiusura meccanica che quella idraulica, mentre le grandezze 7 ed 8 sono solo con chiusura idraulica. Il grafico di fig. 1 mostra le portate in dm³/s (indicative) degli essiccatori.



## CODICE PER L'ORDINAZIONE:

Inserire le lettere appropriate per completare il codice:

1 E 0 0 0 0 r

Tipo di applicazione: A = con flangia

B = con filettatura femmina

Tipo di chiusura: D = idraulica

M = meccanica

Inserire il numero che identifica la grandezza: da 1 a 8

Tipo di ambiente:

- climi desertici o atmosfere fortemente acide: lettera C

- atmosfere leggermente corrosive, climi tropicali o marini: lettera M

(la lettera M corrisponde allo standard COMEM per normali applicazioni).

## INDICAZIONI PER L'APPLICAZIONE

La parte superiore è prevista con due diversi tipi di applicazione:

- con flangia PN 6 sec. UNI 2276-67 caratterizzata dalla lettera A (versione non disponibile per la grandezza 1, E11, E1S);
- con filettatura femmina caratterizzata dalla lettera B (versione non disponibile per le grandezze 7 ed 8).

Nella tabella nr. 4 sono riportate le caratteristiche di assorbimento del sale che unitamente alle portate indicate nella tabella nr. 1, consentono la scelta del deumidificatore più adatto.

I deumidificatori, completi di sali, vengono spediti ermeticamente chiusi con tappi di plastica in modo da evitare l'alterazione dello stato del silicagel. Pertanto, in fase di applicazione si raccomanda di toglierli e rendere attiva la tenuta idraulica, versando dell'olio minerale fino al segno che si trova nel recipiente (il livello dell'olio, una volta montato il pozzetto sul fondello, deve corrispondere con il segno del pozzetto). Si raccomanda inoltre prevedere tubazioni di raccordo dal conservatore al deumidificatore con diametri nominali di passaggio aria della stessa sezione della flangia o foro filettato al fine di evitare strozzature del flusso d'aria sia in entrata che in uscita.

## ISTRUZIONI PER LA MANUTENZIONE

Rigenerazione del sale.

Durante il processo di assorbimento, il sale si satura di umidità. E' possibile eseguire una rigenerazione, mediante la quale l'umidità viene eliminata. Questa operazione deve avvenire tramite riscaldamento ad una temperatura tra 120 °C e 150 °C, fino al ritorno alla tonalità di colore iniziale.

## PROTEZIONI DELLE SUPERFICI ESTERNE

(sec. norma tecnica COMEM NT-003)

Le superfici esterne in lega d'alluminio, previa sabbiatura e sgrassaggio, sono ricoperte da un doppio strato di vernice altamente protettiva contro tutti gli agenti atmosferici e resistente sia alle basse che alle alte temperature. La viteria esterna è completamente in acciaio inossidabile AISI 304.

## ESECUZIONI SPECIALI

Per applicazioni in ambienti desertici o meglio in presenza di venti di sabbia ed atmosfere fortemente acide (con alta concentrazione di SO<sub>2</sub> anidride solforosa) si consiglia di utilizzare sia il pozzetto che il tubo in vetro temperato ed applicare la verniciatura speciale che consiste in una doppia mano di fondo epossidico applicata prima della verniciatura standard.

## SIGLE PER L'IDENTIFICAZIONE

La sigla che identifica il tipo è composta da:

- |               |  |
|---------------|--|
| 1 • Lettera E | = Deumidificatore d'aria                       |
| 2 • Lettera M | = Tubo e pozzetto in polycarbonato             |
| Lettera C     | = Tubo e pozzetto in vetro temperato           |
| 3 • Numero    | = Da 1 a 8 che identifica la grandezza         |
| 4 • Lettera D | = Chiusura idraulica                           |
| Lettera M     | = Chiusura meccanica                           |
| 5 • Lettera A | = Tipo di applicazione a flangia               |
| Lettera B     | = Tipo di applicazione con filettatura femmina |

Esempio: **EM 3 DB** = Deumidificatore d'aria con tubo e pozzetto in polycarbonato, grandezza 3 chiusura idraulica, attacco con filettatura femmina.

TAB. 3	SILICA GEL		
	Tipo	dm <sup>3</sup>	Peso kg
	1	0,46	0,37
	2	0,95	0,76
	3	2,75	2,2
	4	6,50	5,2
	5	13,3	10,5
	6	19	15,2
	7	32	25,6
	8	58	46,3

TAB. 4	Capacità di assorbimento di vapore d'acqua a 25 °C riferita ad una umidità relativa	
	10% R.H.	6.4 w.t.%
	20% R.H.	10.7 w.t.%
	40% R.H.	22.7 w.t.%
	60% R.H.	33.3 w.t.%
	80% R.H.	36.3 w.t.%

## DEUMIDIFICATORE TIPO **E1S**

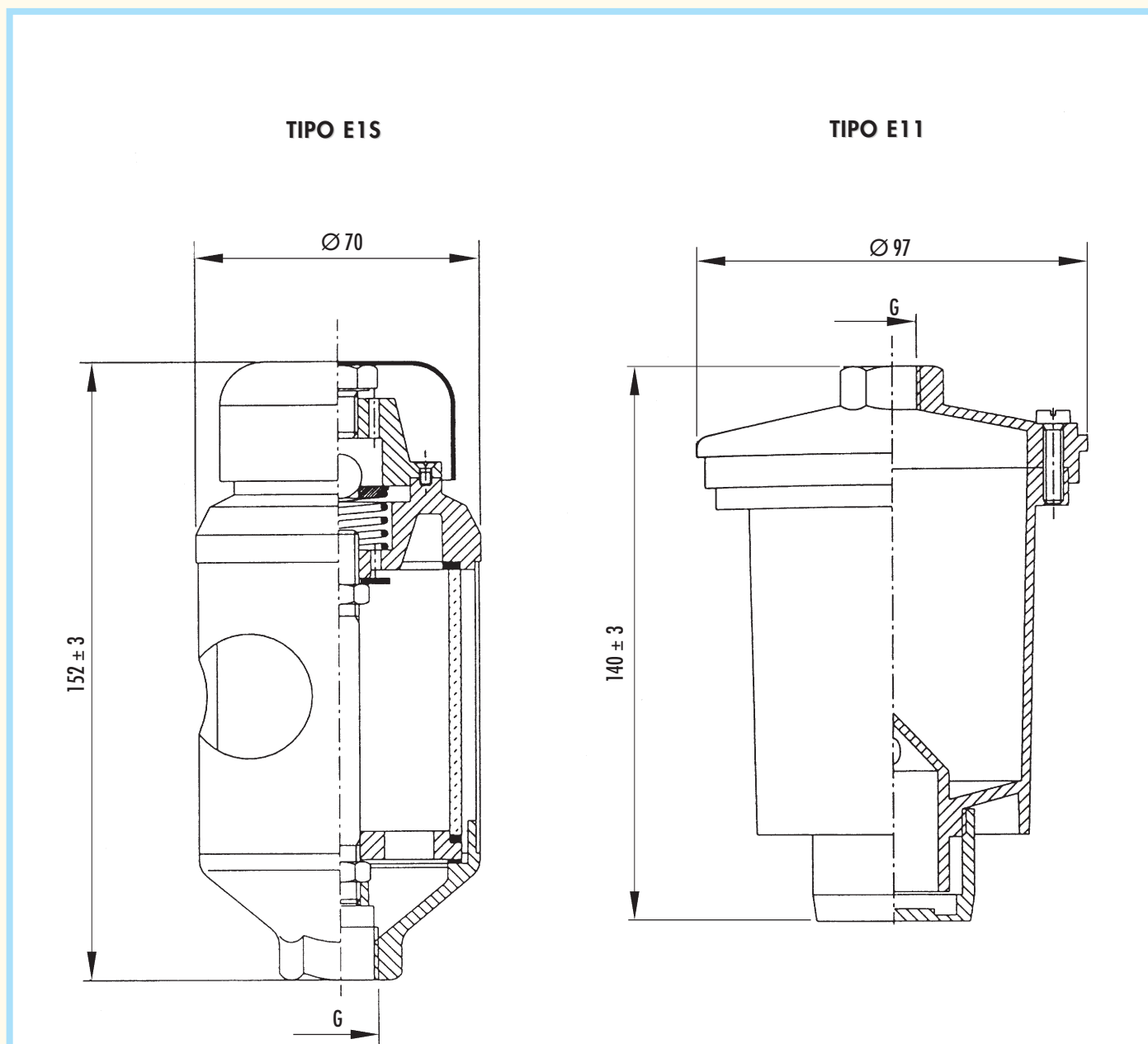




## DEUMIDIFICATORE TIPO **E11**



## TABELLA RIASSUNTIVA DEUMIDIFICATORI TIPO: **E1S** - **E11**



COD.	Tipo	SILICA GEL dm <sup>3</sup>	G UNI-ISO 228	Peso kg
1EM1100000	E11	0.25	G 3/8"	0.40
1EM1100001	E11	0.25	G 1/2"	0.40
1EM01E4063	E1S	0.15	G 1/2"	0.55

### DEUMIDIFICATORI TIPO "E1S" ED "E11"

Si tratta di deumidificatori di piccola grandezza particolarmente adatti per trasformatori di distribuzione. Il tipo "E11" per trasformatori di distribuzione con conservatore, il tipo "E1S" per muffole o sempre per piccoli trasformatori con problemi di ingombro.

L' E1S è una versione speciale della grandezza 1 avente un sistema di aspirazione e chiusura meccanico dall'alto ed un attacco filettato femmina nella parte inferiore.

L' E11 è un deumidificatore la cui parte superiore è in lega d'alluminio verniciata, mentre il resto dell'involucro è in triacetato di cellulosa (nome commerciale Cellidor). Questo può essere fornito con attacco filettato femmina da 3/8" gas oppure su richiesta 1/2" gas.



**comem<sup>®</sup> - S.p.A**

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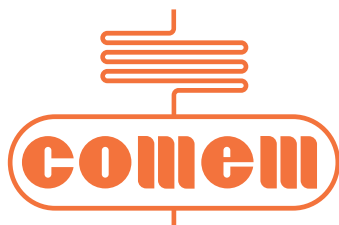
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# PRD

## Pressure Relief Device





# Index

## Pressure Relief Device - LPT

General information	2
Overall dimensions according to EN 50216-5/A2	5
Assembling sequence	6
Order sheet	7

## Pressure Relief Device - M

General information	8
Overall dimensions according to EN 50216-5/A2	12
Assembling sequence	14
Order sheet	15

## Pressure Relief Device - T and Q

General information	16
Overall dimensions according to EN 50216-5/A2	19
Assembling sequence	22
Order sheet	24

## How to select the PRD type for your transformer in 3 simple steps

1st Select size		2nd Select protection type			3rd protection material
Depending on volume of oil tank					
up to 3000 dm <sup>3</sup>	50	no protection needed	"T" model		plastic aluminium alloy
		guard	"T" model		
		conveyor duct	"M" model		
up to 9000 dm <sup>3</sup>	80	no protection needed	"T" model		plastic stainless steel
		guard	"T" model		
		conveyor duct	"T" model		
up to 25000 dm <sup>3</sup>	125	no protection needed	"T" model		plastic aluminium alloy aluminium alloy
		guard	"T" model		
		conveyor duct	"M" model		
		conveyor duct with internal spring	"LPT" model		
up to 45000 dm <sup>3</sup>	200	no protection needed	"T" model		plastic metallic
		guard	"T" model		

# Pressure Relief Device - LPT

COMEM's "LPT" pressure relief device is used to control the pressure inside tanks. It is important in cases where an accidental, sudden and uncontrolled increase in pressure creates the danger of explosion. It is designed to discharge pressure in a very short time (a few thousandths of a second).

It is widely used in oil-cooled electric transformer metal tanks. Sudden and violent short circuits inside these tanks, in fact, instantly generate an enormous amount of gas which cause a substantial increase in internal pressure. If the pressure cannot be externally discharged there is danger that the transformer could explode and potentially cause harm and damage. This danger can be prevented by installing one or more pressure relief devices. It is always good practice to install these pressure relief devices in places where internal pressure values must not exceed specific safety limits.

## LPT

The external protection with a perfect seal guarantess that no drop of oil is dispersed into the environment

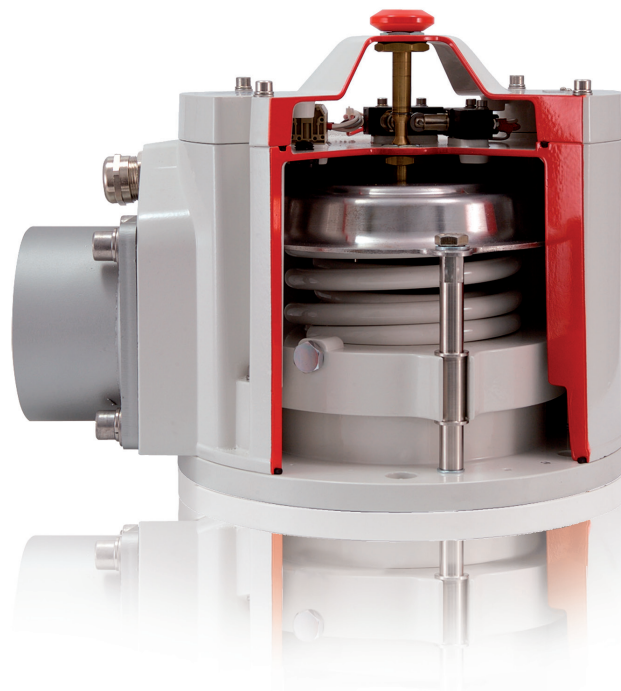
### Total pressure relief completely opening

The pressure relief device is totally opened each time the pressure relief device operates at pressure settings between 20 and 175 kPa.

If pressure generated inside the tank is much higher than the setting, then the further compressed spring allows the closing disk to create even larger discharge areas when it operates.

### Operating performance

Nominal operating pressure: the prefixed overpressure value shall be established between the supplier and the purchaser within the standard range of 20 up to 140 kPa, with 10 kPa steps and 175kPa. Tolerances are - 5 kPa to + 7 kPa for 20-90 kPa and  $\pm 10$  kPa for 100-175 kPa calibration.



## Construction

Our pressure relief device is completely protected against external corrosion and against penetration by foreign bodies between the cover and protective cap. This ensures perfect operating efficiency even for extended periods of time.

## “LPT” pressure relief device

These consist of a flanged body and a corrosion-proof aluminium alloy disk. There are two gaskets in the pressure relief device: a specially-shaped upper gasket and a lip seal. When the pressure relief device is closed, the upper gasket is pressed against the disk. The shape of the gasket creates a perfect seal even if the disk lifts 1-2 mm. The disk also seals against the lip seal gasket as it moves upwards. If, due to internal pressure, the disk rises beyond this amount then the upper seal is no longer maintained while the lip seal remains. When this happens, the surface of the washer consumed by

internal pressure is increased in area equal to the total force applied on the spring.

This causes the total and instant opening of the pressure relief device which consequently discharges excess pressure to the exterior.

When the pressure has been discharged, the disk pushed back by the spring lowers down and closes the valve. As the disk moves downward, it first closes against the side gasket and then against the upper gasket.

The latter, because of its special shape, is pressed down 1-2 mm and the disk moves further down breaking the seal on the lip seal gasket. This releases any pressure that may have been trapped between the two gaskets. Now the pressure relief device is ready to work.

## Routine tests

It is necessary to carry out operational tests, with compressed air:

- to check the correct functioning of the device at operating pressure values
- to check the functioning of the optic signal and of the electric contacts.

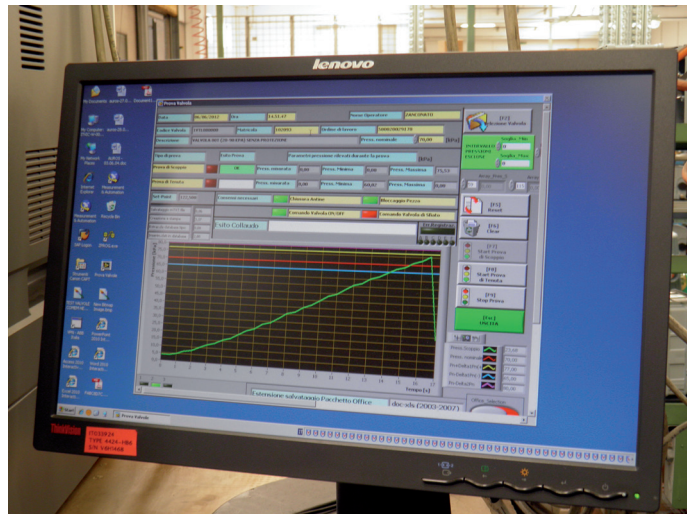
## Installation guidelines

Our “LPT” pressure relief device comes in 1 size.

The following table gives guideline values:

Volume of oil tank:	Type of pressure relief device
up to 25000 dm <sup>3</sup>	LPT

We recommend using multiple pressure relief devices when oil volumes exceed these levels. Instant pressure relief device opening implies direct contact between the closing disk and the oil. For this reason, the pressure relief device is equipped with a screw to bleed out that may accumulate during oil tank filling procedures. In order to prevent harm to people or property due to violent jets of hot oil evacuating from the pressure relief device, it is good practice for pressure relief device discharges to be guided towards points that are properly designed to receive the hot oil. Environmental protection is also another important issue which should be pursued by everyone. Our protection duct allows the oil that is evacuated by the pressure relief device to be drained.



The system's perfect hydraulic seal guarantees that no drop of oil is dispersed into the environment, but is, rather, collected through a pipe into a tank (pipe and tank are not supplied). The sealing oil duct is made of die-casted aluminium; a terminal flanged tube made of steel can be also provided if you want to weld the pipeline air necessary. O-ring gaskets have been applied for duct sealing.

Detailed assembly instructions are supplied with the equipment.



# Pressure Relief Device - LPT



## Visual signal that the pressure relief device is open

The pressure relief device is equipped with a visual signal that shows if it was opened when it is open. This signal consists of a red knob that protrudes from the central part of the duct when the pressure relief device is opened. Simply press it down in order to make it go back to its normal position and reset the switches.

## Electrical signalling switch

Maximum 3 "pressure relief device open signal" contacts can be mounted upon request. These are fast tripping limit switches with switching contacts contained inside a watertight room IP65. The contacts act together with the visual signal.

## Contact diagram

- FIRST SWITCH (terminals 12-14-11)  
change-over contact:
  - 14-11 normally open
  - 11-12 normally closed
- SECOND SWITCH (terminals 22-24-21)  
change-over contact:
  - 23-21 normally open
  - 21-22 normally closed
- THIRD SWITCH (terminals 32-34-31)  
change-over contact:
  - 34-31 normally open
  - 31-32 normally closed

The switches have the following characteristics:

## Specifications:

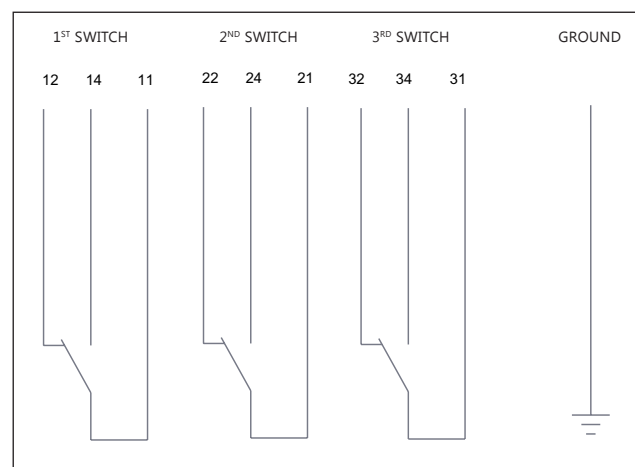
Breaking and making capacity (NO and NC contacts)		
Voltage	Uninterrupted current (making capacity)	Interrupted current (breaking capacity)
24 VDC to 220 VDC	2 A	100 mA L/R < 40 ms
230 VAC	2 A	2 A $\cos \varphi > 0.5$

## Other characteristics:

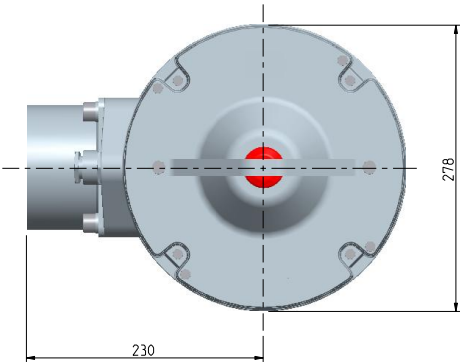
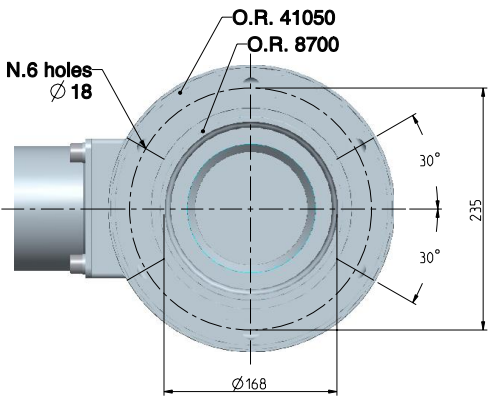
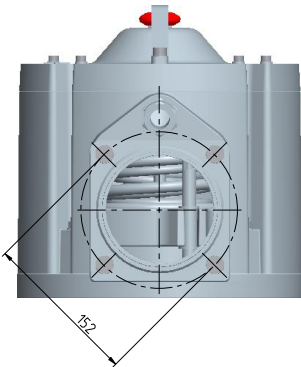
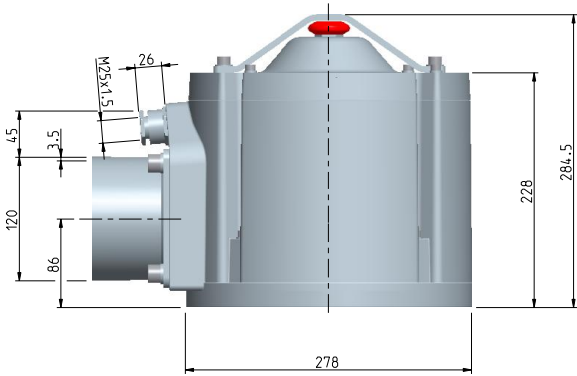
- The pressure relief device is supplied with a "locking system" which allows the pressure relief device to be blocked during the transformer oil leakage test. The locking system has been tested to withstand max 2 bar pressure and can also be used during the transformer transport.  
**WARNING!:** the locking system must be removed before powering-up the transformer.
- The pressure relief device is supplied with a M25x1.5 cable gland.
- Colour: RAL 9002.

## Outer surface protection

The outer surfaces are protected against weather corrosion. Aluminum alloy components are non-corroding, their surface is protected with a thick layer of paint which offers a high level of protection against atmospheric agents and can resist temperature variations between -40 °C and +100 °C. Standard protection suits moderate salinity areas acc. ISO 12944-5. Special protection for severe climate applications, off-shore, is also available upon request.



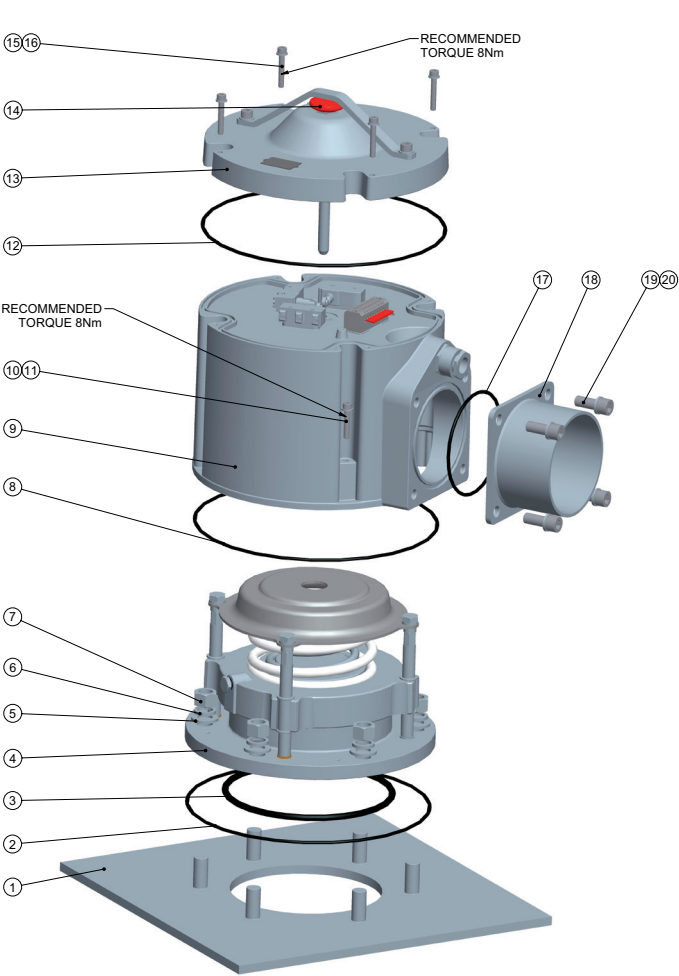
Overall dimensions according to EN 50216-5/A2



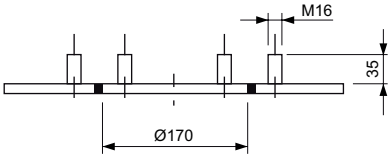
Weight kg 19

# Pressure Relief Device - LPT

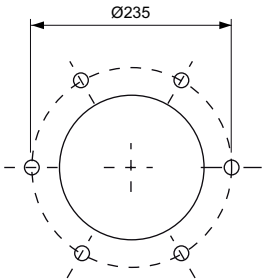
## Assembling sequence



Ref.	Q.ty	Code	Description
1	1		Transformer cover
2	1	5GOD041050	Gasket OR 41050
3	1	5GOD008750	Gasket OR 8750
4	1		125x-6 safety valve
5	6		M16 washer (not supplied)
6	6		M16 grower washer (not supplied)
7	6		M16 nut (not supplied)
8	1	5GOD041050	Gasket OR 41050
9	1		LPT type oil duct
10	4	5v50606060	UNI 5931 M6X60 screw
11	4	5400800861	M6 washer (plain+elastic)
12	1	5GOD041100	Gasket OR 41100
13	1		LPT type oil duct cover
14	1		Visual signal
15	4	5V50605035	UNI 5931 M5x35 screw
16	4	5RG0600050	M5 washers (plain+elastic)
17	1	5GOD004475	Gasket OR 4475
18	1	5COV464600	LPT type flange with pipe for duct
19	4	5V50612030	UNI 5931 M12x30 screw
20	4	5RB0600120	M12 washer



A-A



Order sheet

Number of pieces							
Contacts	<div>1</div>		<div>2</div>		<div>3</div>		
Pressure setting kPa	<div></div> <div>20</div>	<div></div> <div>30</div>	<div></div> <div>40</div>	<div></div> <div>50</div>	<div></div> <div>60</div>	<div></div> <div>70</div>	<div></div> <div>80</div>
	<div></div> <div>90</div>	<div></div> <div>100</div>	<div></div> <div>110</div>	<div></div> <div>120</div>	<div></div> <div>130</div>	<div></div> <div>140</div>	<div></div> <div>175</div>
For use in:	Moderate salinity areas acc. to ISO 12944					<div></div>	
	Off-shore areas acc. to ISO 12944					<div></div>	
Gaskets type	Viton <div></div>		silicone oils and/or high temperatures -10 °C up to +150 °C				
	NBR -40°C <div></div>		mineral oils and low temperatures -40 °C up to +120 °C				

# Pressure Relief Device - M

COMEM "M" pressure relief devices are used to control pressures inside tanks. They are used where accidental, instantaneous and uncontrolled increases in pressure may create the danger of explosion. They are designed to discharge the pressure increases that have taken place to the exterior in a very short time period (a few thousandths of a second).

They are widely used in the metal tanks of oil-cooled electric transformers. Sudden and violent short circuits inside these tanks, in fact, instantly generate an enormous amount of gas with a great increase in interior pressures. If the pressure cannot discharge to the exterior there is danger that the transformer may explode, with all the possible harm and damages this may cause. This danger can be prevented by installing one or more pressure relief device with discharge sizes proportional to the volume of oil contained in the transformer. It is always good practice to install these pressure relief devices in all situations where internal pressure values must not exceed specific safety limits.



They are widely used in large distribution transformers and traction transformers.

## Total pressure relief completely opening

Pressure relief device opening is total each time the pressure relief device operates for pressure settings between 20 and 90 kPa. The discharge opening area, for each pressure relief device operation, is equal to that for higher pressure settings even when pressure settings are lower than 20 kPa. If, however, pressures are generated inside the tank that are much higher than the setting then the spring, further compressed, allows the closing disk to create even larger discharge areas when it operates.

## Operating performance

Nominal operating pressure: the pre-fixed overpressure value shall be agreed between supplier and purchaser within the standard range from 20 up to 90 kPa, with 10 kPa steps, with a tolerance of - 5 kPa to + 7 kPa. For model 50M the standard operating pressure range comes up to 200kPa, with 10kPa steps.



## Construction

Our pressure relief devices are totally protected against external corrosion and against penetration of foreign bodies between cover and protective cap. This ensures perfect operating efficiency even for extended periods of time.

### “M” pressure relief device

These consist of a flanged body and a corrosion-proof aluminium alloy disk. A brass rod that holds the spring is applied to the central part of the disk. There are two gaskets in the pressure relief device: a special shaped upper gasket and a lip seal. When the pressure relief device is closed the upper gasket is pressed against the disk. The shape of the gasket permits a perfect seal even if the disk lifts 1-2 mm. The disk also makes a seal against the lip seal gasket as it moves upwards. If, due to interior pressure, the disk rises beyond this amount then the upper seal is no longer maintained while the lip seal remains.

At this instant the surface of the washer invested by internal pressure is multiplied in area as is the total force applied on the spring. This causes total and instantaneous opening of the pressure relief device which consequently discharges excess pressures to the exterior.

When pressure has been discharged the disk, pushed back by the spring, lowers down and closes the valve. As the disk moves downwards it first closes against the side gasket and then against the upper gasket.

This latter gasket, because of its special shape, is pressed down 1- 2 mm. and the disk moves further down, breaking the seal on the lip seal gasket. This releases any pressure that may have been trapped between the two gaskets. Now the pressure relief device is ready to work.

## Routine tests

It is necessary to carry on operational tests, with compressed air:

- to check the correct functioning of the device at operating pressure values
- to check the functioning of the optic signal and of the electric contacts.

## Installation guidelines

Our “M” pressure relief devices come in 2 sizes and have different discharge areas. This allows users to select the type that is best suited for the volume of oil contained in the tank. The following table gives guideline values:

Volume of oil tank:	Type of pressure relief device
up to 3000 dm <sup>3</sup>	50 M*
up to 25000 dm <sup>3</sup>	125 M*

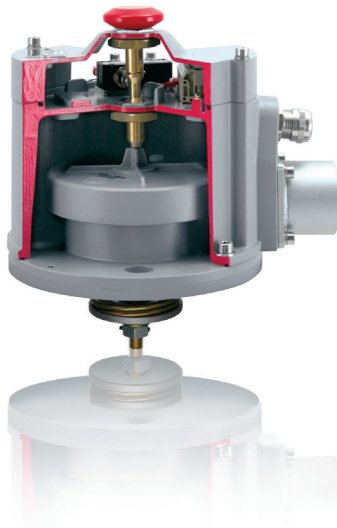
\* These guideline sizes are based on experience.

We recommend using multiple pressure relief devices when oil volumes exceed these levels. It is always good practice to use multiple pressure relief device with smaller discharge areas rather than a single pressure relief device with a large area. The reason for this, in the case of transformers, is that it is better to install one pressure relief device above each winding column since these are the points where maximum interior pressures are generated in case of a short circuit. Instantaneous pressure relief device opening implies direct contact between the closing disk and oil. For this reason the pressure relief device are equipped with a screw to bleed out air that may accumulate during oil tank filling procedures.

## Oil tightness duct

It is a good practice to prevent harm to persons or property from violent jets of hot oil evacuating from the pressure relief device, for pressure relief device discharges to be ducted towards points properly designed to receive the hot oil. The protection of the environment is also another important target which has to be pursued by everybody. Our protection duct allows to drain the oil evacuated by the pressure relief device. The perfect hydraulic tightness of the system guarantees that not any drop of oil is dispersed in the environment, but collected through a pipe in a tank (pipe and tank are not supplied). The sealing oil duct is made of die-casted aluminium; a terminal flanged tube made of steel is also provided if someone wants to weld the pipeline. O-ring gaskets have been adopted for the duct sealing. Detailed assembling instructions are supplied with the equipment.

# Pressure Relief Device - M



## Visual signal that the pressure relief device is open

Pressure relief devices are equipped with a visual signal that shows when they have opened. This signal consists of a red knob that protrudes from the central part of the duct when the pressure relief device has opened. Just press it down in order to make it go back to its normal position and reset the switches, too.

## Electrical signalling switch

Maximum 3 "pressure relief device open signal" contacts can be mounted on request. These are a fast tripping limit switch with switching contact contained inside a watertight room IP 65. The contacts simultaneously act with the visual signal.

## Contact diagram

- FIRST SWITCH (terminals 12-14-11)  
change-over contact:
  - 14-11 normally open
  - 11-12 normally closed
- SECOND SWITCH (terminals 22-24-21)  
change-over contact:
  - 23-21 normally open
  - 21-22 normally closed
- THIRD SWITCH (terminals 32-34-31)  
change-over contact:
  - 34-31 normally open
  - 31-32 normally closed

The switches have the following characteristics:

## Specifications:

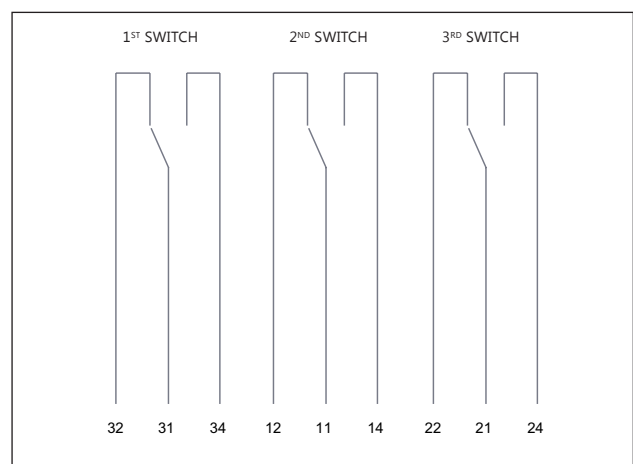
Breaking and making capacity (NO and NC contacts)		
Voltage	Uninterrupted current (making capacity)	Interrupted current (breaking capacity)
24 VDC to 220 VDC	2 A	100 mA L/R<40 ms
230 VAC	2 A	2 A cos $\varphi$ >0.5

## Other characteristics:

- The pressure relief device is supplied with a "locking system" which allows the pressure relief device to be blocked during the transformer oil leakage test. The locking system has been tested to withstand max 2 bar pressure and can also be used during the transformer transport.
- WARNING!:** the locking system must be removed before powering-up the transformer.
- The pressure relief device is supplied with a M25x1.5 cable gland.
- Colour: RAL 7001.

## Outer surface protection

External surfaces are protected against weather corrosion. Aluminum alloy components are non-corroding and their surfaces are protected with a double layer of paint offering high level protection against all atmospheric agents and resisting temperature variations between -40 °C and +100 °C. Special painting for severe climate applications is also available on request.





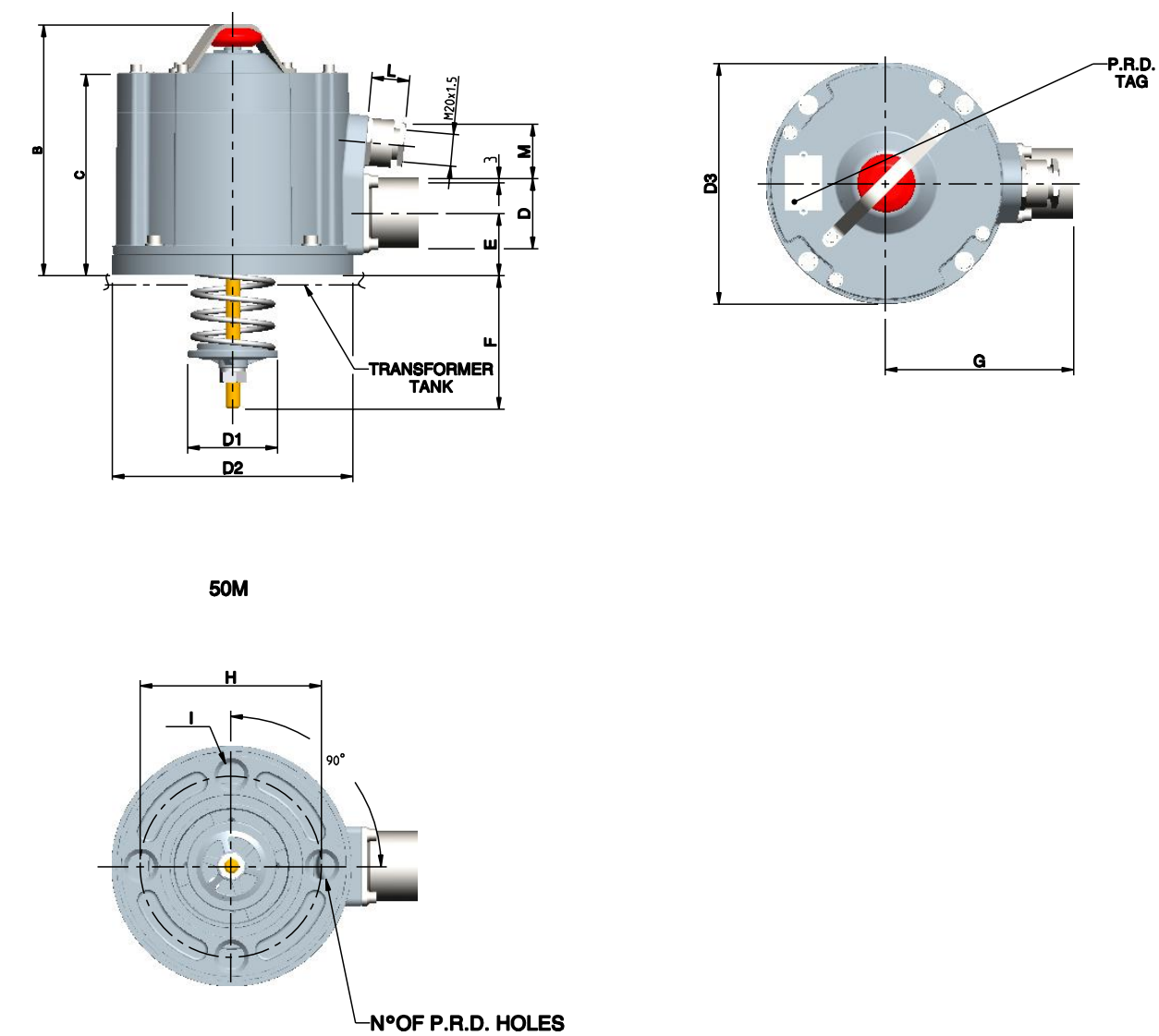




# Pressure Relief Device - M

## Overall dimensions

Type 50M

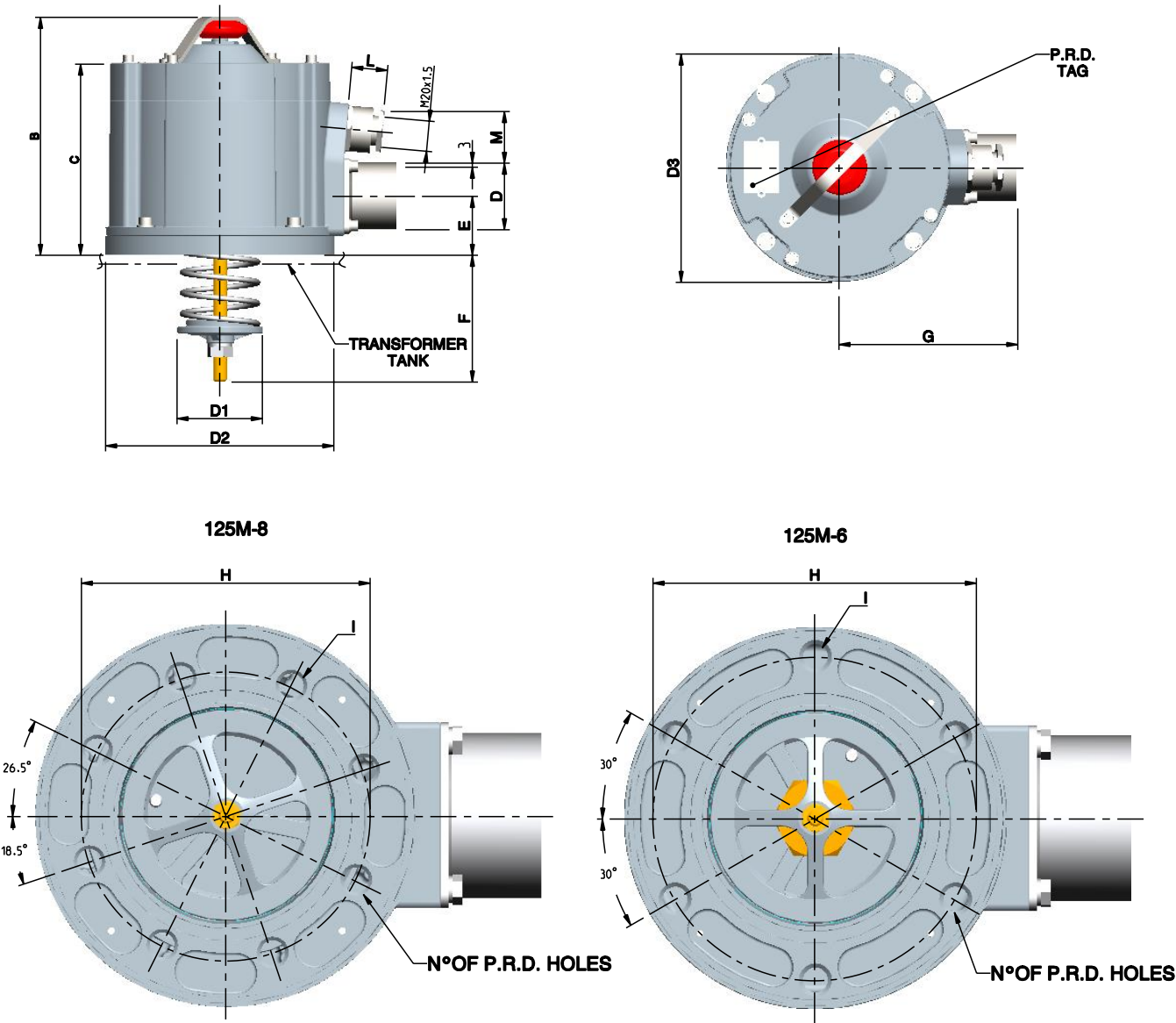


Type	F20KPA *	F70KPA *	kg
50 T	85	45	2.1

\* F = the dimension varies with set pressure

Overall dimensions

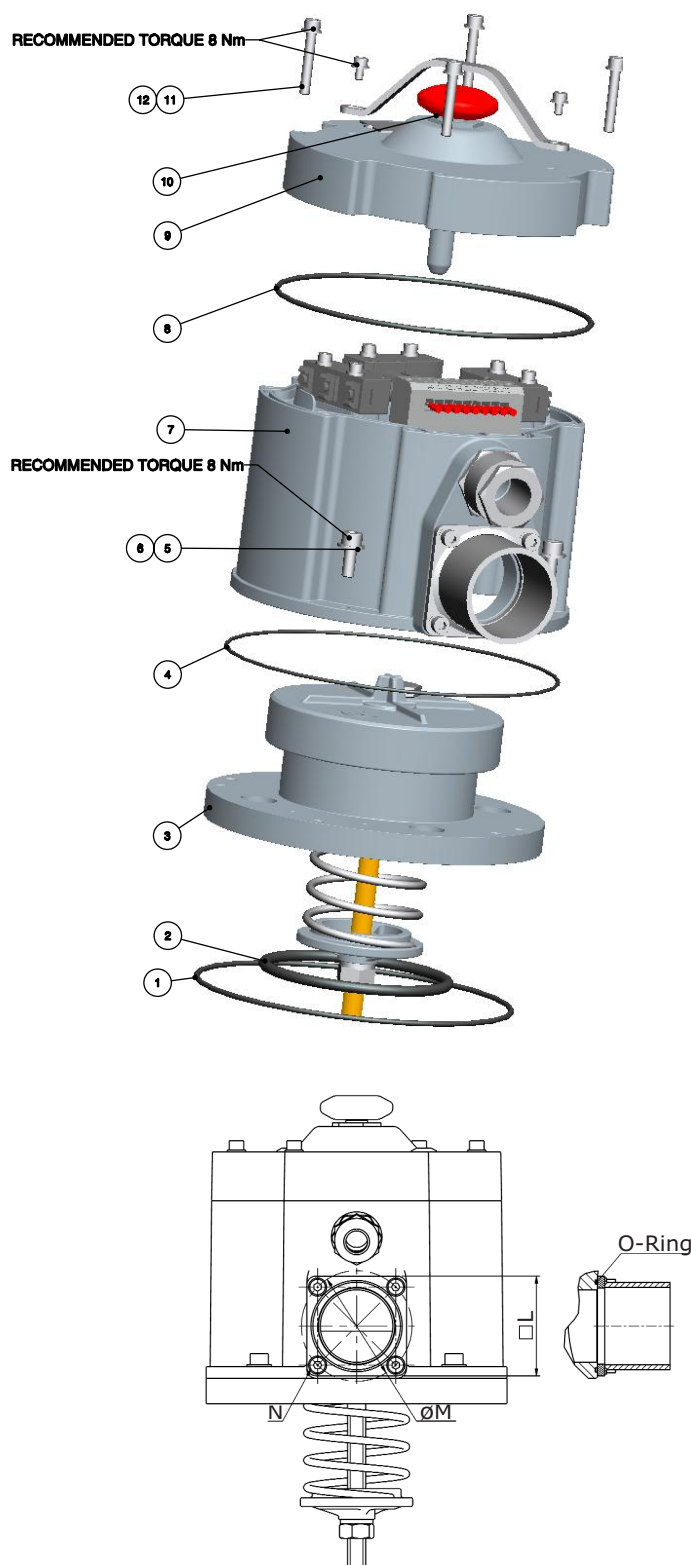
Type 125 M8 and 125 M6



Type	B	C	D	D1	D2	D3	E	F20KPA	F70KPA	G	H	I	No. of holes
125 M-8	278	228	Ø120	Ø153	Ø278	Ø278	86	175	80	230	Ø210	Ø18	8
125 M-6	278	228	Ø120	Ø153	Ø278	Ø278	86	175	80	230	Ø235	Ø18	8

# Pressure Relief Device - M

## Assembling sequence



### Type 50 M

Ref.	Q.ty	Code	Description
1	1	5G0D003600*	GASKET O.R. 3600
2	1	5G0D000183*	GASKET O.R. 6337
3	1	-	50M SAFETY VALVE
4	1	5G0D002637	GASKET O.R. 2637
5	1	5V51106012	UNI 5931 M6X12 FIXING SCREW
6	1	5400800861	WASHER
7	1	-	OIL DUCT 50M
8	1	5G0D003600	GASKET O.R. 3600
9	1	-	OIL DUCT COVER 50M
10	1	-	VISUAL SIGNAL
11	1	5V50605035	UNI 5931 M5X35 FIXING SCREW
12	1	5RG0600050	WASHER

### Type 125 M-8

Ref.	Q.ty	Code	Description
1	1	5G0D041050**	GASKET O.R. 41050
2	1	5G0L000227**	GASKET O.R. 8650
3	1	-	125M-8 SAFETY VALVE
4	1	5G0D041050**	GASKET O.R. 41050
5	1	5V50606060	UNI 5931 M6X60 FIXING SCREW
6	1	5400800861	WASHER
7	1	-	OIL DUCT 125M
8	1	5G0D041100	GASKET O.R. 41100
9	1	-	OIL DUCT COVER 125M
10	1	-	VISUAL SIGNAL
11	1	5V50605035	UNI 5931 M5X35 FIXING SCREW
12	1	5RG0600050	WASHER

### Type 125 M-6

Ref.	Q.ty	Code	Description
1	1	5G0D041050**	GASKET O.R. 41050
2	1	5G0L000227**	GASKET O.R. 8650
3	1	-	125M-6 SAFETY VALVE
4	1	5G0D041050**	GASKET O.R. 41050
5	1	5V50606060	UNI 5931 M6X60 FIXING SCREW
6	1	5400800861	WASHER
7	1	-	OIL DUCT 125M
8	1	5G0D041100	GASKET O.R. 41100
9	1	-	OIL DUCT COVER 125M
10	1	-	VISUAL SIGNAL
11	1	5V50605035	UNI 5931 M5X35 FIXING SCREW
12	1	5RG0600050	WASHER

\* ALTERNATIVE PLANE GASKET CODE 5C0V412501

\*\* ALTERNATIVE PLANE GASKET CODE 5C0V452900

Type	□L	ØM	N	O-Ring
50 M	55	61	4 Screws M5x12	5G0D002187
125 M-8	135	152	4 Screws M12x25	5G0D004475
125 M-6	135	152	4 Screws M12x25	5G0D004475

## Order sheet

Number of pieces			
Model	50 M <input type="checkbox"/>	125 M-8 <input type="checkbox"/>	125 M-6 <input type="checkbox"/>
Contacts	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Pressure setting 20÷90 kPa Up to 200kPa for 50M only	Value ..... kPa		
For use in:	Moderate salinity areas acc. to ISO 12944 <input type="checkbox"/>		
	Off-shore areas acc. to ISO 12944 <input type="checkbox"/>		
Gaskets type	Viton <input type="checkbox"/>	silicone oils and/or high temperature -10°C up to + 150°C	
	NBR -40°C <input type="checkbox"/>	mineral oils and low temperature -40°C up to + 120°C	

# Pressure Relief Device - T and Q

## T and Q

COMEM "T" valves are used to control pressures inside tanks. They are used where accidental, instantaneous and uncontrolled increases in pressure may create the danger of explosion. They are designed to discharge the pressure increases that have taken place to the exterior in a very short time period (a few thousandths of a second). They are widely used in the metal tanks of oil-cooled electric transformers. Sudden and violent short circuits inside these tanks, in fact, instantly generate an enormous amount of gas with a great increase in interior pressures. If the pressure cannot discharge to the exterior there is danger that the transformer may explode, with all the possible harm and damages this may cause. This danger can be prevented by installing one or more valves with discharge sizes proportional to the volume of oil contained in the transformer. It is always good practice to install these valves in all situations where internal pressure values must not exceed specific safety limits.

Pressure relief devices reduce the danger of explosion in case of an instantaneous and uncontrolled increase of pressure inside the transformer

### Total valve opening

Valve opening is total each time the valve operates for pressure settings between 20 and 90 kPa.

The discharge opening area, for each valve operation, is equal to that for higher pressure settings even when pressure settings are lower than 20 kPa. If, however, pressures are generated inside the tank that are much higher than the setting then the spring, further compressed, allows the closing disk to create even larger discharge areas when operates.

### Operating performance

Nominal operating pressure: the pre-fixed overpressure value shall be agreed between supplier and purchaser within the standard range from 20 up to 90 kPa, with 10 kPa steps, with a tolerance of - 5 kPa to + 7 kPa.

### Routine tests

It is necessary to carry on operational tests, with compressed air:

- to check the correct functioning of the device at the operating pressure value
- to check the functioning of the optic signal and of the electric contacts.



## Construction

Our valves are totally protected against external corrosion and against penetration of foreign bodies between cover and protective cap. This ensures perfect operating efficiency even for extended periods of time.

These consist of a flanged body and a corrosion-proof aluminium alloy disk. A brass rod that holds the spring is applied to the central part of the disk. There are two gaskets in the valve: a special shaped upper gasket and a lip seal.

When the valve is closed the upper gasket is pressed against the disk. The shape of the gasket permits a perfect seal even if the disk lifts 1-2 mm. The disk also makes a seal against the lip seal gasket as it moves upwards. If, due to interior pressure, the disk rises beyond this amount then the upper seal is no longer maintained while the lip seal remains. At this instant the surface of the washer invested by internal pressure is multiplied in area as is the total force applied on the spring.

This causes total and instantaneous opening of the valve which consequently discharges excess pressures to the exterior. When pressure has been discharged the disk, pushed back by the spring, lowers down and closes the valve. As the disk moves downwards it first closes against the side gasket and then against the upper gasket.

This latter gasket, because of its special shape, is pressed down 1-2 mm. and the disk moves further down, breaking the seal on the lip seal gasket. This releases any pressure that may have been trapped between the two gaskets. Now the valve is ready to intervene again.

## Installation guidelines

Our valves come in 4 sizes and have different discharge areas. This allows users to select the type that is best suited for the volume of oil contained in the tank. The following table gives guideline values:

Volume of oil tank:	Type of valve
up to 3000 dm <sup>3</sup>	50 T*
up to 9000 dm <sup>3</sup>	80 T*
up to 25000 dm <sup>3</sup>	125 T*
up to 45000 dm <sup>3</sup>	200 T*

\* These guideline sizes are based on experience.

## Pressure settings

Standard pressure settings, for each type of valve, may vary from 20 to 90 kPa (approximately 0.2-0.9 Atm.).

Valves with non-standard pressure settings are manufactured on request. For model 50T the standard operating pressure range comes up to 200kPa, with 10kPa steps.

## Guard against jets of hot oil

It is good practice, to prevent harm to persons or property from violent jets of hot oil evacuating from the valve, for valve discharges to be directed towards points properly designed to receive the discharge. Our valves are furnished with a plastic protective cap for this purpose. This cap, which does not offer any impediment to the discharge, permits you to direct the discharge flow towards the point you desire. The protection of the environment is one of the main aim which has to be pursued by any industry.

In order to do this Comem has developed a new duct for safety devices type "T 50", "T 80" and "T 125". This duct allows to collect the oil drained from the valve following to an internal overpressure of the transformer.

The perfect hydraulic tightness of the system guarantees that not any drop of oil is dispersed in the environment, but carried through a pipe and then collected in a tank (not supplied).

The oil duct is made of unpainted stainless steel and it is solely supplied along with the safety device.

Detailed assembling instructions are supplied with the equipment. Please feel free to contact our Sales Dept and ask for a copy of the working test film.

# Pressure Relief Device - T and Q



## Electrical signalling switch

A “valve open signal” contact may be mounted on request. This is a fast tripping limit switch with switching contact contained inside a watertight casing. This contact is installed so that it acts simultaneous with the visual signal. This switch has the following characteristics:

### Specifications:

Breaking and making capacity (NO and NC contacts)		
Voltage	Uninterrupted current (making capacity)	Interrupted current (breaking capacity)
24 VDC to 220 VDC	2 A	100 mA L/R<40 ms
230 VAC	2 A	2 A cos $\varphi$ >0.5

## External surface protection

External surfaces are protected against weather corrosion. Aluminum alloy components are non-corroding and their surfaces are protected with a double layer of paint offering high level protection against all atmospheric agents and resisting temperature variations between -40 °C and +100 °C. The plastic protection cap and stainless steel screws offer further assurance of proper valve operation.

## Visual signal that the valve is open

Valves are equipped with a visual signal that shows when they have opened. This signal consists of a rod that protrudes from the central part of the protective cap when the valve has opened. Just press it down in order to make it go back to its normal position.

## Contact diagram

FIRST SWITCH (terminals 23-24-13-12)

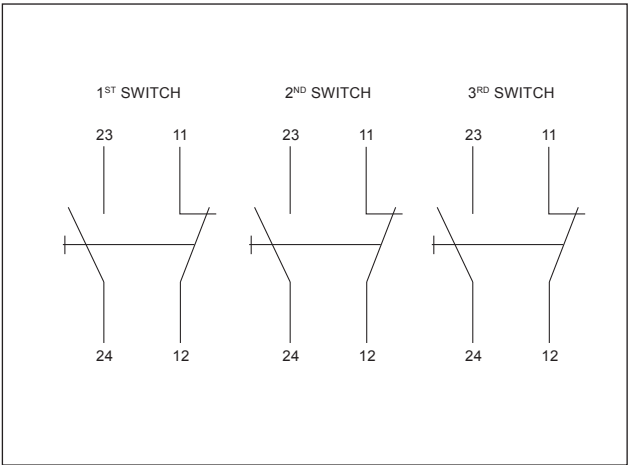
- 23-24 normally open
- 13-12 normally closed

SECOND SWITCH (terminals 23-24-13-12)

- 23-24 normally open
- 13-12 normally closed

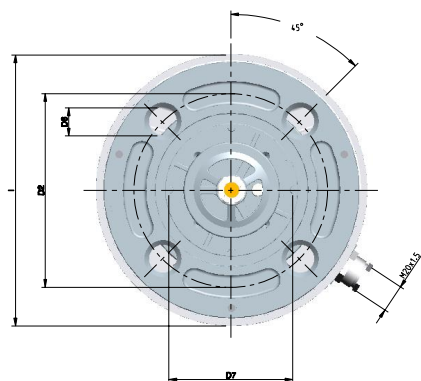
THIRD SWITCH (terminals 23-24-13-12)

- 23-24 normally open
- 13-12 normally closed

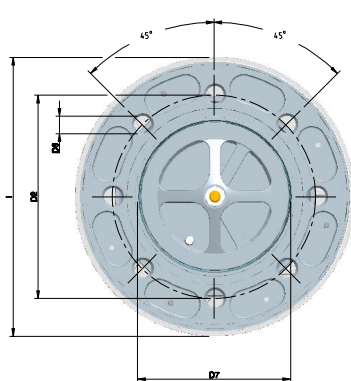


## Overall dimensions

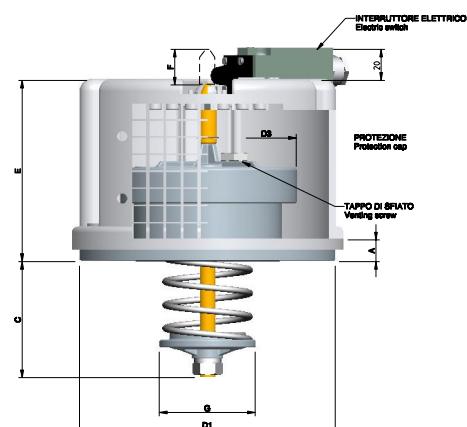
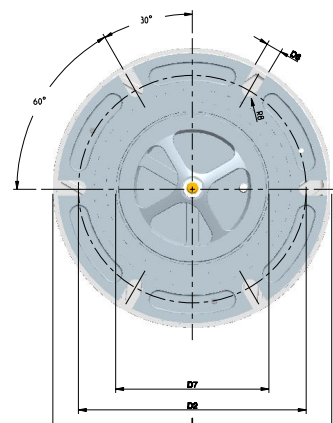
Type 50T - 80 T



Type 125 T



Type 125 Q

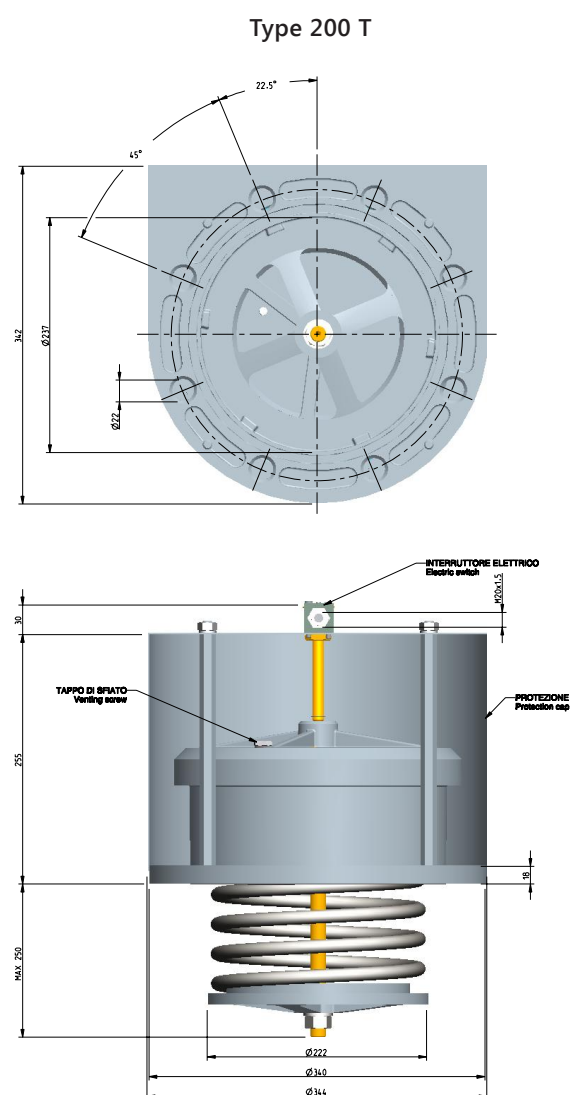


Type	G	A	D	D1	D2	D3	D4	D5	D6	D7	B	C20KPA	C70KPA	E	I	FMAX	O-ring	kg
50 T	62	14	50	165	125	116	85	99	18	80	4	85	45	130	175	16	6337	2.1
80 T	100	16	80	200	160	150	117	131	18	109.5	4	90	50	140	210	32	199	3.8
125 T	153	16	125	278	210	206	164	182	18	158	5	175	80	210	288	62	227	6.7



# Pressure Relief Device - T and Q

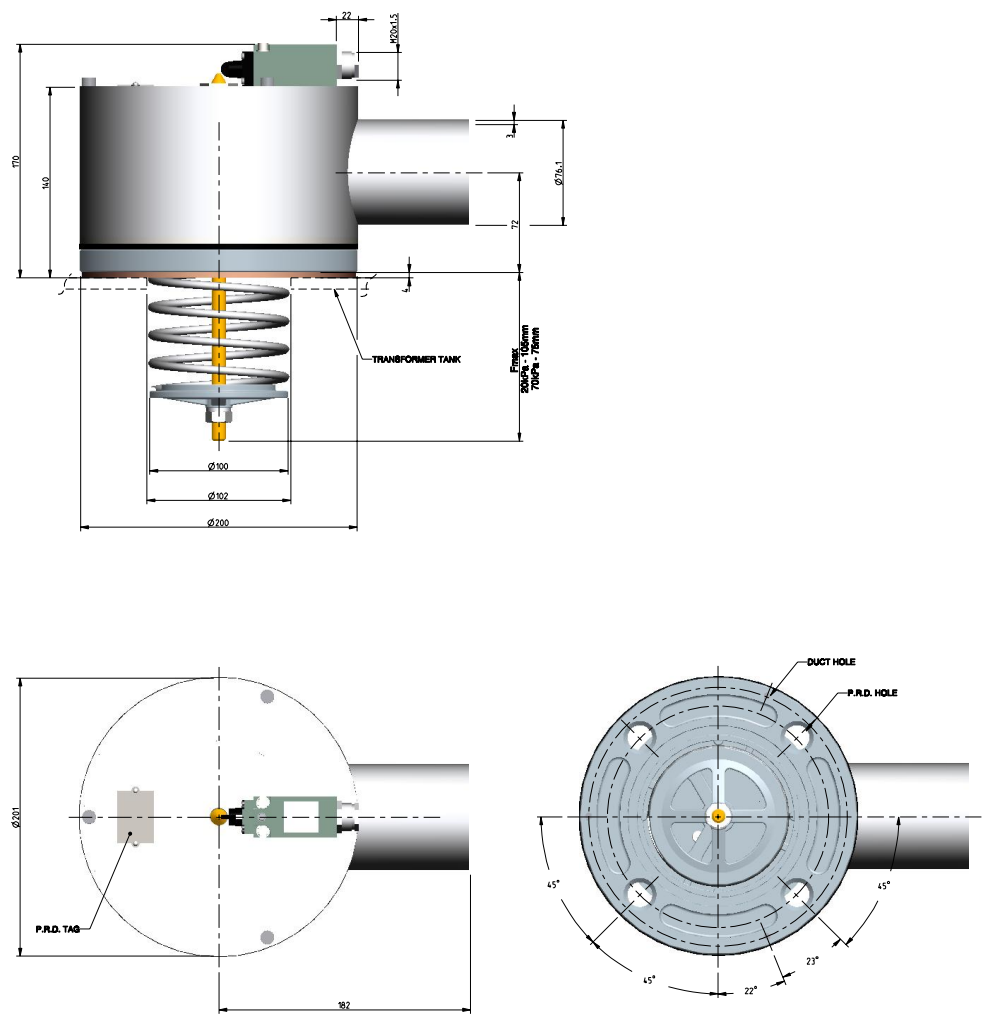
## Overall dimensions



Weight kg 9.8

\* These dimension varies with set pressure

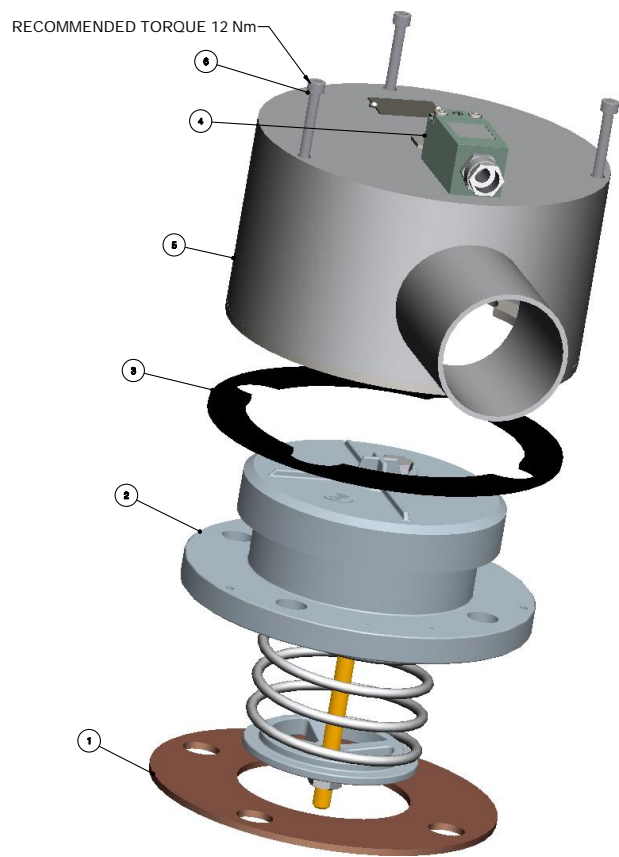
Type 80 T - Stainless steel guard



Weight kg 4.7

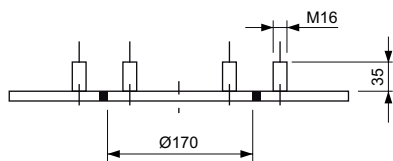
# Pressure Relief Device - T and Q

## Assembling sequence

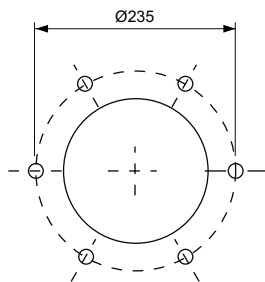


### Type 80 T

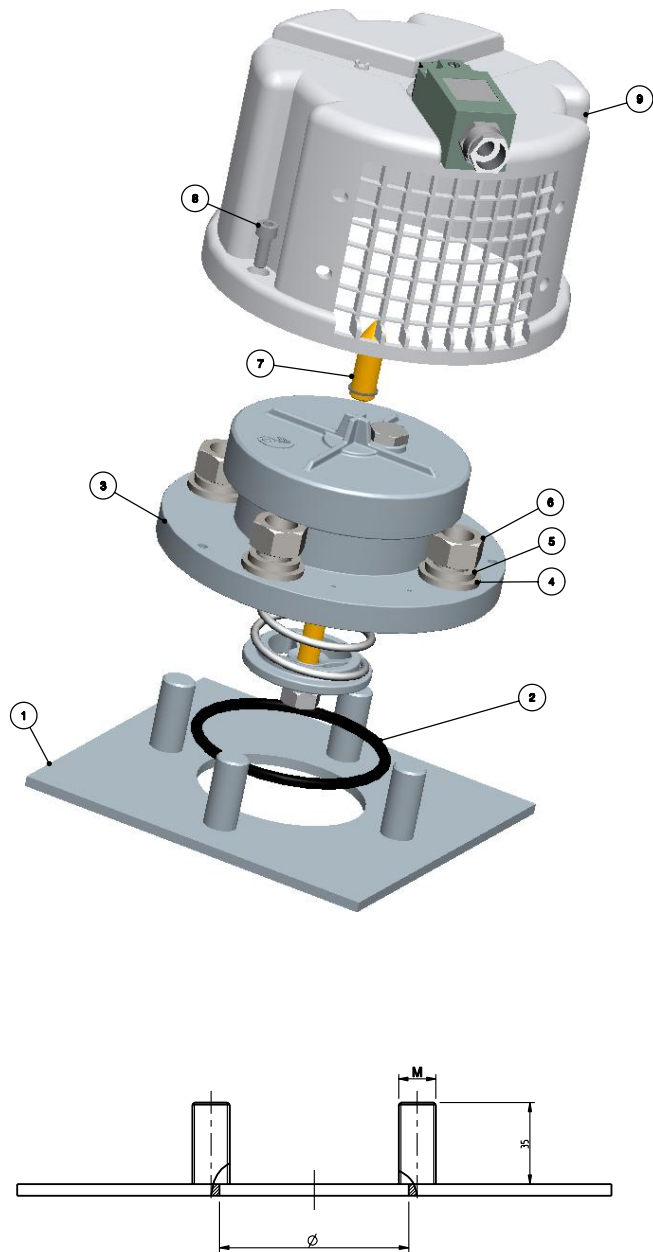
Ref.	Q.ty	Code	Description
1	1	5COV412601	80T GASKET FOR TANK COVER
2	1	-	80T SAFETY VALVE
3	1	5COV451500	80T GASKET FOR DUCT
4	1	5COV451400	VISUAL SIGNAL
5	1	-	80T OIL DUCT
6	3	5V50606130	UNI 5931 M6X110 FIXING SCREW



A-A



## Assembling sequence



Type	Ø Reccomended	M
50T	80	M16
80T	109.5	M16
125T	158	M16
125Q	150	M14

### Type 50 T

Ref.	Q.ty	Code	Description
1	1	-	Transformer cover
2	1	-	Gasket O.R. 183
3	1	5GOD000183	P.R.D. 50T
4	4	-	M16 washer (not supplied)
5	4	-	M16 grover washer (not supplied)
6	4	-	M16 nut (not supplied)
7	1	5COV409105	Visual signal
8	3	54VC006010	Screw M6x10 UNI 5931
9	1	5COV432900	Protection cover

### Type 80 T

Ref.	Q.ty	Code	Description
1	1	-	Transformer cover
2	1	5GOD000199	Gasket O.R. 199
3	1	-	P.R.D. 80T
4	4	-	M16 washer (not supplied)
5	4	-	M16 grover washer (not supplied)
6	4	-	M16 nut (not supplied)
7	1	5COV409106	Visual signal
8	3	54VC006016	Screw M6x16 UNI 5931
9	1	5COV433300	Protection cover

### Type 125 T

Ref.	Q.ty	Code	Description
1	1	-	Transformer cover
2	1	5GOL000227	Gasket O.R. 227 (125T)
3	1	-	P.R.D. 125T
4	4	5RA0000160	M16 washer (not supplied)
5	4	-	M16 grover washer (not supplied)
6	4	-	M16 nut (not supplied)
7	1	5COV409107	Visual signal
8	3	54VC006016	Screw M6x16 UNI 5931
9	1	5COV433100	Protection cover

### Type 125 Q

Ref.	Q.ty	Code	Description
1	1	-	
2	1	5GPO020184	Flat gasket 200x180x4
3	1	-	P.R.D. 125Q
4	4	-	M14 washer (not supplied)
5	4	-	M14 grover washer (not supplied)
6	4	-	M14 nut (not supplied)
7	1	5COV458600	Visual signal
8	3	54VC006016	Screw M6x16 UNI 5931
9	1	5COV433100	Protection cover

# Pressure Relief Device - T and Q

## Order sheet

Number of pieces				
Model	50 T <input type="checkbox"/>	80 T <input type="checkbox"/>	125 T <input type="checkbox"/>	200 T <input type="checkbox"/>
Guard (plastic)	with <input type="checkbox"/>		without <input type="checkbox"/>	
Valve with conveyor duct Stainless steel		80 T <input type="checkbox"/>		
Contacts*	with <input type="checkbox"/> <div>1 2 3</div>		without <input type="checkbox"/>	
* If there are electric contacts, the guard is always supplied.				
Pressure setting 20÷90 kPa Up to 200kPa for 50T only	Value ..... kPa			
For use in:	Moderate salinity areas acc. to ISO 12944			<input type="checkbox"/>
	Off-shore areas acc. to ISO 12944			<input type="checkbox"/>
Gaskets type	Viton <input type="checkbox"/>		silicone oils and/or high temperature -10°C up to + 150°C	
	NBR -40°C <input type="checkbox"/>		mineral oils and low temperature -40°C up to + 120°C	









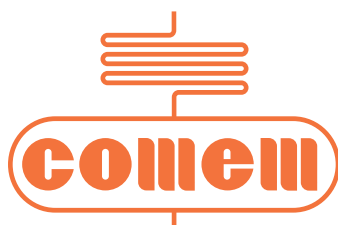
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# Type W□L Off-Circuit Tap Changer Operation Instructions

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HM0.460.602



**Shanghai Huaming Power Equipment Co.,Ltd.**



## Contents

1. General	2
2. Technical Data	5
3. Structure of the Tap changer	10
4. Technical Requirements	11
5. Storage and Transportation	12
6. Documents	12
7. Scope of delivery	12
8. Installation	12
9. Drying Procedure	13
10. Operation	13
11. Maintenance	15
12. Appendix	21

## 1. General

Type WSL Off-Circuit Tap Changers are used for adjusting the voltage of oil-immersed transformers. It is designed like a cage without oil compartment and can be vertically installed on the transformer tank cover through top flange directly.

As per different operating modes, there're three types of tap changer: motor drive, manual drive and top hand wheel Refer to fig.1, fig.2 and fig.3.

As per different internal structures, and regulating mode there are six types of tap changer: Type Linear off-circuit tap changer for neutral application; Type Single-bridging off-circuit tap changer; Type Star-delta off-circuit tap changer; Type Double-bridging off-circuit tap changer; Type Reversing off-circuit tap changer; Type Serial-parallel off-circuit tap changer

As per different sizes, there are two types of tap changer: type A and type B.

There are two type of flange mounting: tank cover type and bell type.

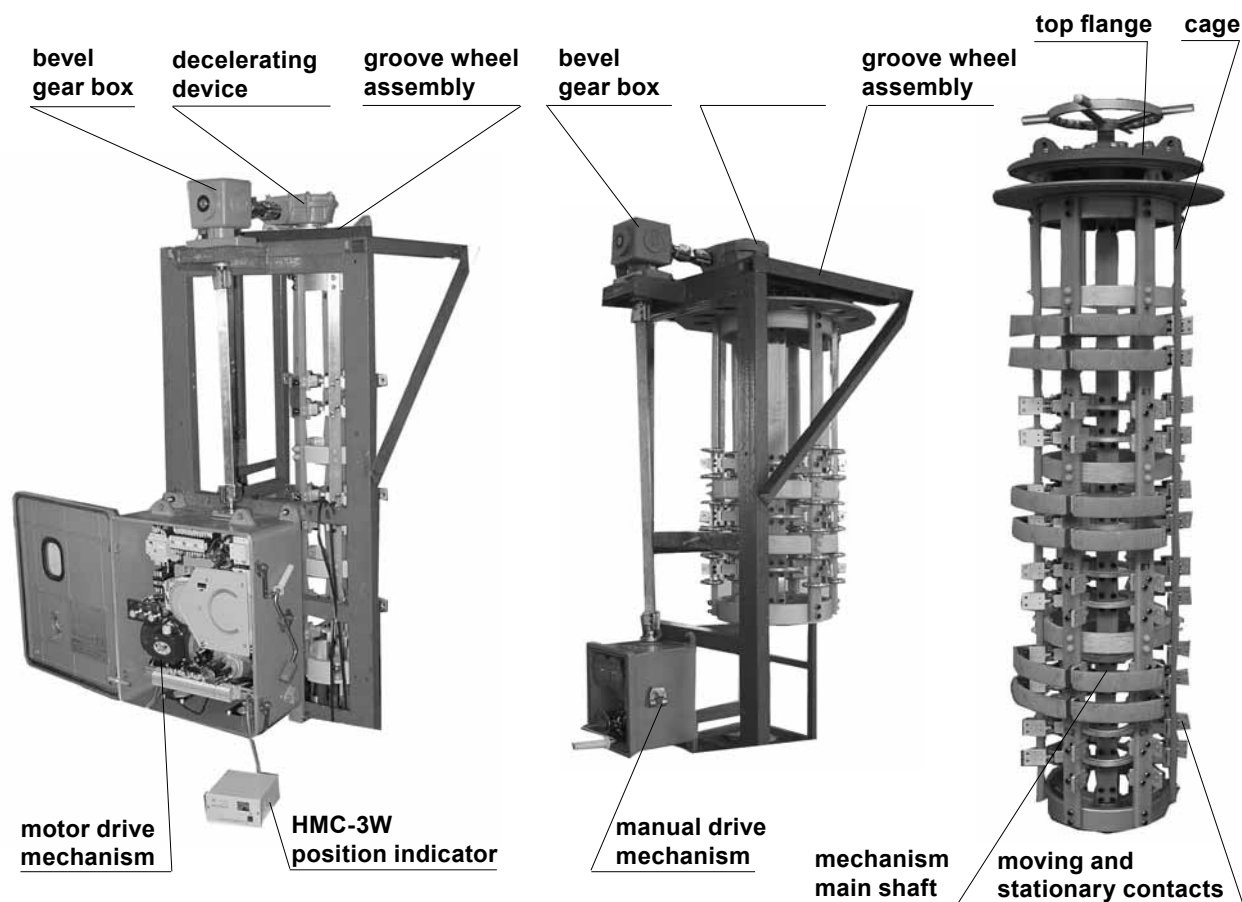


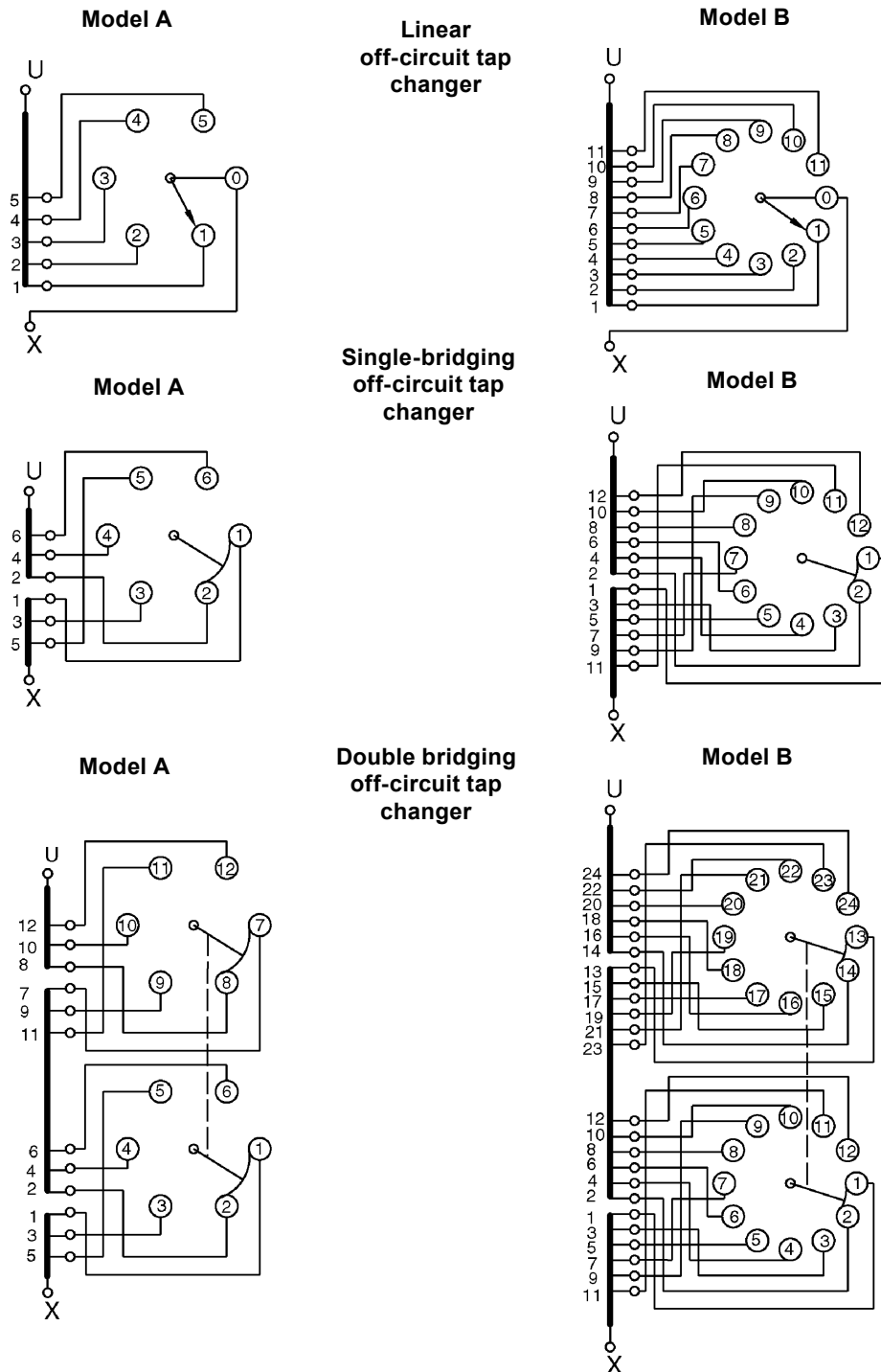
Fig.1 Ground motor drive type tap changer

Fig.2 Ground manual drive type

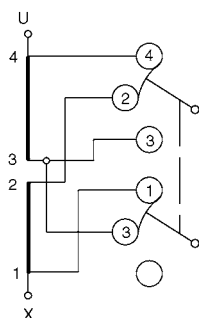
Fig.3 Cover hand wheel type

The ground motor drive tap changer is equipped with a motor drive unit. See fig.15 for connection and "CMA9 Motor Drive Unit Instructions" specifies the operating instructions for the motor drive unit.

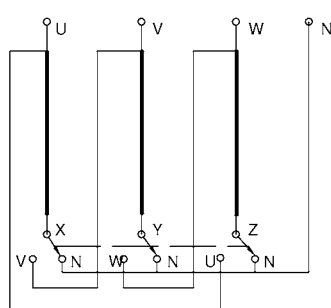
This instruction contains all the information for installing and operating of the three types off circuit tap changer.



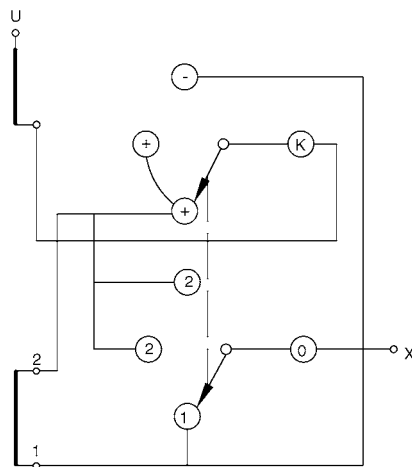
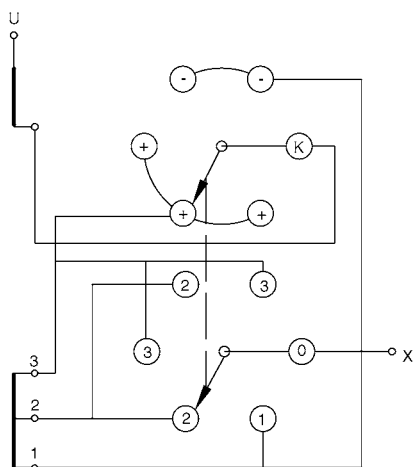
### Serial-parallel transform



### Y-D transform



### Reversing



Tap position	1	2	3	4	5
Position for regulation	+2	+1	0	-1	-2
Connection mode	K-+	K-+	K-+	K--	K--
Connection mode	0-1	0-2	0-3	0-2	0-3

WSLII-XXX/XX-6x5

Tap position	1	2	3
Position for regulation	+1	0	-1
Connection mode	K-+	K-+	K--
Connection mode	0-1	0-2	0-2

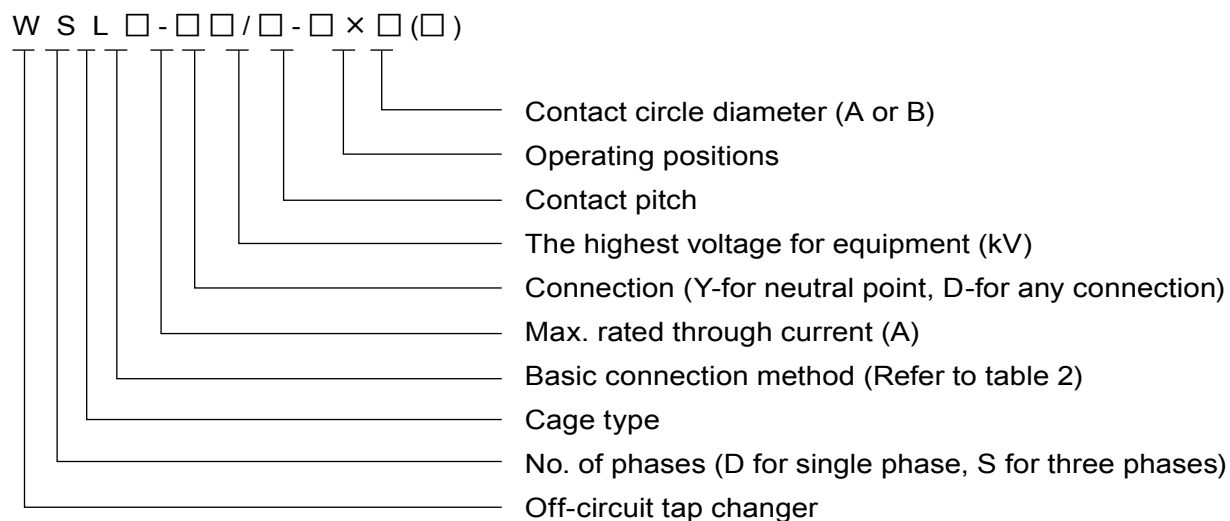
WSLII-XXX/XX-4x3

Fig.4(b) Basic connection diagram

Table 1

Code	IV	V	VI	VII	V III	II
Connection	Linear off-circuit tap changer for neutral application	Single-bridging off-circuit tap changer	Star-delta off-circuit tap changer	Double-bridging off-circuit tap changer	Series-parallel off-circuit tap changer	Reversing off-circuit tap changer

## 1.1 Designation of tap changer model



## 1.2 Functions and Application

Type WSL off-circuit tap changers apply to single pole or three poles oil immersed transformers with the max. rated through current of 300A,600A,800A,1000A,1200A and highest voltage for equipment of 12 kV, 72.5 kV and 126kV. And the operating position is: model A is 5; mode B is 11. The rated frequency is 50Hz~60Hz.

## 1.3 Normal service condition of the tap changer

1.3.1 The temperature of the transformer oil shall be less than 100℃ , and lower than -25℃

1.3.2 The tap changer shall be kept in the place with ambient temperature from -25℃ ~+40℃ , and the relative humidity shall be less then 85%.

1.3.3 Vertical inclination of the tap changer should not be over 2% when it is installed on the transformer.

1.3.4 The tap changer shall be operated in areas without any corrosive or explosive gases.



## 2. Technical Data

All technical data are given in table 2, table 3, and table 4.

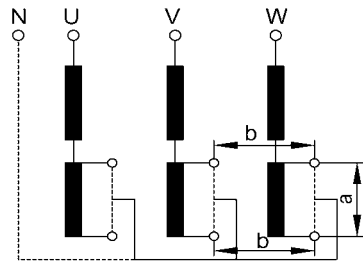
Overall dimensions of the tap changers refer to Appendix 1~22.

**Table 2 Technical data of the tap changer**

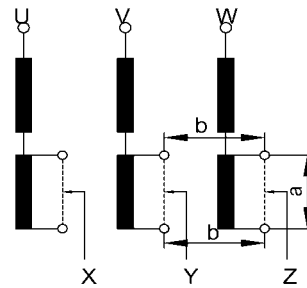
Item	Type		WSL, WDL							
1	No. of Phases		3-phase (WSL), single-phase (WDL)							
2	Max. rated through current(A)		600	800	1000	1200	1600	2000	2400	3000
3	Short-circuit current test (kA)	Thermal (3s)	9	12	15	15	20	24	26	30
		Dynamic (Peak)	22.5	30	37.5	37.5	50	60	65	75
4	Rated frequency (Hz)		50 or 60							
5	Insulation to ground (kV)	The highest voltage for equipment	12 72.5 126							
		Rated separate source AC withstand voltage(kV/50Hz,1min)	36 140 230							
		Rated lightning impulse withstand voltage (kV,1.2/50μs)	75 325 550							
6	Internal insulation		Refer to table 3							
7	Contact circle diameter		Type A: Ø350 Type B: Ø500 or Ø550							
8	Max. operating positions		Max. 5 for type A and max. 11 for type B, see appendix							
9	Mechanical life		Not less than 10,000 operations for manual driving Not less than 100,000 operations for motor driving							
10	Weight (kg)		Type A Max.: 100				Type B Max.: 195			

**Remark:** The tap changer can be designed and produced according to special requirements, please contact us accordingly Single-phase W □ L OCTC drawings are not including in this Technical Data, please contact us if you require single-phase W □ L OCTC.

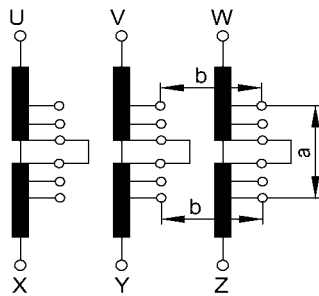
Table 3 Specific voltage stress of the transformer winding



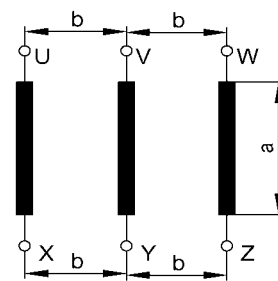
Linear neutral point



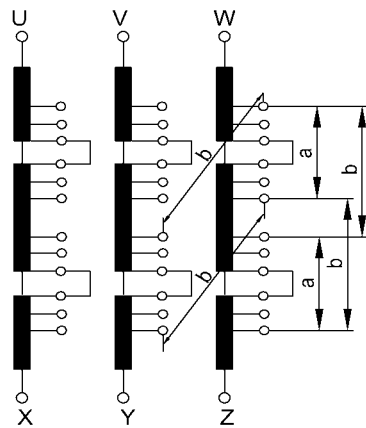
Linear delta connection



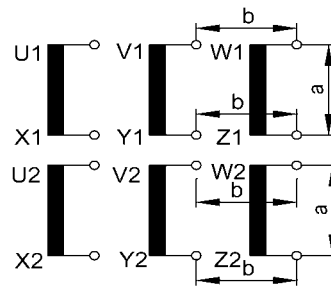
Single-bridging



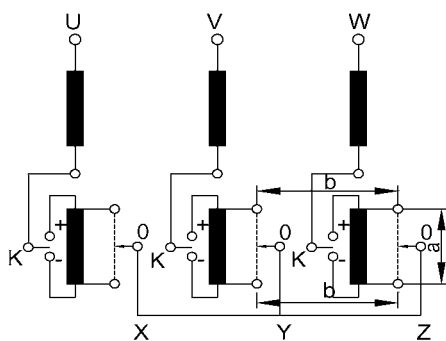
Y-D transform



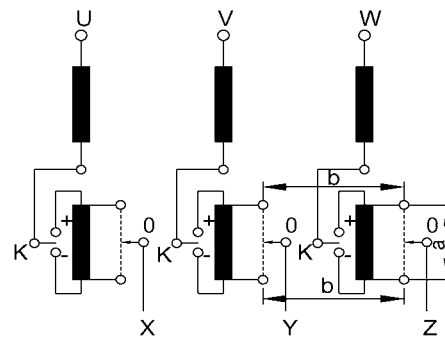
Double-bridging



Serial-parallel



Y connection reversing



D connection reversing

**Table 4 Internal insulation level**

Basic connection mode		Linear for Y connection (IVY)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-3	65	158	2-5	90	216
		4-5	65	158	6-11	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	72	226	-	72	226
126	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	92	272	-	92	272

Basic connection mode		Linear D connection (IVD)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-3	65	158	2-5	90	216
		4-5	65	158	6-11	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	260	575	-	260	575

Basic connection mode		Single bridging (V)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	260	575	-	260	575

Table 4-1 Internal insulation level

Basic connection mode		Y connection reversing (VIID)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	2-3	65	158	2-5	90	216
		4-5	-	-	6-11	65	158
	b	-	53	130	-	53	130
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	6-11	65	158
	b	-	140	325	-	140	325
126	a	2-5	70	216	2-5	85	258
		-	-	-	6-11	45	200
	b	-	260	575	-	260	575

Basic connection mode		Serial-parallel transform (VIII)			
Contact diameter		ø350mm		ø500mm	
Highest voltage for equipment kV	Insulation gap	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	65	158	90	216
	b	53	130	53	130
72.5	a	-	-	90	216
	b	-	-	185	405
126	a	-	-	-	-
	b	-	-	-	-

Basic connection mode		Y-D transform (VI)			
Contact diameter		ø350mm		ø500mm	
Highest voltage for equipment kV	Insulation gap	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50µs)	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50µs)
12	a	75	170	90	216
	b	53	130	53	130
72.5	a	-	-	-	-
	b	-	-	-	-
126	a	-	-	-	-
	b	-	-	-	-

Remark: other requirements to internal insulation upon request.

**Table 4-2 Internal insulation level**

Basic connection mode		Y connection reversing (II)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50μs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50μs)
12	a	2-3	65	158	2-3	90	216
		4-5	65	158	4-5	65	158
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	72	226	-	72	226
126	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	92	272	-	92	272

Basic connection mode		D connection reversing (II)					
Contact diameter		ø350mm			ø500mm		
Highest voltage for equipment kV	Insulation gap	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (kV) (1.2/50μs)	Tap position	Power frequency withstand voltage 50Hz/1min(kV)	Impulse test voltage (1.2/50μs)
12	a	2-3	65	158	2-5	90	216
		4-5	65	158	-	-	-
	b	-	53	160	-	53	160
72.5	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	140	325	-	140	325
126	a	2-5	65	158	2-5	90	216
		-	-	-	-	-	-
	b	-	260	575	-	260	575

**Table 5 Motor Drive Unit Technical Data**

Motor drive unit		CMA9
Motor	Rated power (W)	370
	Rated voltage (V)	380/3AC
	Rated current (A)	1.1
	Rate frequency(Hz)	50 or 60
	Rotate speed (r.p.m.)	1400
Rated torque on drive shaft (Nm)		40
Revolution of the drive shaft per switching operation		2
Revolution of the hand crank per switching operation		30
Running time per switching operation (S)		About 4
Max. operation positions		27
Voltage for control circuit and heater circuit (V)		220/AC
Heater power (W)		30
A.C. voltage test to ground (kV/50Hz, 1min)		2
Approx. weight (kg)		70
Protective degree		IP56
Mechanical endurance (operations)		≥80

### 3. Structure of the tap changer

This tap changer adopts cage structure and is categorized into three types by operation made: motor drive, ground manual drive and cover hand wheel. The cover hand wheel tap changer composes of a cover and a cage and the former two types tap changer also contain a motor operating cabinet or a manual operating cabinet. .

#### 3.1 Cover hand wheel type tap changer (Fig.3)

Cover hand wheel type tap changer composes of head flange and contacts system.

3.1.1 Cover: see fig.6 for the head flange of cover hand wheel type tap changer. The force is transmitted through the hand wheel to the driving shaft and then to the moving contacts of the contacts system through coupling box.

3.1.2 Contacts system: the contacts system consists of moving contacts on a shaft and stationary contacts attached to a cage.

#### 3.2 Ground manual drive type tap changer (Fig.2)

Ground manual drive type tap changer composes of head flange, contacts system, manual

operating unit and bevel gear box.

3.2.1 This head flange is different from the hand flange of cover hand wheel type tap changer. It has a set of groove wheels and a gear decelerating device.

3.2.2 Contacts system: This contacts system is the same as the contacts system of cover hand wheel type tap changer.

3.2.3 Manual operating unit (Fig.5) Manual operating unit consists of tank, tank cover, internal gear mechanism and position indicator. 33 turns manual operation makes one position tap change.

3.2.4 Distance switch positioning provides double protections which make the off circuit tap changer more reliable.

### 3.3 Ground motor drive type tap changer (Fig.1)

The head flange and contacts system are the same as those of ground manual drive type tap changer. "CMA9 operating instruction" specifies the motor drive unit (Fig.6).

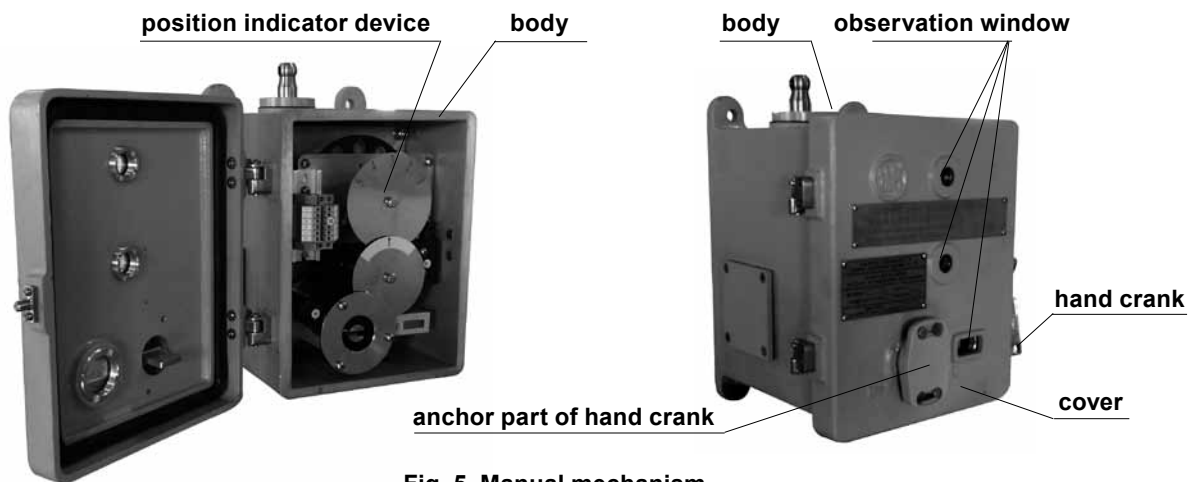


Fig .5 Manual mechanism

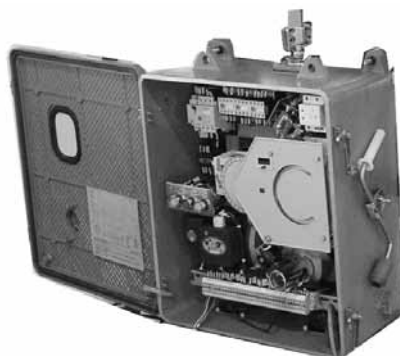


Fig.6 CMA9 motor drive mechanism

## 4. Technical Requirements

4.1 No mechanical malfunctions within 10 after tap changer is connected with the motor drive unit at the adjustment position.

4.2 Measure the contact pressure and contact resistance after they are assembled, the pressure should be  $50\text{N} \pm 10\text{N}$ , the pressure of the upper and lower contact point should be even and the contact resistance  $\leq 350\mu\Omega$ .

4.3 Perform gas pressure test after the flange is mounted on the top. There shall not be any leakage within 24 hours under the air pressure of 0.08MPa.

4.4 As for head hand wheel type tap changer, when the head position indicator is at the middle position, the moving contact should be at the middle of fixed contact accordingly.

4.5 As for ground motor drive type tap changer, when the motor drive unit stops, the moving contact should be at the same position as the motor drive unit indicates and at the middle position of fixed contact.

4.6 As for ground manual drive type tap changer, when unit operates 10 turns, the moving contact should be at the same position as the manual drive unit indicates and at the middle position of the fixed contact.

4.7 After the tap changer is connected with the motor drive unit, one tap change is complete at manual 30 turns, that is, the motor drive indicative red line is back at its original position (to the middle of the window), for both directions, the differences between the turns when the tap changer's contacts are at positions and the turns when the red line in the indicator is at the window is not more than 3.75 turns.

4.8 When the tap changer in the transformer oil undergoes through 1.2 times of rated current, the temperature rise of oil over contacts should not be over 15K.

## 5 Storage and Transportation

5.1 Tap changer should be kept in a warehouse where it is clean, dry and free of corrosive gas with anti-dust and anti-moisture protection. Temperature is between  $-25^{\circ}\text{C}$  and  $+40^{\circ}\text{C}$ . The relative humidity should not be over 85%.

5.2 Temporary mounting is necessary during transportation for tap changer over 2 meters long in order to prevent tap changer from distortion or damage due to wobble. Dismantle the



temporary mounting before putting the equipment into service.

## **6. Documents**

### **6.1 Quality certificate**

### **6.2 Packing list**

### **6.3 Operating instructions**

## **7. Scope of delivery**

The tap changer equipment is shipped as follows:

### **7.1 Off circuit tap changer**

7.2 For the tap changer driven by motor drive unit, the tap changer will be delivered with Motor drive Unit type CMA9, middle drive gear box, drive shaft

7.3 For ground manual drive type off-circuit tap changer, the tap changer will be delivered with hand wheel crank, middle drive gear box and drive shaft

## **8. Installation**

### **8.1 Initial check**

8.1.1 Check the tap changer's specification against the requirements of the transformer and make sure the approval, operating instruction packing list and other technical documents are all available.

8.1.2 Check and make sure that the tap changer is in good condition and free of distortion or damage.

8.1.3 Operate the tap changer for one complete operation cycle to make sure that the tap changer work properly and the contact work position should be the same as what the position indicator shows.

8.1.4 Measure contact resistance for each position, Make sure the results are in accordance with those on the certificate.

## 8.2 Mounting

This type of tap changer doesn't contain oil compartment and can be directly mounted into the transformer oil tank.

### 8.2.1 Installation of the off-circuit tap changer onto the tank cover type transformer (fig. 7)

Clean all the surfaces for the gaskets (head bottom, mounting flange). Put on oil-proof gasket on the mounting flange. Slowly lower the tap changer into the transformer. Be careful not to damage the tap changer terminals.

After the confirmation of its right position, the tap changer can be mounted over the installation flange of the transformer.

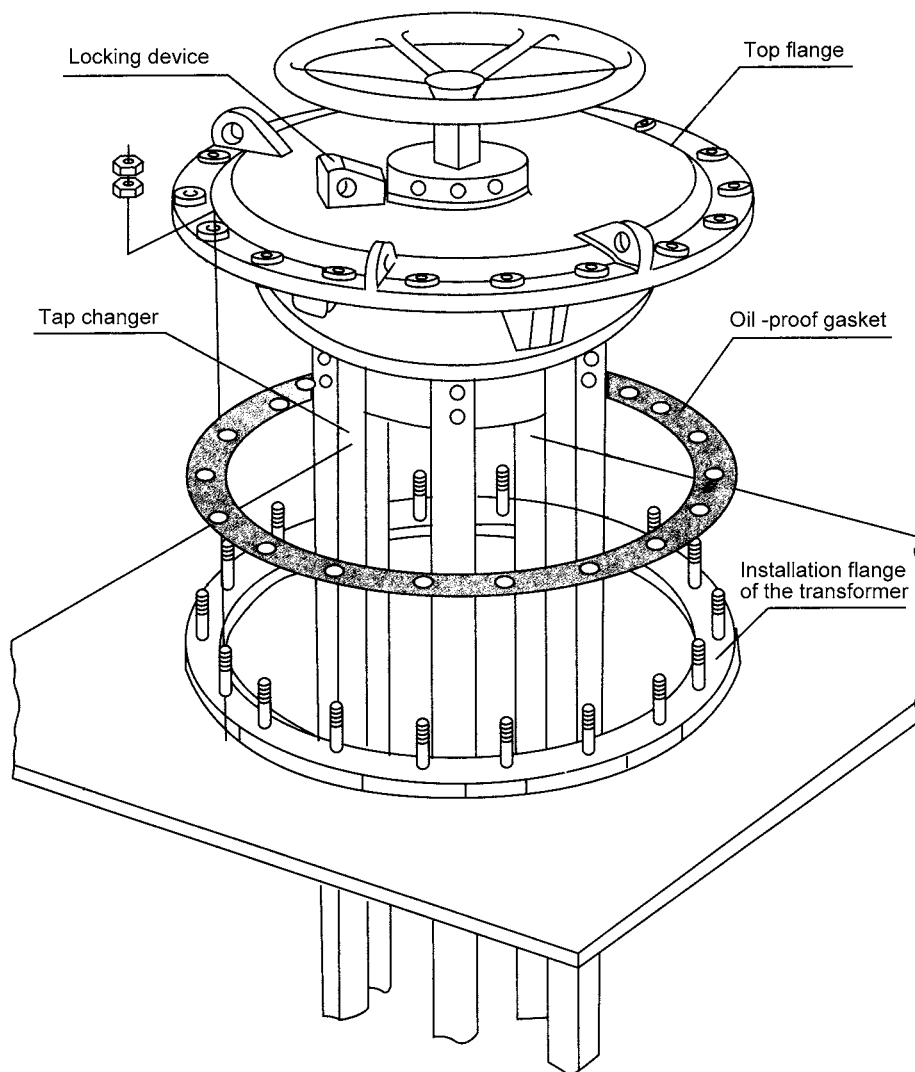


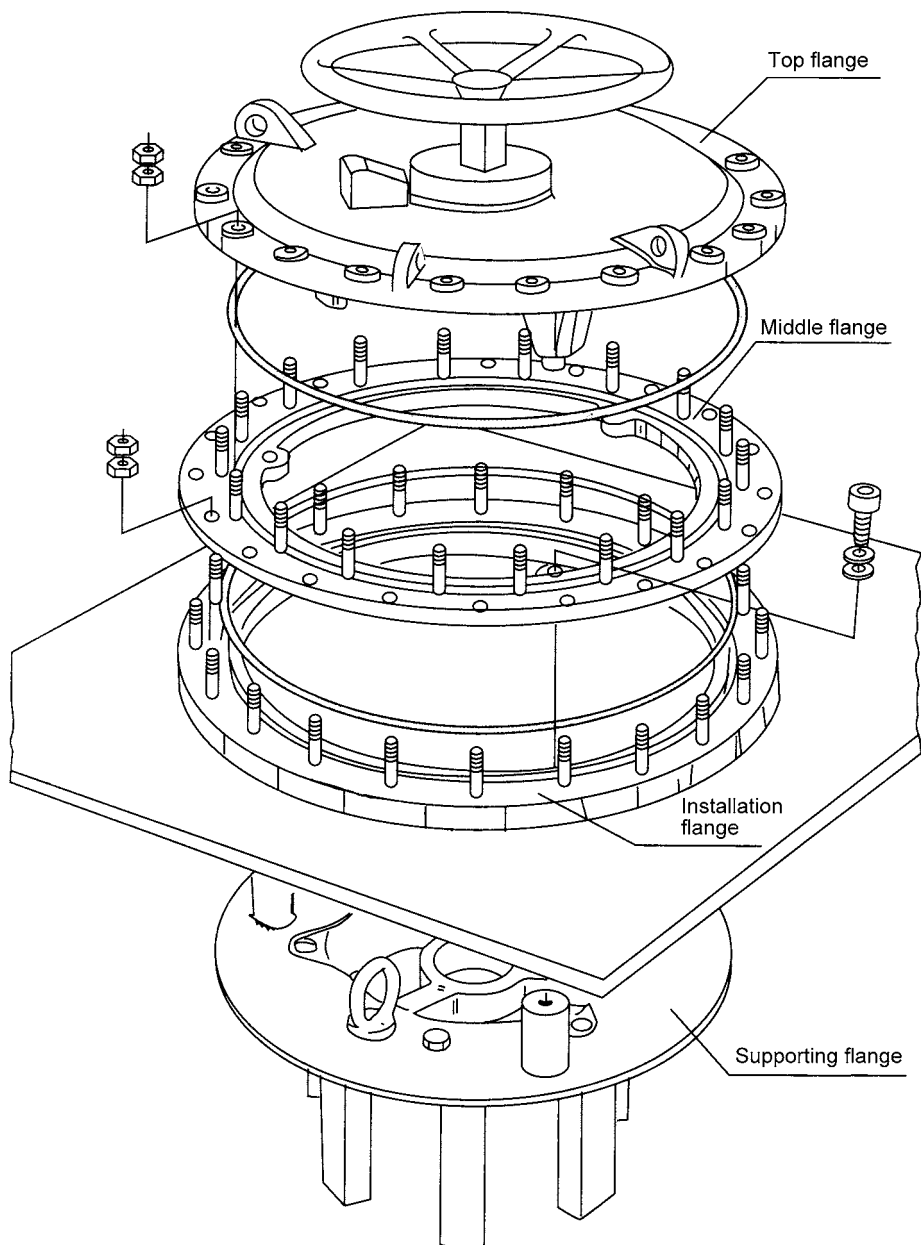
Fig.7 Installation diagram of the tap changer on the tank cover type transformer

## 8.2.2 Installation of the off-circuit tap changer onto the Bell type cover (fig. 8)

8.2.2.1 Place the tap changer vertically and dismantle the cover flange.

8.2.2.2 Loosen the three hex screws which connect between the middle flange and the supporting flange. Take out the middle flange; make sure to keep all the demounted parts.

8.2.2.3 Lift the tap changer up and place the supporting flange onto the supporting shelf. Adjust the relative position between the supporting flange and the cover flange before their mounting.



**Fig.8** Installation diagram of the tap changer mounting on the bell type transformer

If it's difficult to verify the relative position of supporting flange and cover flange, pre-mounting of the bell type cover to the transformer can be arranged in order to adjust.

#### Pre-mounting Process

Lift up the bell type cover and put it down covering the transformer; clean the sealing surface and put on gasket, fasten the middle flange onto the transformer mounting flange. Lift up the tap changer through two rings on the supporting flange and adjust the relative position so that the tap changer is mounted on the middle flange. Clean the sealing surface and put on the gasket, then finally install the top cover flange.

Caution: During mounting, the three triangle marks on the supporting flange, middle flange and cover flange should lined up towards each other (Appendix 13,14)

- (a) All of the tap leads should be carefully handled and properly fastened.
- (b) There should be no pulling force between any tap leads and the tap changer.
- (c) The leads between flange of the tap changer cover and the transformer cover are to be grounded.

#### Caution!

The transformer cannot be energized until the drive unit and the off-circuit tap changer are in the same operating position. That is, the connection between the tap changer and the motor drive unit must be checked before energizing the transformer.

8.2.3.1 The tap changer is installed according to 8.2.1 and 8.2.2

8.2.3.2 Mount the bevel gear box on the supporting plate of the transformer head; make sure the horizontal output shaft of the bevel gear box is lined up with the output shaft of the head gear box. Set the size of the drive shaft by leaving a 2 mm gap. After machining the drive shaft to its specified length, connect the bevel gearbox with the tap changer headgear box. Pay attention to the adjustment of the horizontal position. Make sure that the gearbox output shaft, drive shaft and the bevel gearbox output shaft are all lined-up.

8.2.3.3 Install the motor drive unit or the manual unit onto the side tank of the transformer, (caution: the surface must be flat otherwise the tank could become warped or even cannot close after mounting the bolts). The output shaft must be vertical to the ground and in alignment with the vertical output shaft of the bevel gearbox on the transformer head supporting plate. Set the size of the drive shaft by leaving a 2 mm gap. After machining the drive shaft to its specified

length, connect the motor drive unit or the manual unit to the bevel gearbox and fasten the bolts.

#### 8.2.4 Connection of the motor unit and the tap changer

8.2.4.1. The indicated position in the motor unit should be in accordance with the indicated position in the tap changer and then couple horizontal shaft with vertical shaft.

8.2.4.2 Manually operate the motor unit in both directions with the following method and record moving turns of the tap changer:

Operate the motor unit in one direction until the red arrow in the center of the tap changer's cover stops at a number. Then keep on operating and start recording the operating turns until the middle of the green zone is shown in the center of the displaying window. "m" is the turns needed. Likewise "n" is the recorded turns needed in the opposite direction. (See fig. 9)

8.2.4.3 Adjustment: if m-n or n-m 3.75 turns, no adjustment is required. Otherwise, the following method may be applied: disconnect the vertical shaft from the motor drive unit and operate the motor unit by 3.75 turns towards the bigger number direction then reconnect the vertical shaft to meet the "m-n or n-m 3.75" requirement.

8.2.4.4 Measure the transformer's transforming ratio at each tap position.

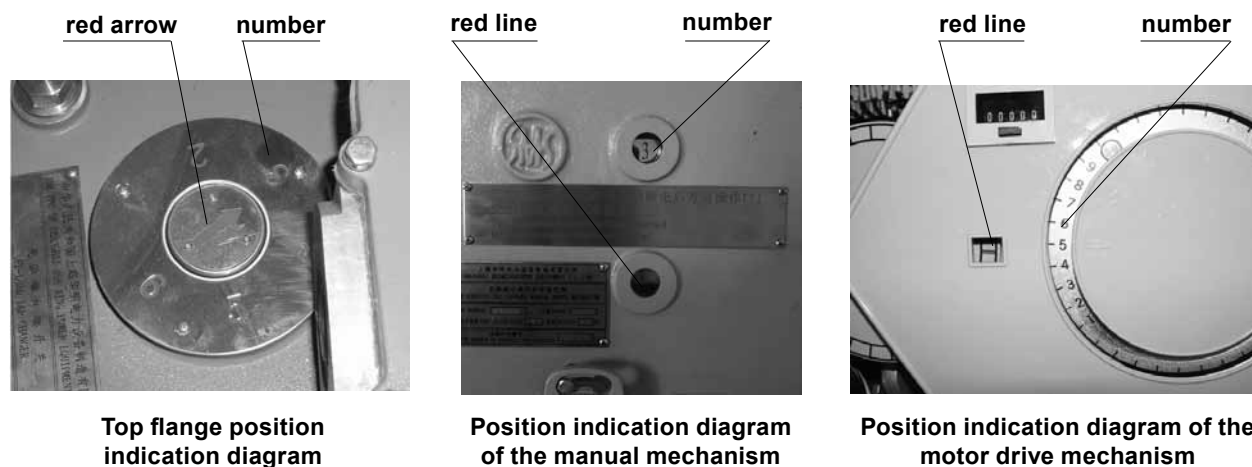


Fig.9 Position indication diagram

## 9. Drying Procedure

The tap changer is to be dried with the transformer; the drying temperature and time are the same as that of the transformer. The electric insulation level of the tap changer can only be guaranteed after the drying procedure.

Note:

- a. Do not operate the tap changer without oil after drying. If necessary, smear all contacts with some transformer oil before operation
- b. The tap changer should be immersed into the transformer oil immediately after the drying process.
- c. Loosen the bleeder on the head flange of the tap changer to release gas during oil refilling of the transformer tank. The transformer oil should strictly adhere to the standard, especially regarding the insulation level and the water percentage level.

## 10. Operation

The off-circuit tap changer can only be operated when the transformer is de-energized.

### 10.1 Type hand wheel on the head tap changer operation

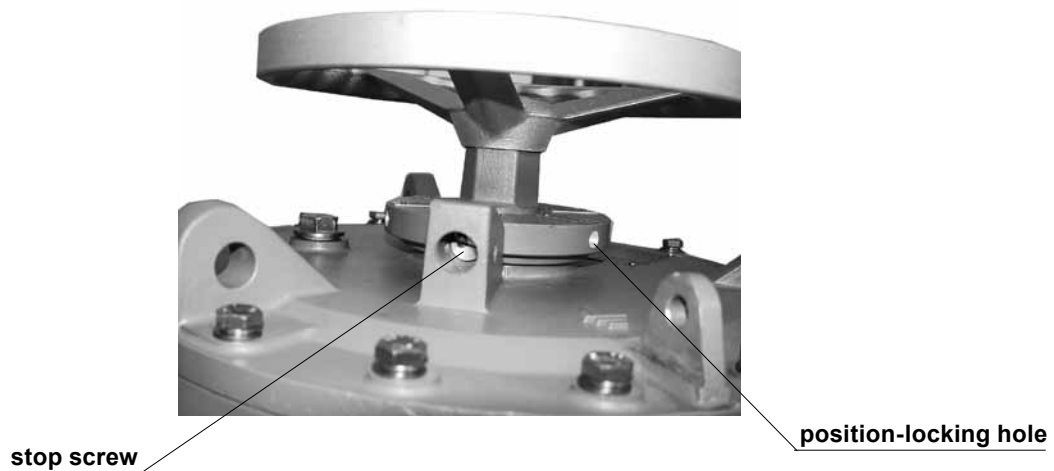
Make sure the transformer is disconnected. Loosen the stop-screw on the tap changer head so that the hand wheel can be turned. Operate the tap changer to the desired operating position by turning the hand wheel. After each tap changing, the red arrow on the cover must be aligned. Check the position of the tap changer through the inspection window on the tap changer head. Align the stop screw with the locking hole and fasten the stop screw to finish the operation. (See Fig. 10)

### 10.2 Type Ground Manual tap changer operation

Open the hand crank cover, take out the fixture part and insert into the hand crank then turn 33 cycles. Observe through the window whether the position indication is right. Keep turning until the red arrow lined up with the red line of the indication plate. Take out the hand crank and insert the fixture part so that one tap change is completed, the transformer can resume operating. (See Fig. 5)

### 10.3 Operating the tap changer by means of the motor drive unit

The transformer must be de-energized before changing the tap position of the motor drive type off-circuit tap changer.



Caution: The stop screws must be placed into the position-locking holes over the perimeter of the locking wheel.

**Fig.10 Stop screw**

The motor drive unit is designed with cable leads inside. The cable leads are connected to the auxiliary non-source leads of the transformer circuit breaker so that the motor drive unit cannot be operated when the circuit breaker is at its closing position. After making sure the transformer is de-energized, by pressing the raise button or lower button on the motor drive cabinet, the off-circuit tap changer can go from one tap position to the next to finish one tap change.

## **11. Maintenance**

11.1 Operate the tap changer through its complete operating cycle at least once a year to refresh contact surface.

11.2 If the tap changer has not been operated for a long time, several pre-run operating cycles are recommended before setting it to the desired position.

11.3 Careful alignment of connection position is needed before operation

11.4 Check the reliability of the grounding connection

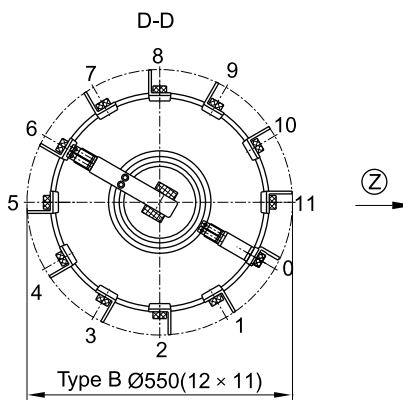
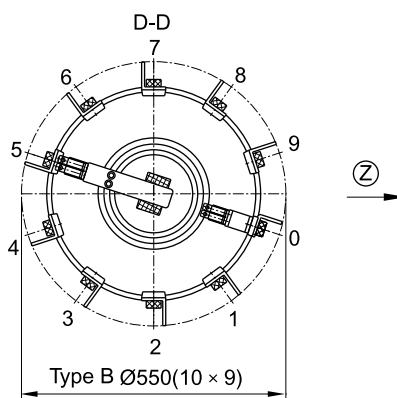
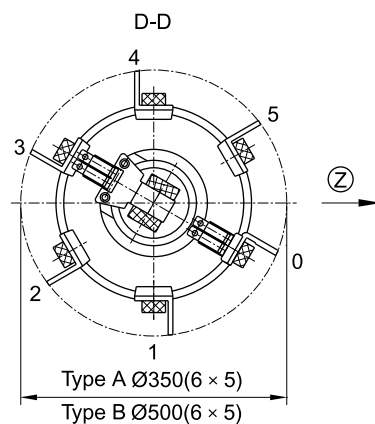
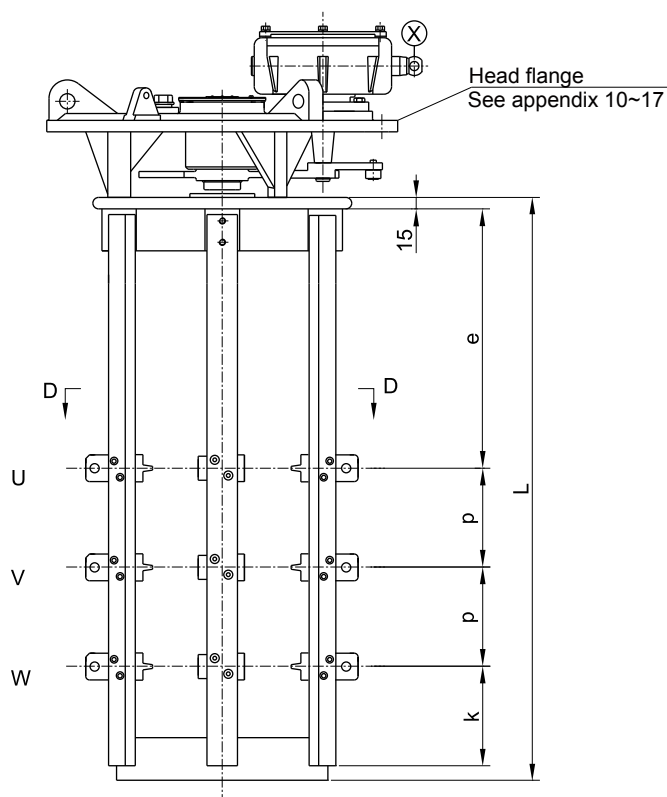
11.5 Check the interlock function between the tap changer motor drive unit and the transformer circuit breaker at least once a year to ensure its reliability.

## 12. Appendix

Appendix 1	600A-1200A Linear regulation,overall dimension	22
Appendix 2	600A-1200A Single-bridging regulation,overall dimension	23
Appendix 3	600A-1000A Y-D transform regulation,overall dimensionr	24
Appendix 4	600A-1000A Double-bridging regulation,overall dimensions	25
Appendix 5	600A-1000A Serial-parallel transform regulation,overall dimension	26
Appendix 6	600A-1000A Reversing regulation,overall dimensions	27
Appendix 7	1000A-2000A Reversing regulation,overall dimensions	28
Appendix 8	Installation flange for standard tank type cover,overall dimensions	29
Appendix 9	Installation flange for bell type tank cover,overall dimensions	30
Appendix 10	Ground motor drive (manual),Type A for standard tank, Head flange dimensions	31
Appendix 11	Ground motor drive(manual),Type B for standard tank, Head flange dimensions	32
Appendix 12	Top cover hand wheel,Type A for standard tank, Head flange dimensions	33
Appendix 13	Top cover hand wheel,Type B for standard tank, Head flange dimensions	34
Appendix 14	Ground motor drive(manual),Type A for bell type, Head flange installation dimension	35
Appendix 15	Ground motor drive(manual),Type B for bell type, Head flange installation dimension	36
Appendix 16	Top cover hand wheel,Type A for bell type, Head flange installation dimension	37
Appendix 17	Top cover hand wheel,Type B for bell type, Head flange installation dimension	38
Appendix 18	Type A supporting flange, installation drawingr	39
Appendix 19	Type B for bell type, supporting flange installation drawing	40
Appendix 20	Tap changer terminal overall dimension	41
Appendix 21	Reversing(6×5),top cover hand wheel, relative position of contacts	42
Appendix 22	Reversing(10×9),top cover hand wheel, relative position of contacts	43
Appendix 23	Reversing(12×11),top cover hand wheel, relative position of contacts	44
Appendix 24	Ground motor drive, Tap changer installation illustrating drawing	45
Appendix 25	Ground manual operation,tap changer installation illustrating drawing	46
Appendix 26	Bevel gear,Overall dimensions	47
Appendix 27	Side-manual operation,Overall dimensions	48
Appendix 28	CMA9 Motor drive unit,overall dimensions	49
Appendix 29	HMC-3W Position indicator	50



## Appendix 1 600A-1200A Linear regulation, overall dimension



⊗ Driving shaft(with bevel gear)

⊙ Direction of driving shaft(with bevel gear)

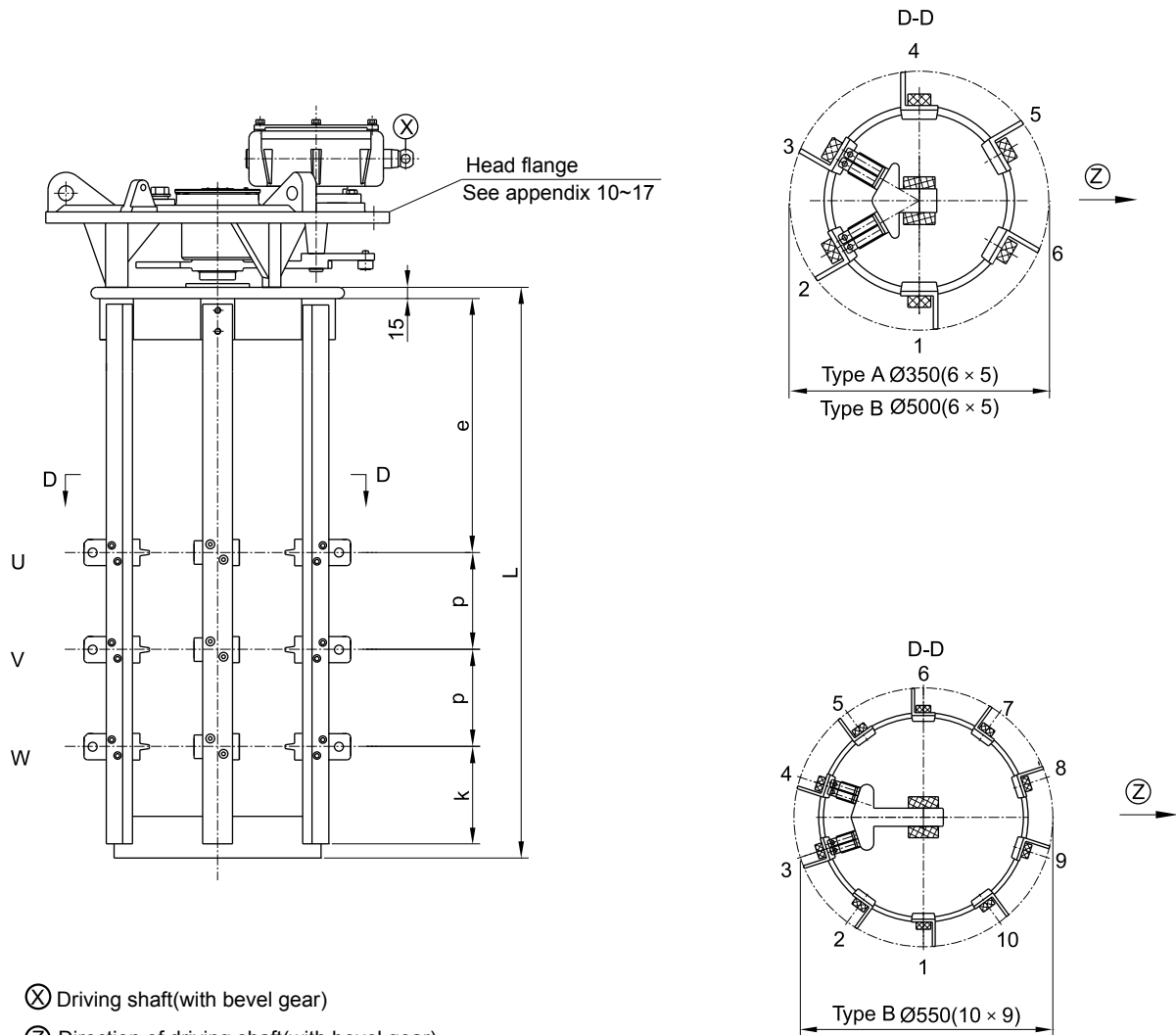
3-phase	Y				D			
Highest voltage for equipment	e	p	k	L	e	p	k	L
12kV	200	130	130	624	200	130	130	624
72.5kV	340	130	140	774	340	280	140	1074
126kV	470	170	150	994	470	410	150	1474

Note: ① : Type A only for  $I \leq 800A$

② : Contact size see appendix 20

Unit: mm

## Appendix 2 600A-1200A Single-bridging regulation, overall dimension

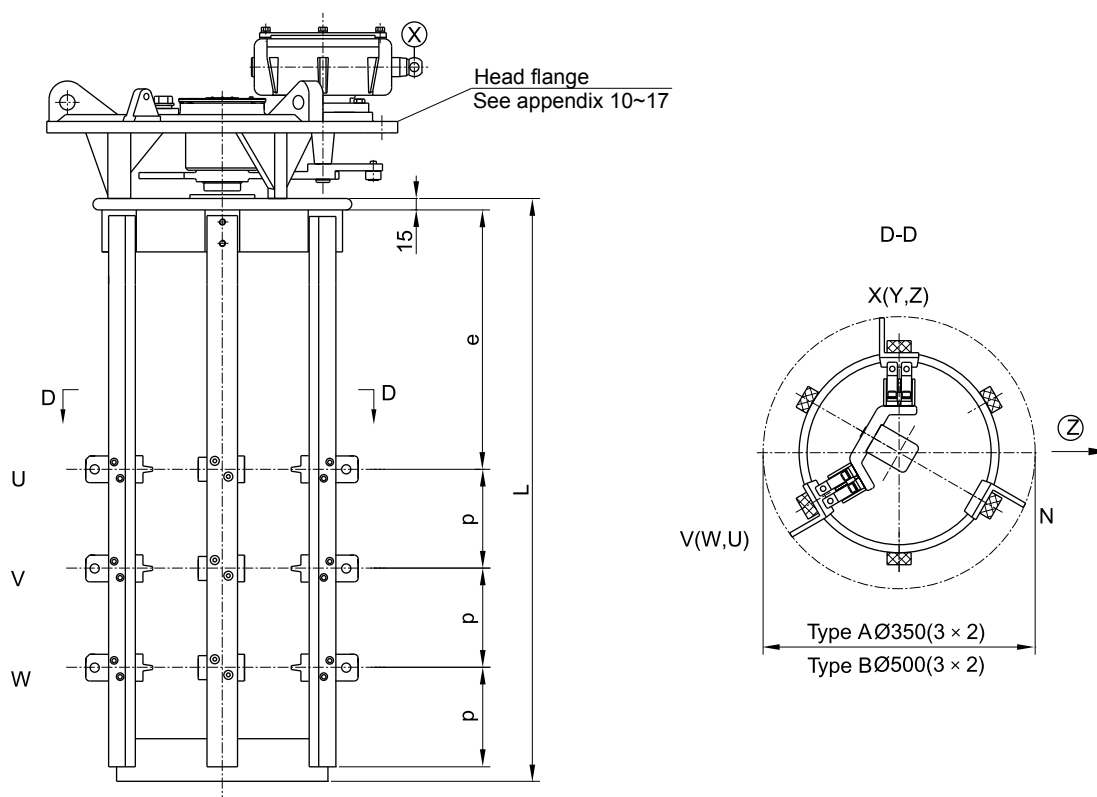


3-phase	D			
Highest voltage for equipment	e	p	k	L
12kV	200	130	130	624
72.5kV	340	280	140	1074
126kV	470	410	150	1474

Note: ① : Type A only for  $I \leq 600A$   
 ② : Contact size see appendix 20

Unit: mm

### Appendix 3 600A-1000A Y-D transform regulation, overall dimension



⊗ Driving shaft(with bevel gear)

⊙ Direction of driving shaft(with bevel gear)

Highest voltage for equipment	e	p	L
12kV	200	130	624
72.5kV	340	280	1214

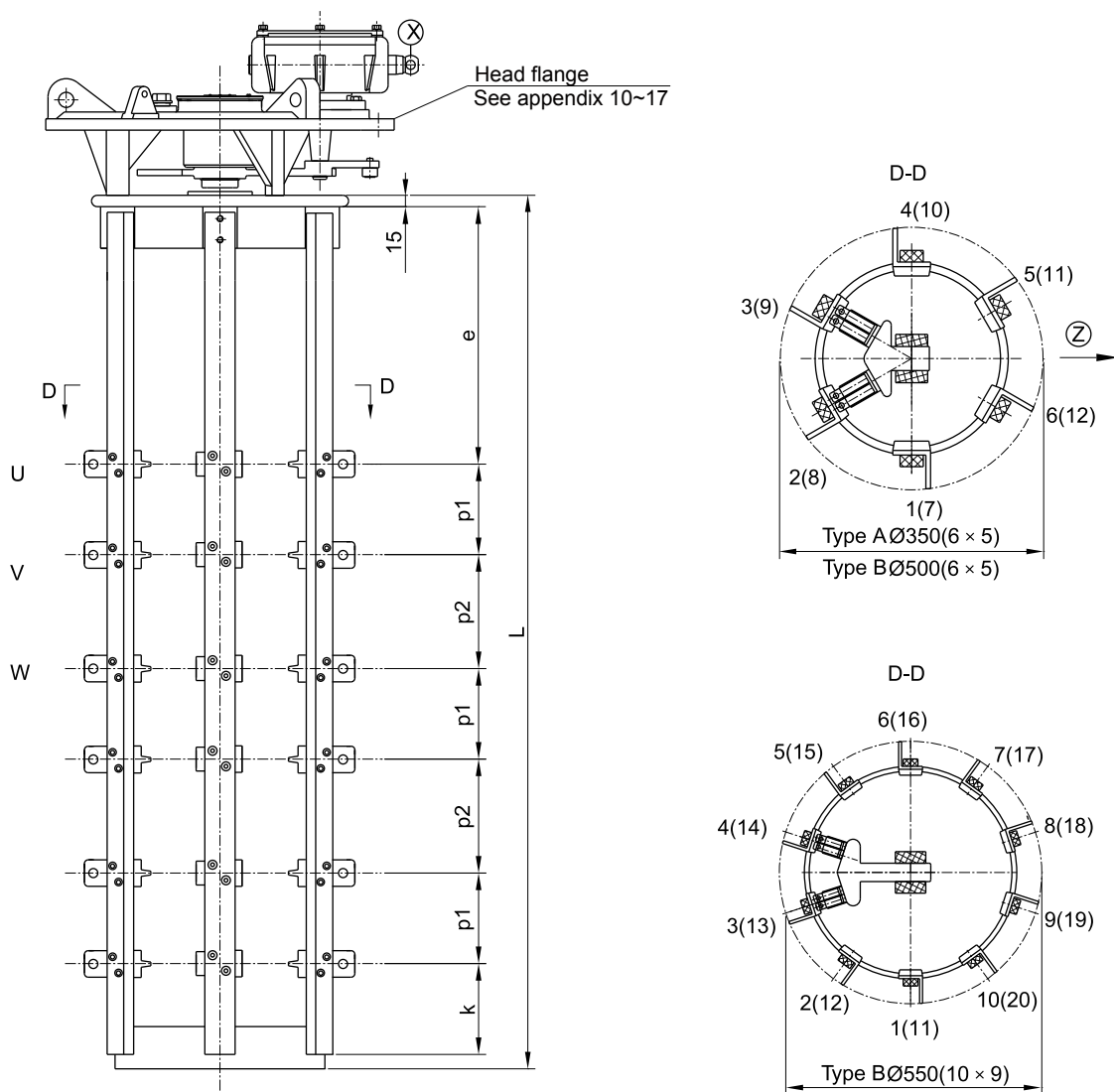
Outer dia, Ø750 upon special request

Note: ⊕ : Type A only for  $I \leq 600A$

⊙ : Contact size see appendix 20,

Unit: mm

## Appendix 4 600A-1000A Double-bridging regulation, overall dimensions



⊗ Driving shaft(with bevel gear)

② Direction of driving shaft(with bevel gear)

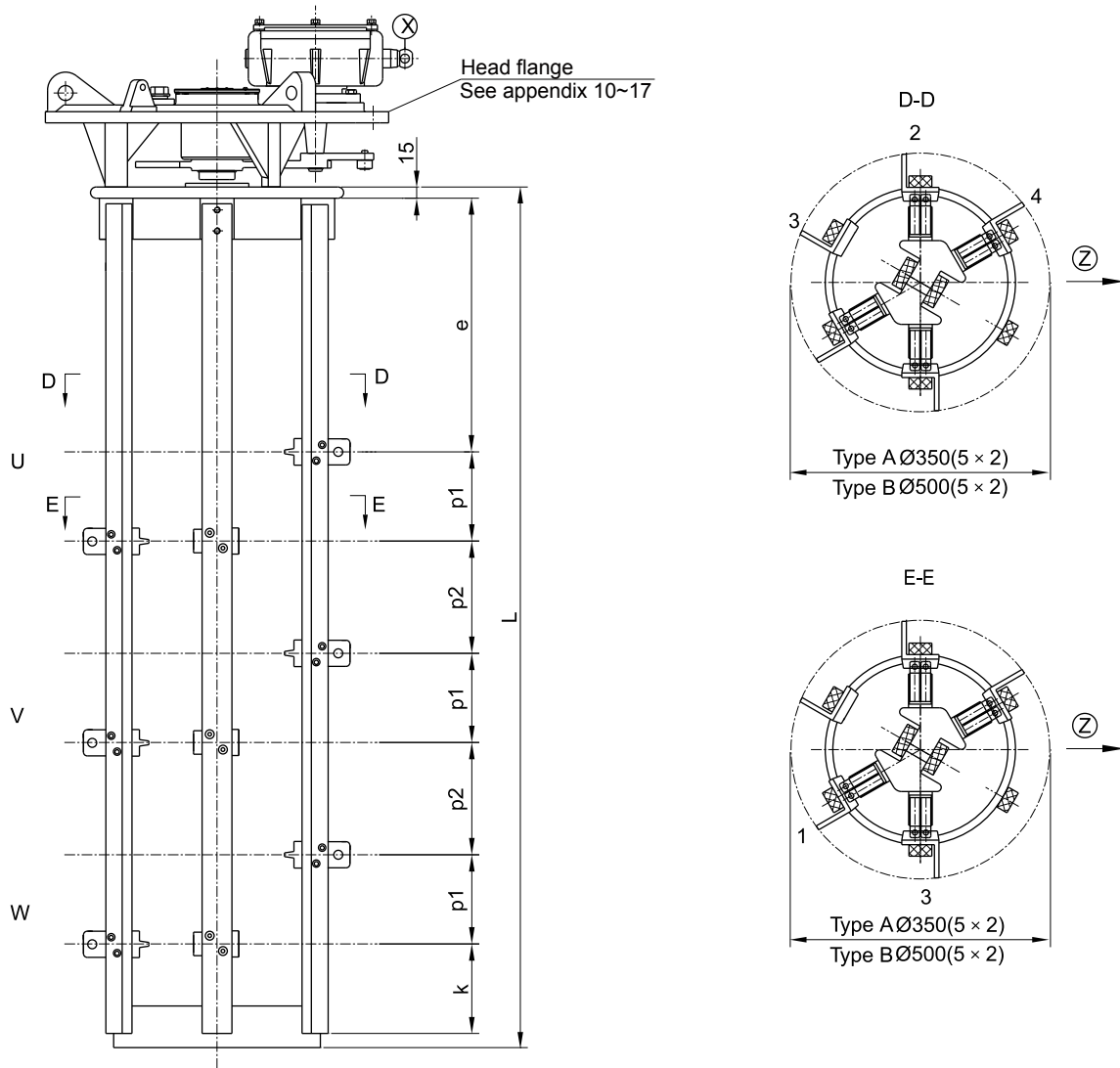
Highest voltage for equipment	e	p1	p2	k	L
12kV	200	120	150	120	1014
72.5kV	340	160	280	140	1554
126kV	470	170	410	150	1984

Note: ① : Type A only for I ≤ 600A

② : Contact size see appendix 20,

Unit: mm

## Appendix 5 600A-1000A Serial-parallel transform regulation, overall dimension



⊗ Driving shaft(with bevel gear)

⌚ Direction of driving shaft(with bevel gear)

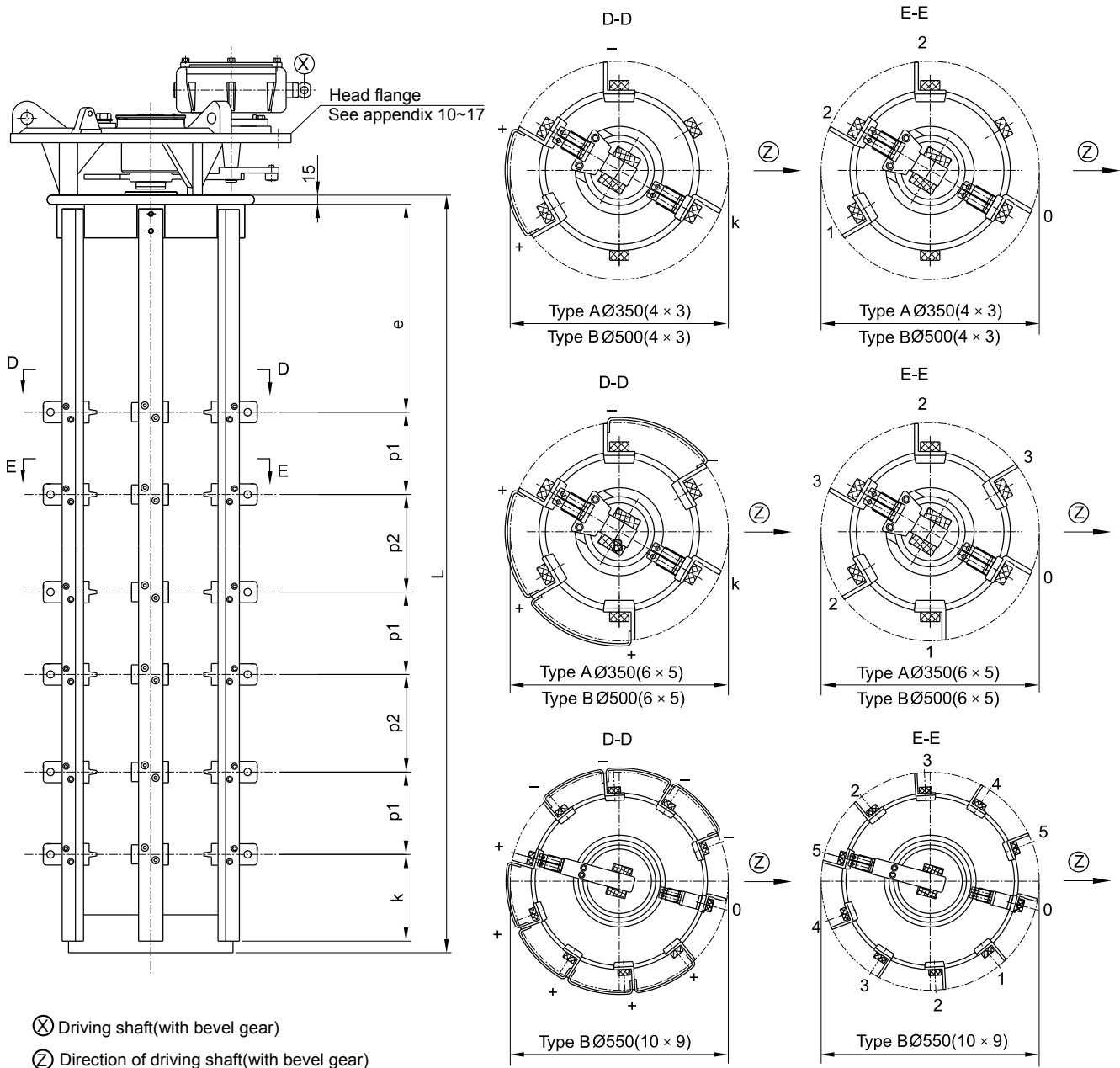
Highest voltage for equipment	e	p1	p2	k	L
12kV	200	120	150	120	1014
72.5kV	340	160	280	140	1554

Note: ① : Type A only for  $I \leq 600A$ . Highest voltage for equipment is 12kV

② : Contact size see appendix 20

Unit: mm

## Appendix 6 600A-1000A Reversing regulation, overall dimensions



3-phase	Y					D				
Highest voltage for equipment	e	p1	p2	k	L	e	p1	p2	k	L
12kV	170	120	120	120	904	200	120	150	120	1014
72.5kV	340	135	160	145	1244	340	160	280	140	1554
126kV	470	170	170	150	1504	470	170	410	150	1984

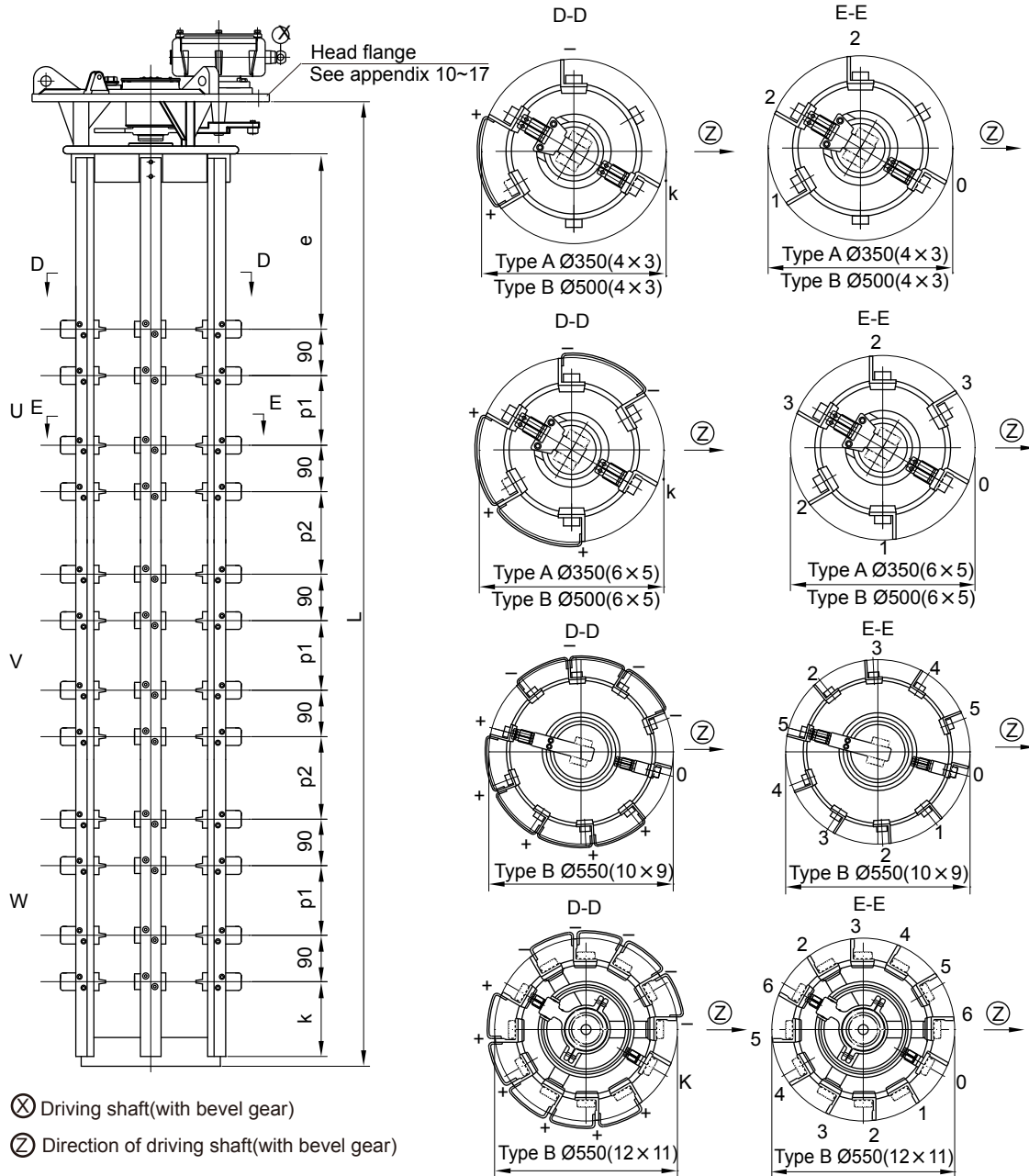
Note: ①: Type A only for  $I \leq 800A$

②: Contact size see appendix 20

③: Standard product, only "+" connects with "+" and "-" with "-", like showing in "D-D", other connection by user themselves.

Unit: mm

## Appendix 7 1000A-2000A Reversing regulation, overall dimensions



3-phase	Y				
Highest voltage for equipment	e	p1	p2	k	L
12kV	170	135	135	100	1586
72.5kV	340	135	160	145	1870

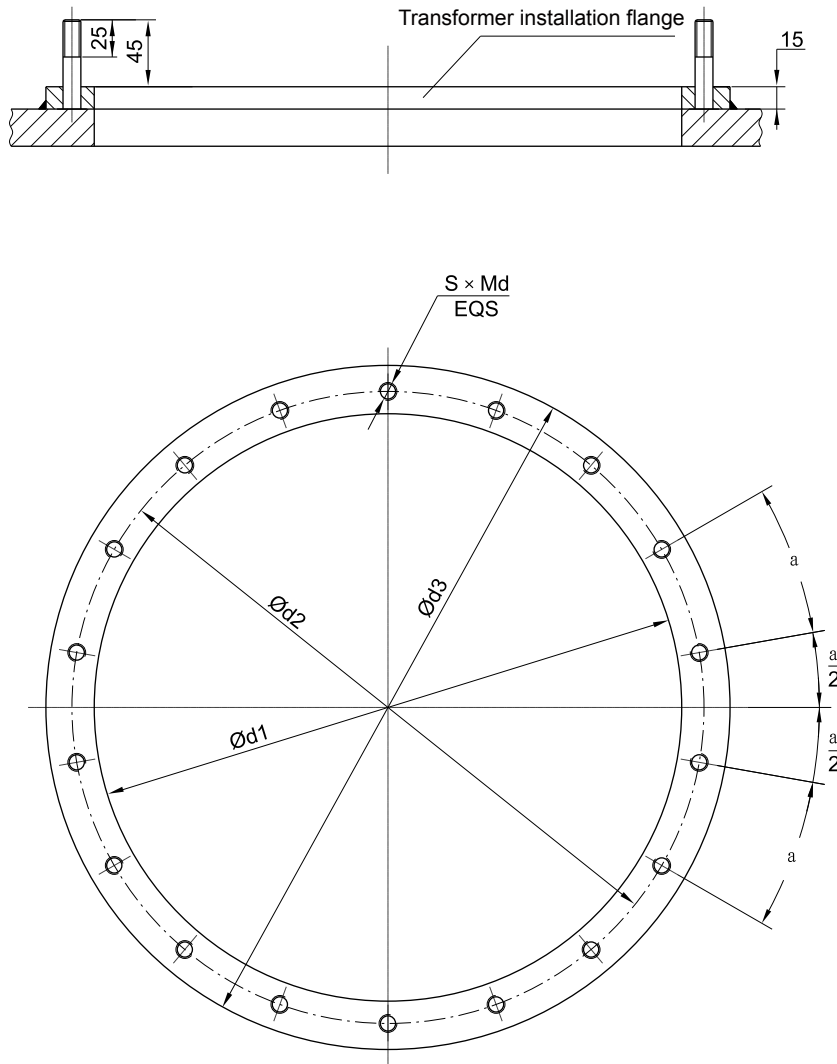
Note: ①: Type A only for I :1000A-1200A

②: Contact size see appendix 20

③: Standard product, only "+" connects with "+" and "-" with "-", like showing in "D-D", other connection by user themselves.

Unit: mm

## Appendix 8 Installation flange for standard tank type cover, overall dimensions

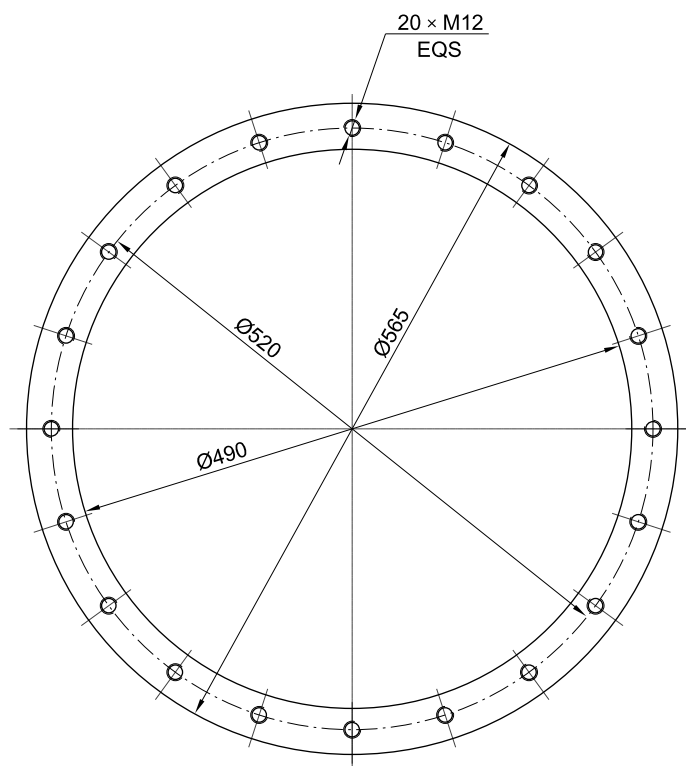
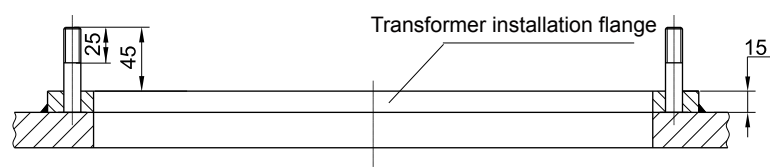


	d1(Dia)	d2(Dia)	d3(Dia)	Screw distribution S-Md	Distribution angle a
Type A	Ø395	Ø425	Ø460	18-M12	20°
Type B(Ø500)	Ø520	Ø550	Ø590	20-M12	18°
Type B(Ø550)	Ø570	Ø600	Ø640	20-M12	18°

Unit: mm

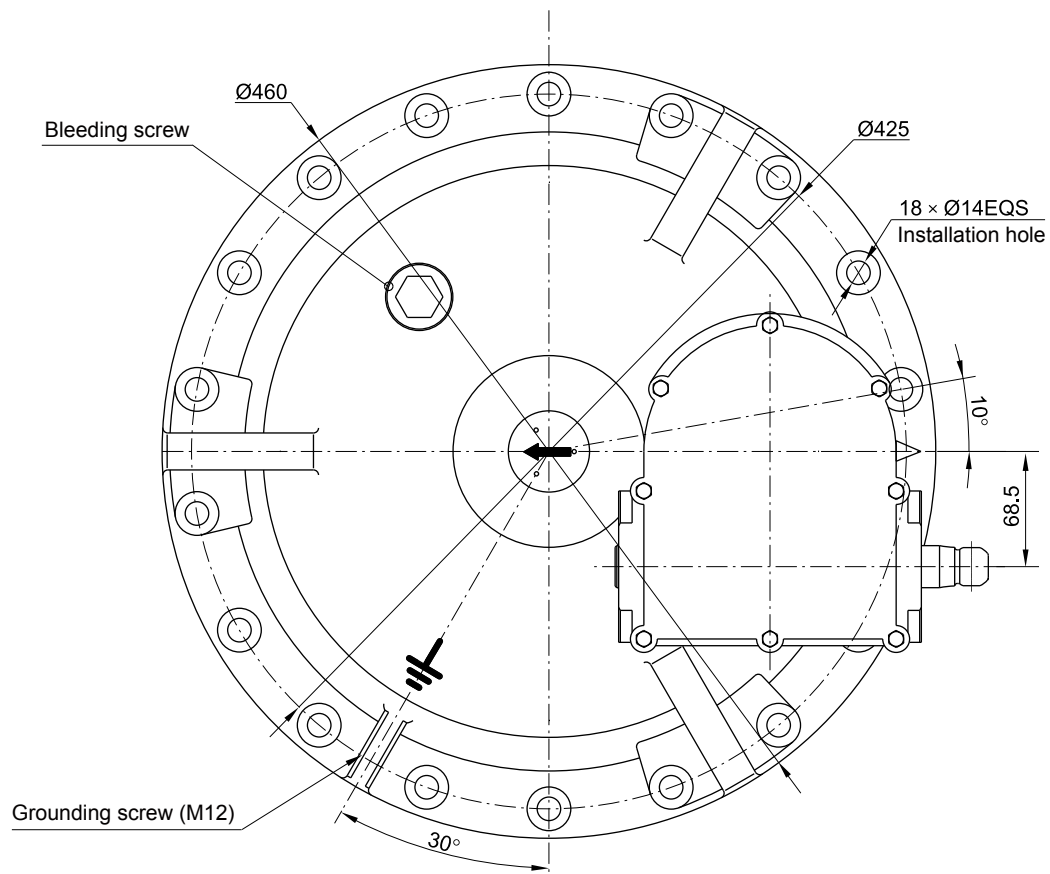
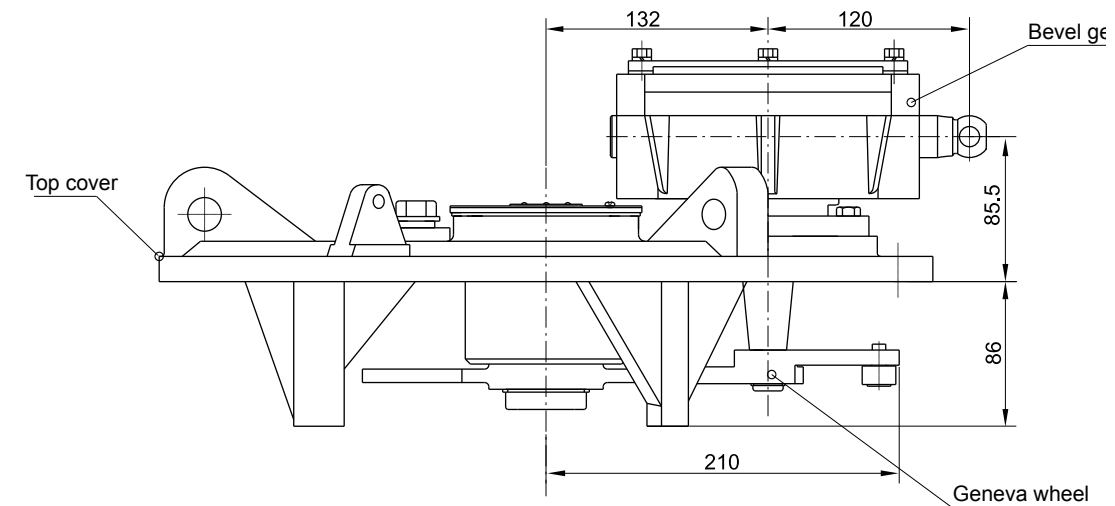


## Appendix 9 Installation flange for bell type tank cover, overall dimensions



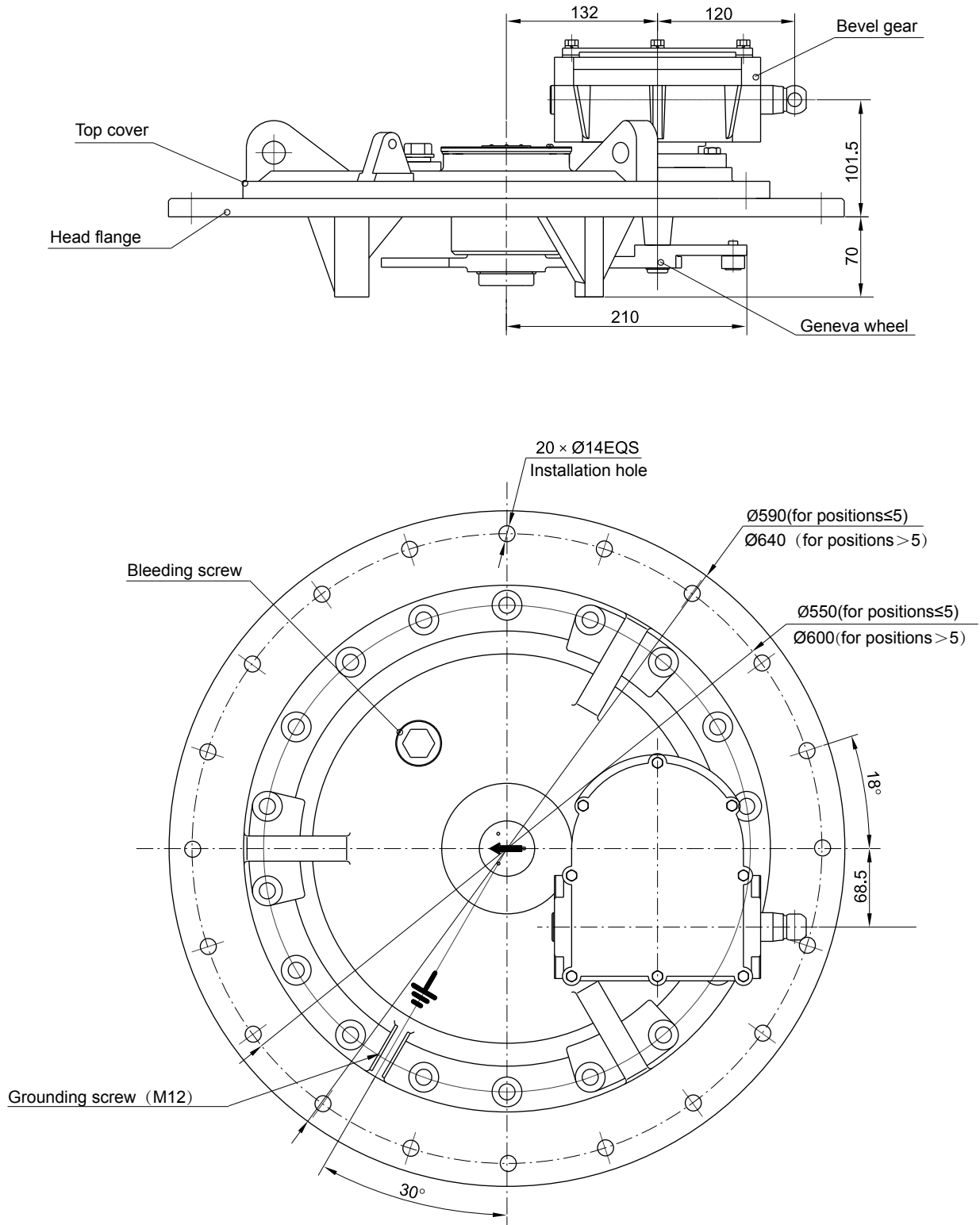
Unit: mm

**Appendix 10 Ground motor drive (manual),  
Type A for standard tank, Head flange dimensions**



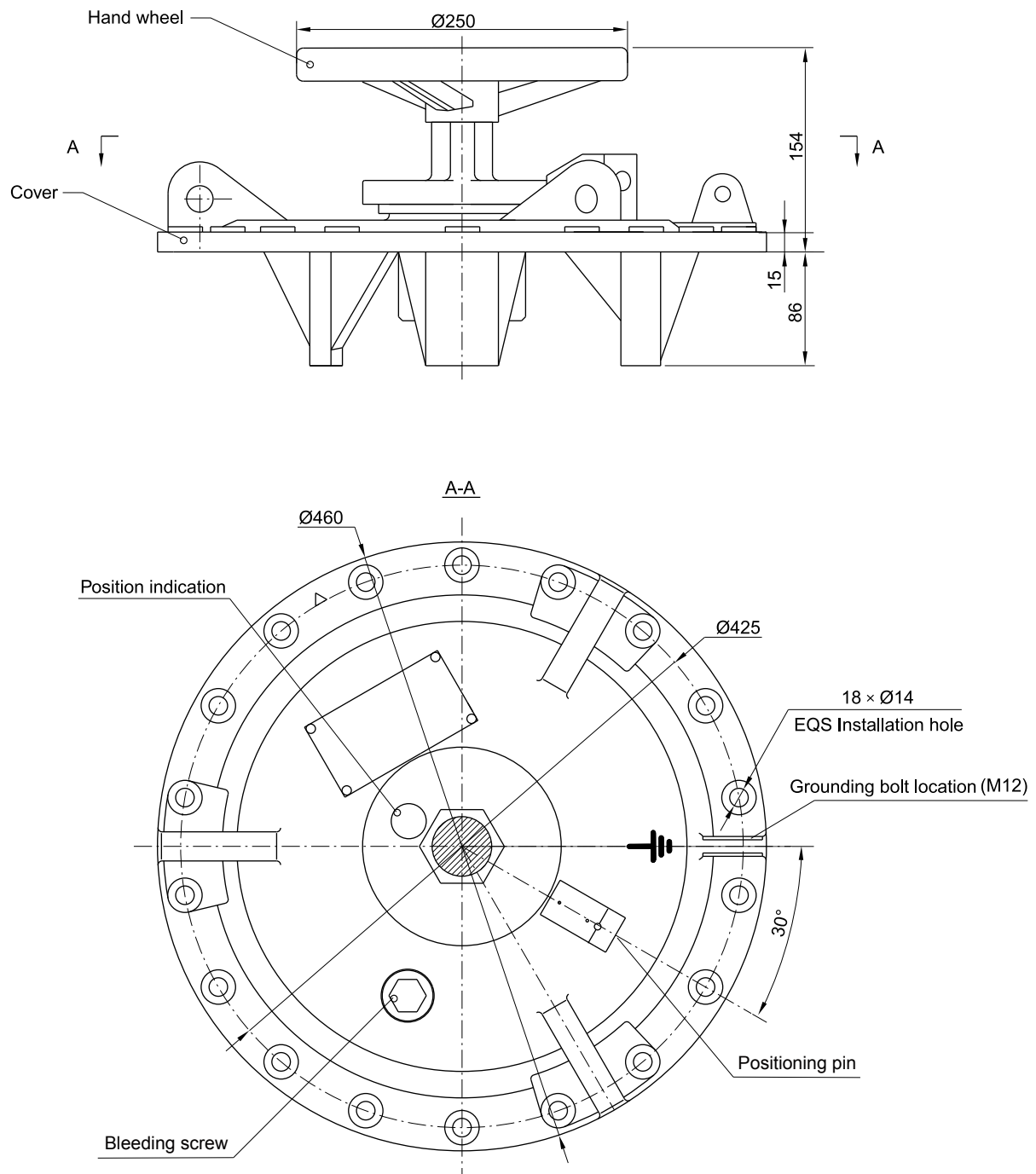
Unit: mm

## Appendix 11 Ground motor drive(manual), Type B for standard tank, Head flange dimensions



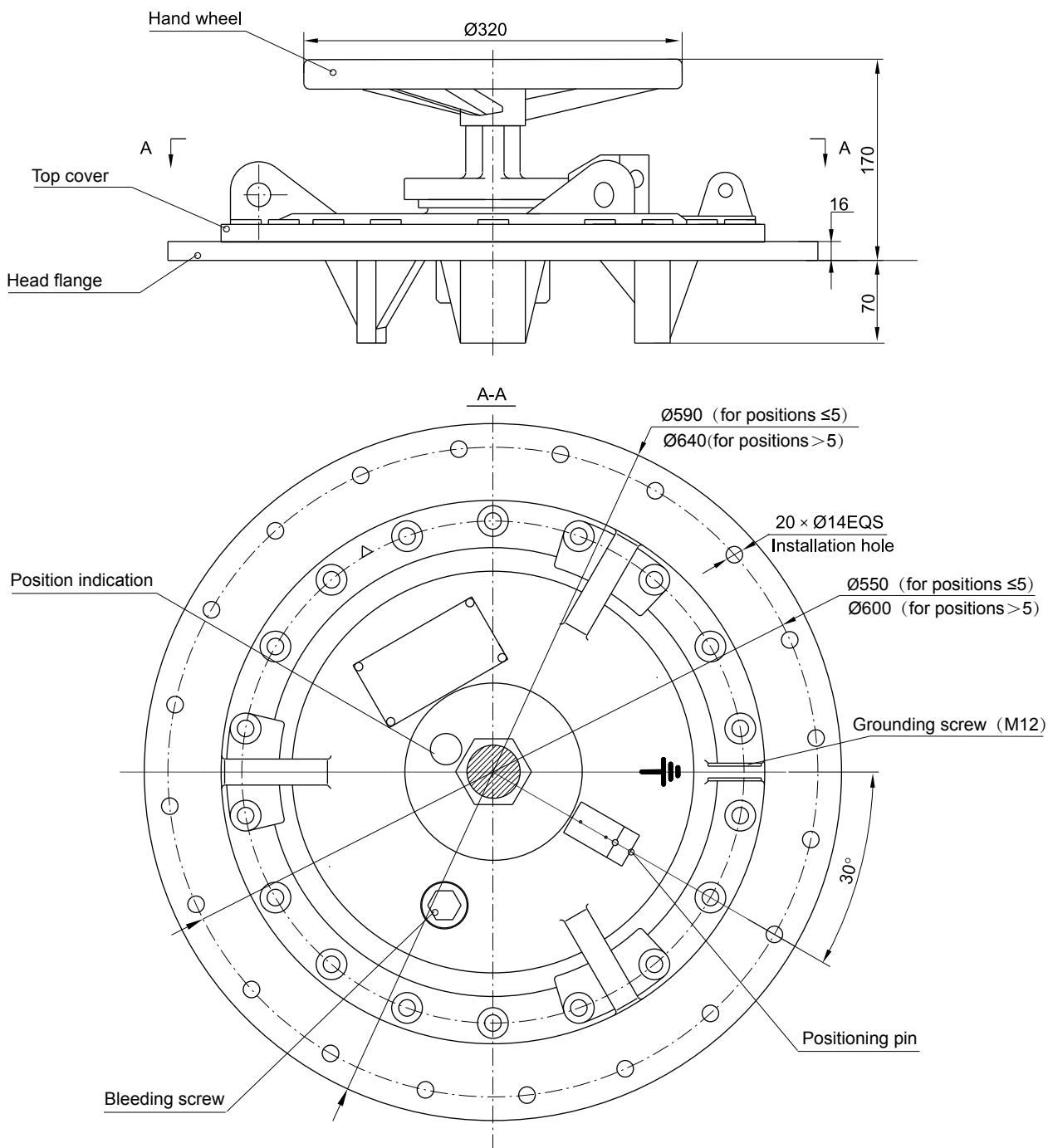
Unit: mm

## Appendix 12 Top cover hand wheel, Type A for standard tank, Head flange dimensions



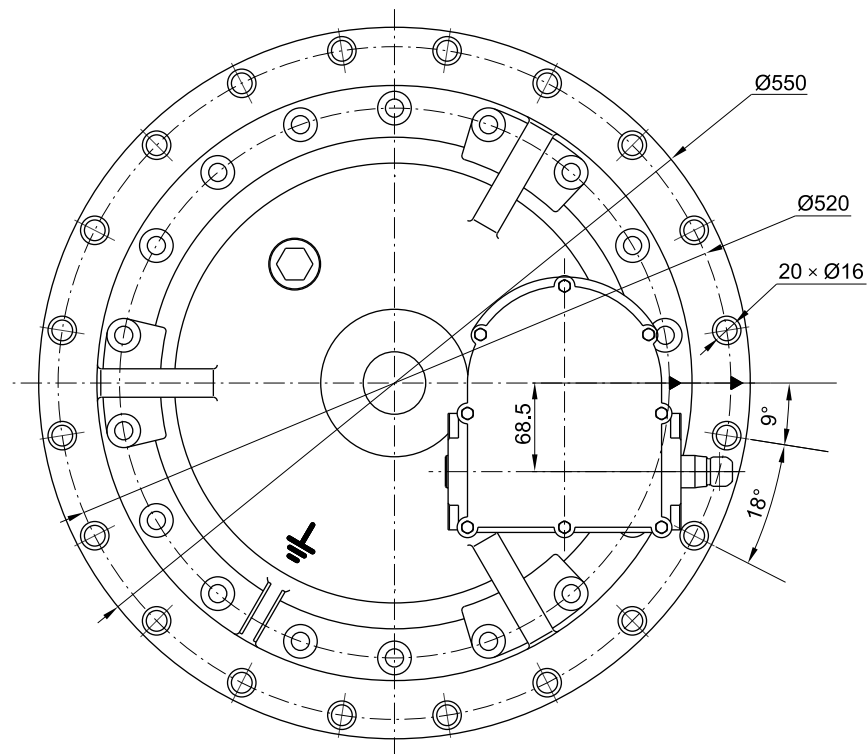
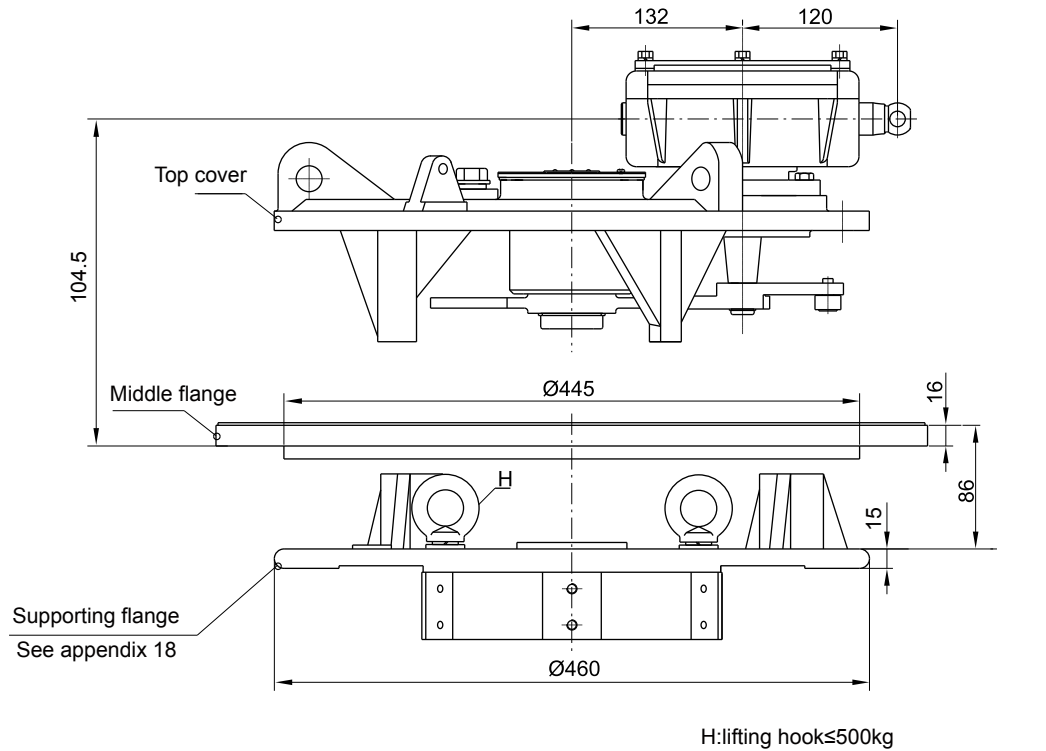
Unit: mm

## Appendix 13 Top cover hand wheel, Type B for standard tank, Head flange dimensions



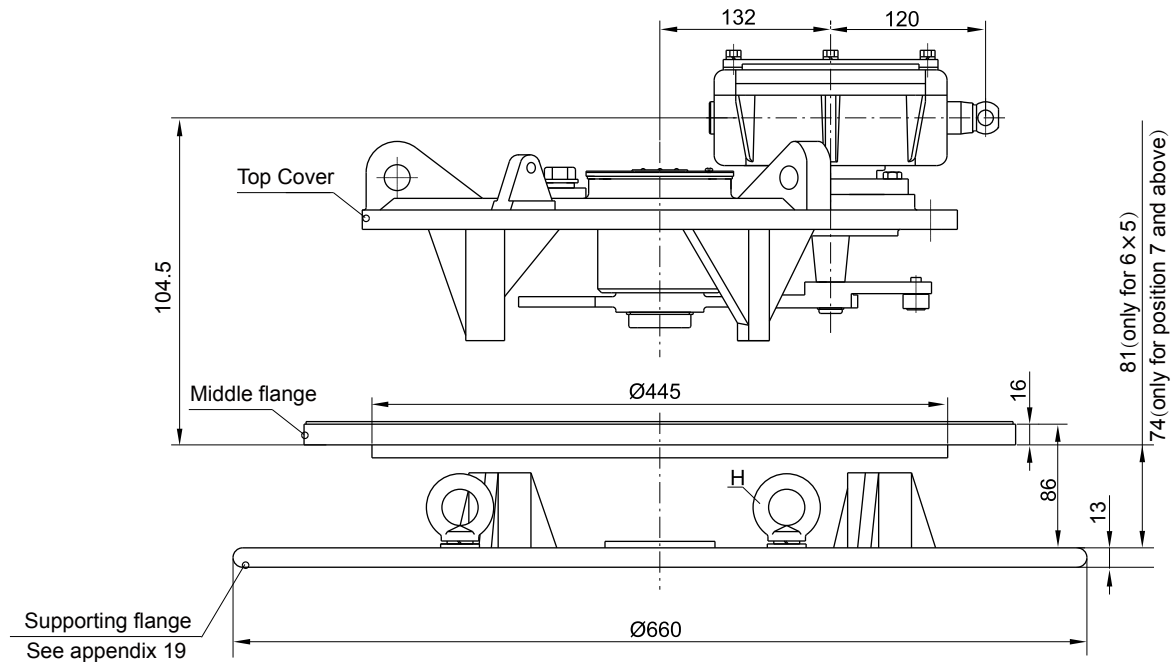
Unit: mm

## Appendix 14 Ground motor drive(manual),Type A for bell type, Head flange installation dimension

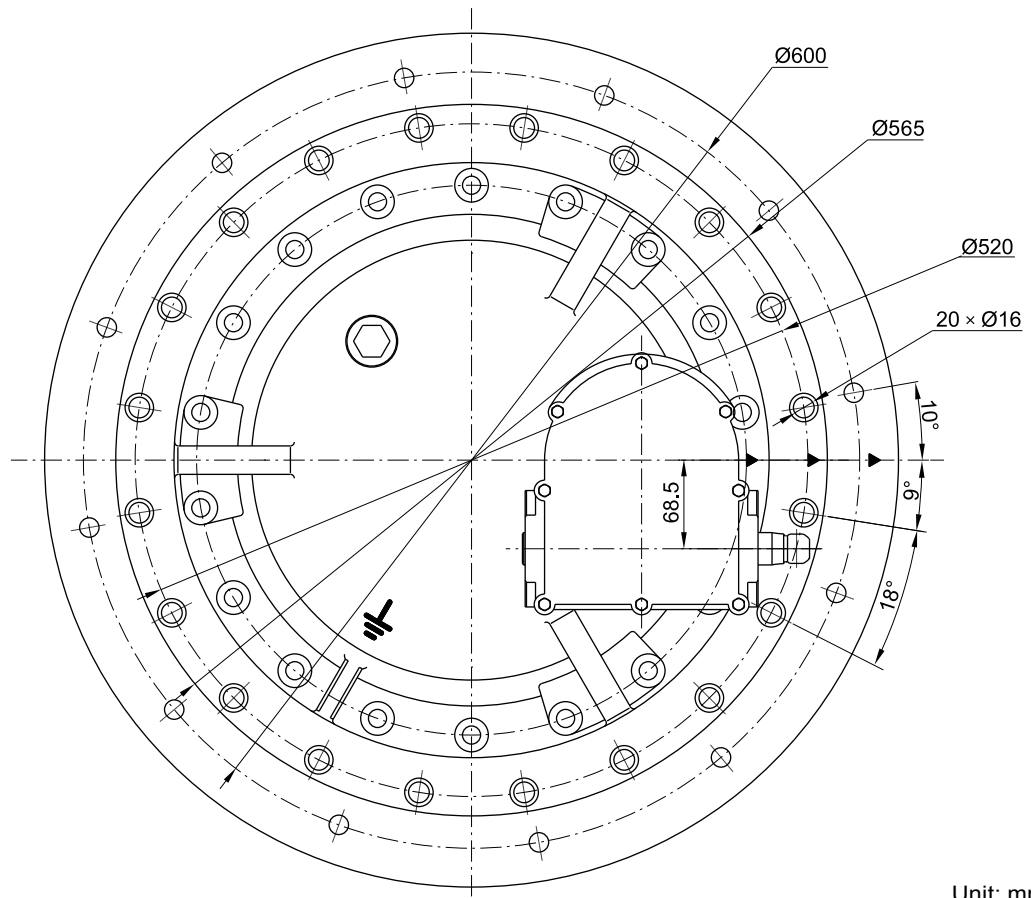


Unit: mm

## Appendix 15 Ground motor drive(manual),Type B for bell type, Head flange installation dimension

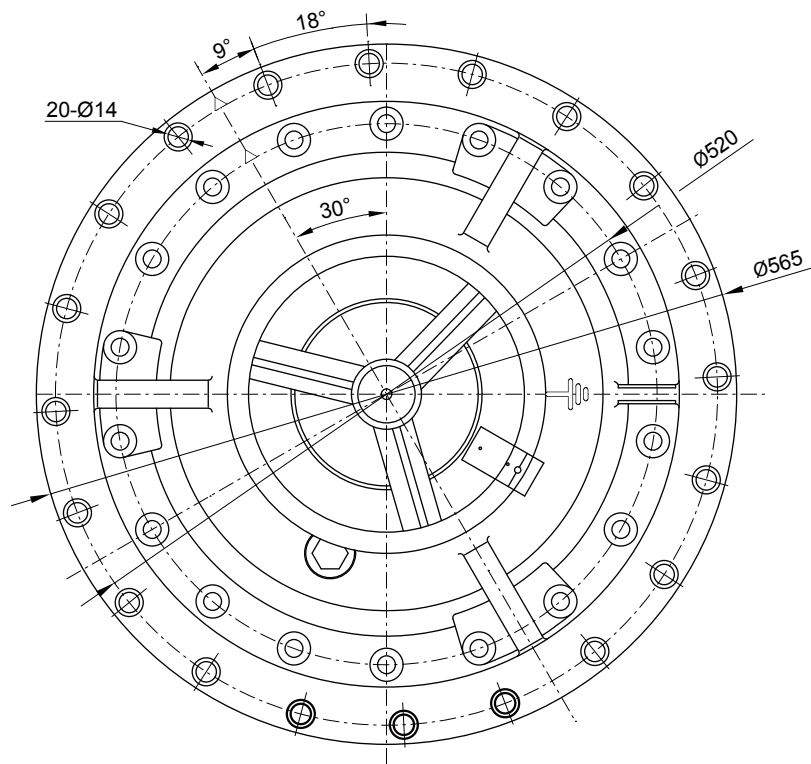
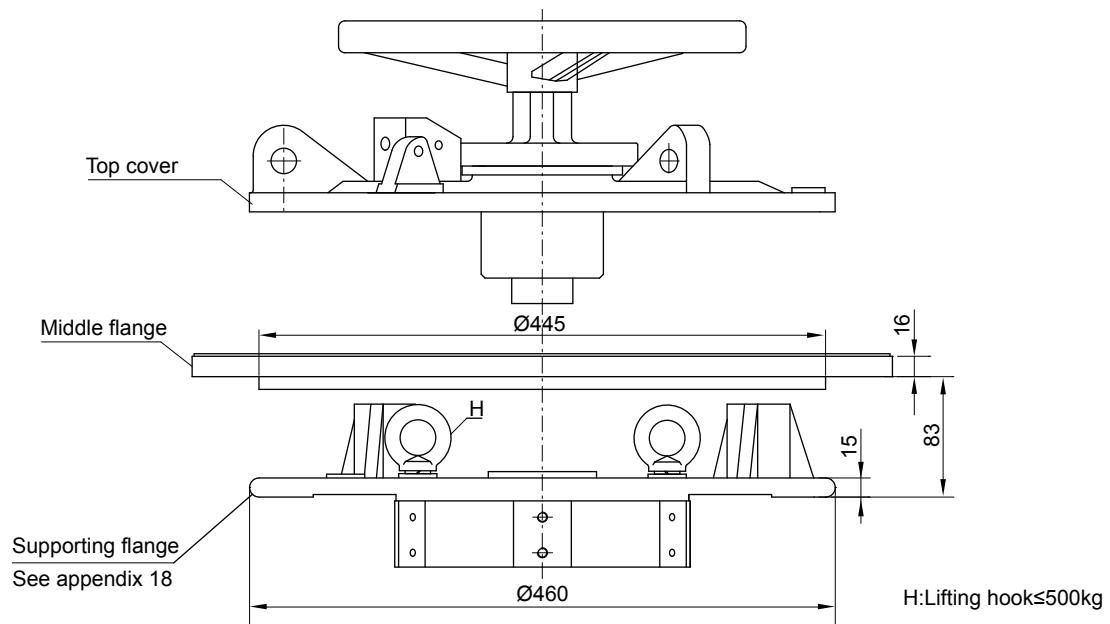


H: Lifting hook  $\leq 500\text{kg}$



Unit: mm

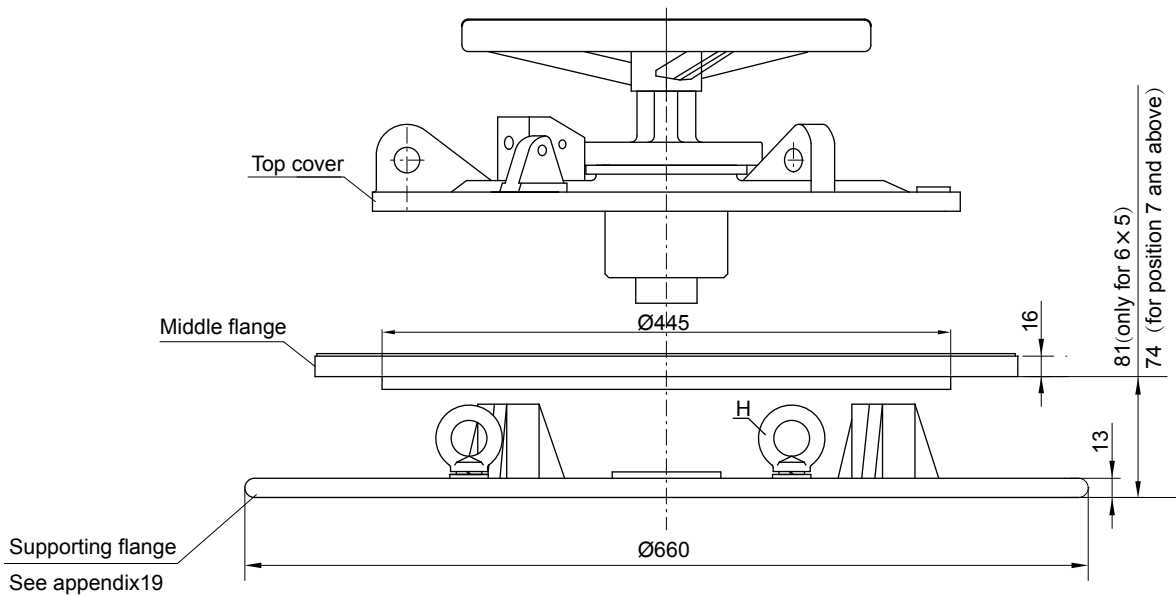
## Appendix 16 Top cover hand wheel, Type A for bell type, Head flange installation dimension



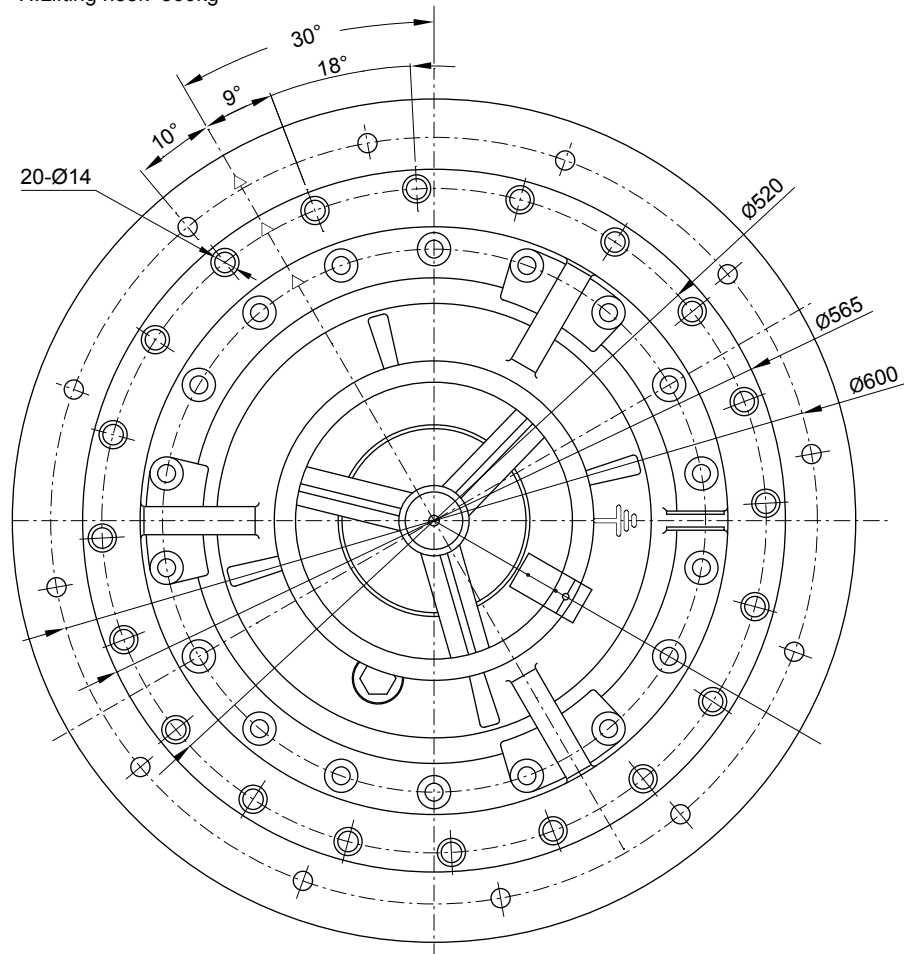
Unit: mm



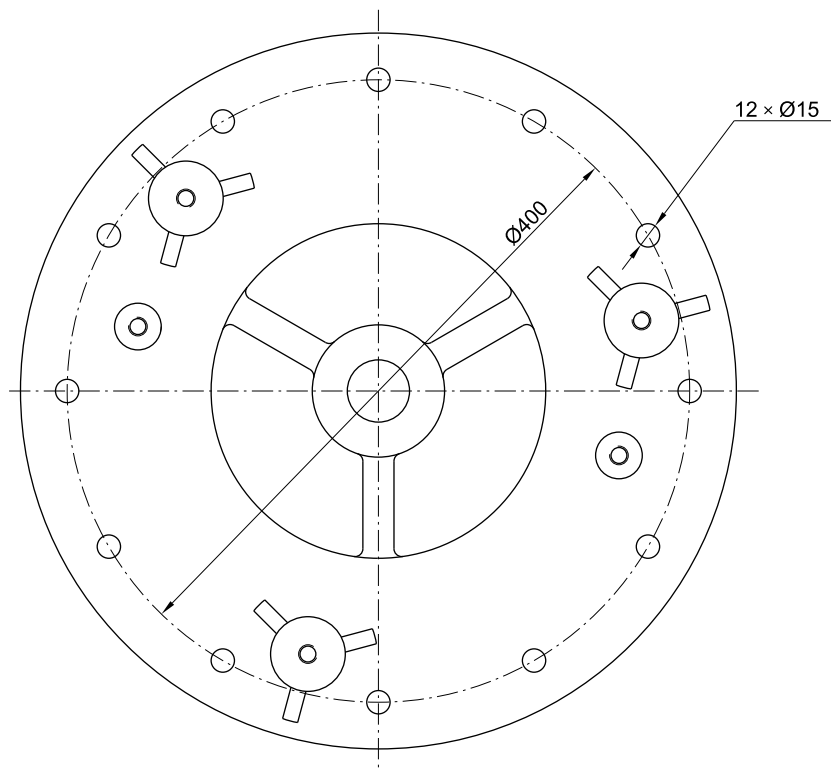
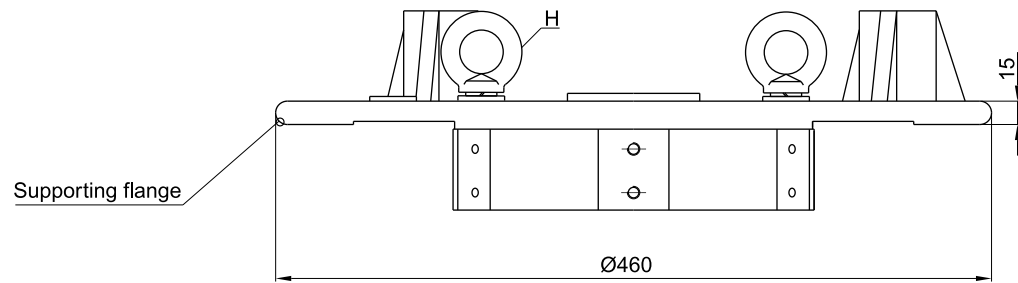
## Appendix 17 Top cover hand wheel, Type B for bell type, Head flange installation dimension



H: Lifting hooks ≤ 500kg

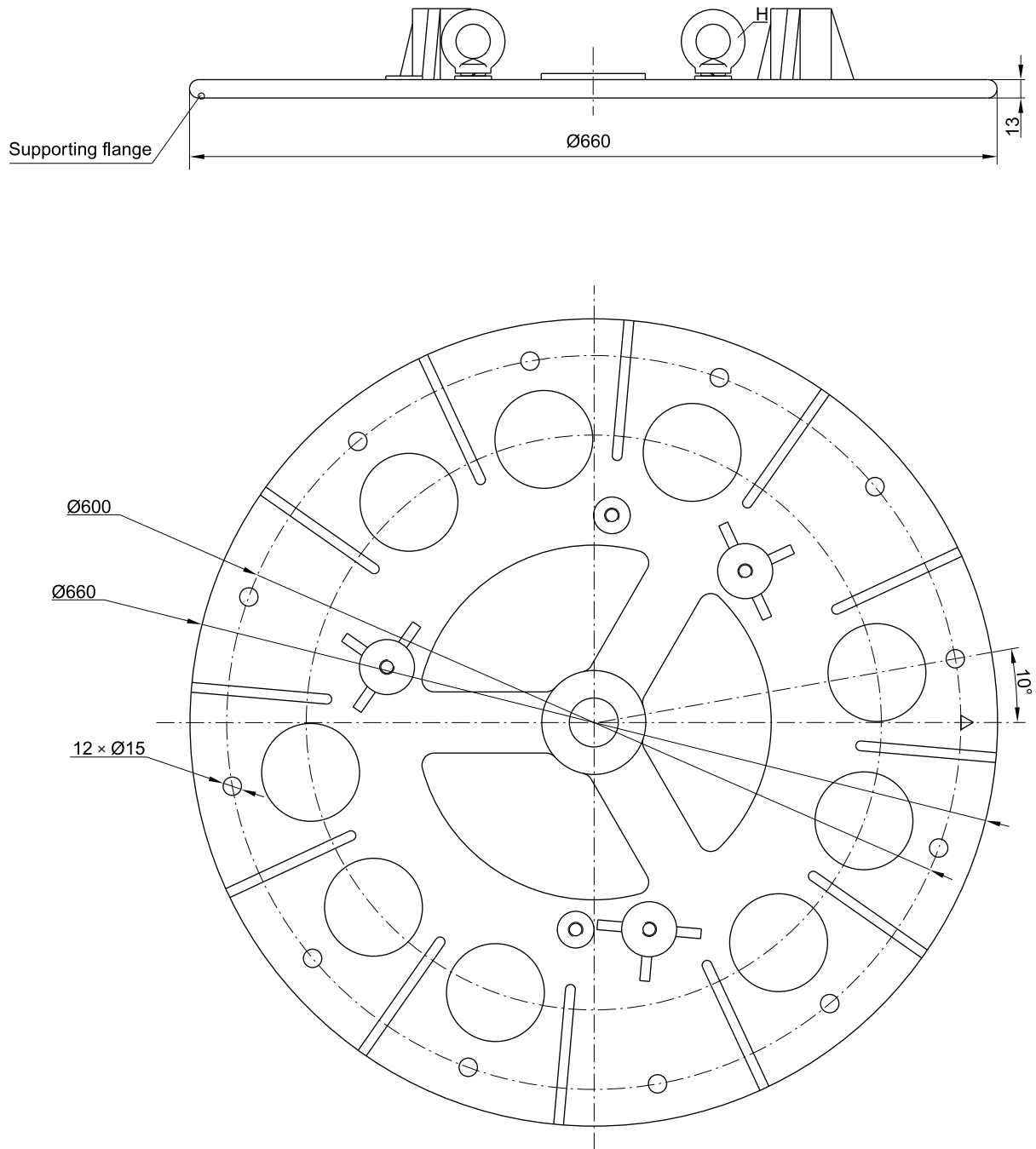


Unit: mm



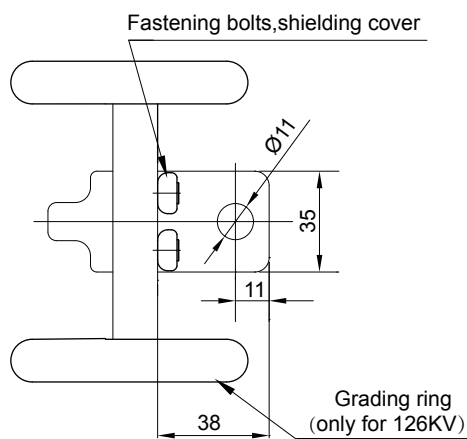
Unit: mm

## Appendix 19 Type B for bell type, supporting flange installation drawing

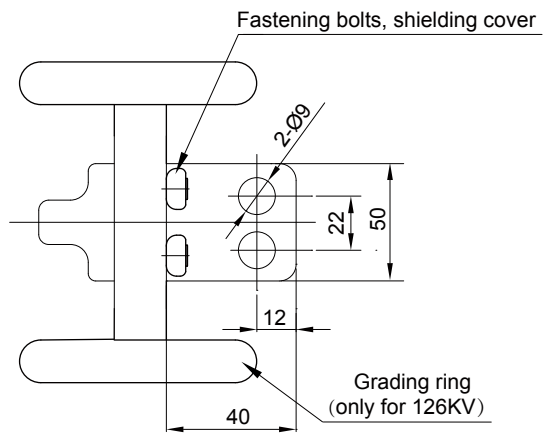


Unit: mm

## Appendix 20 Tap changer terminal overall dimension

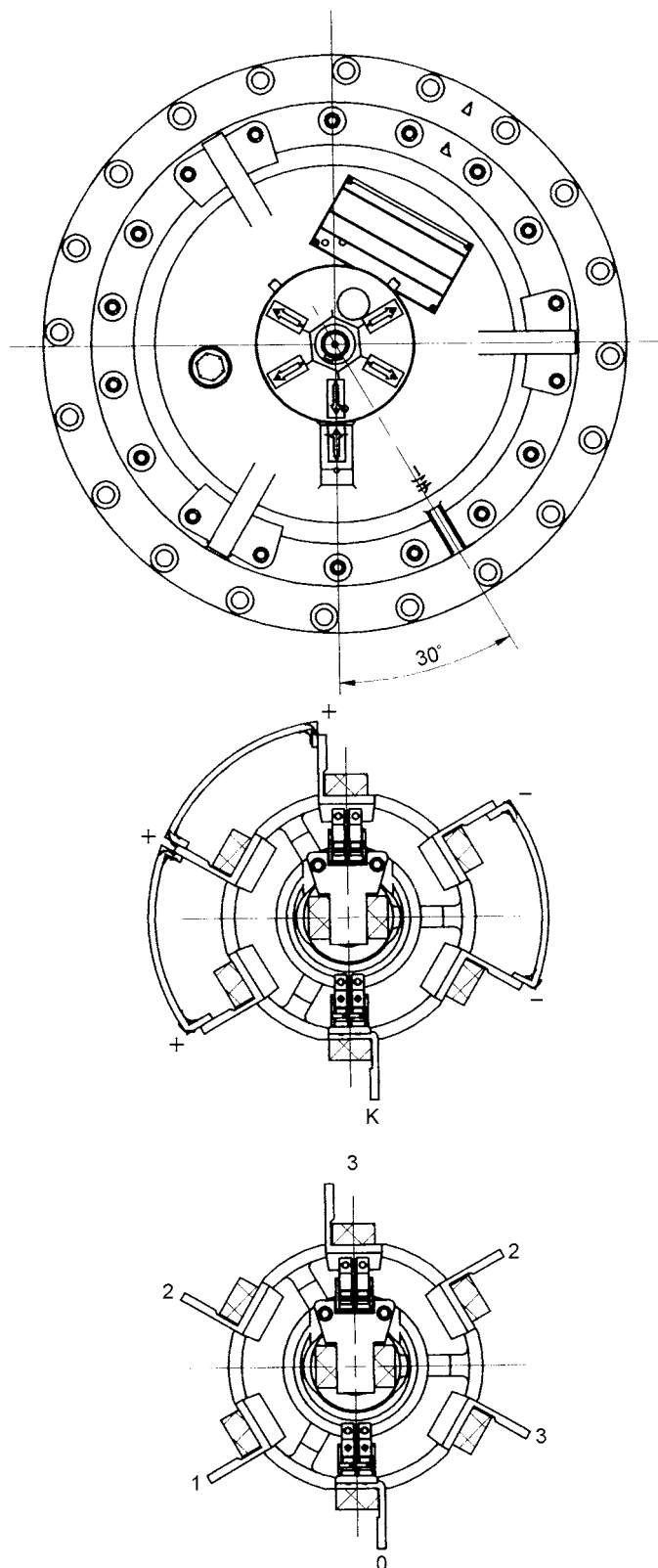


Fixed contact with one hole: ≤600A



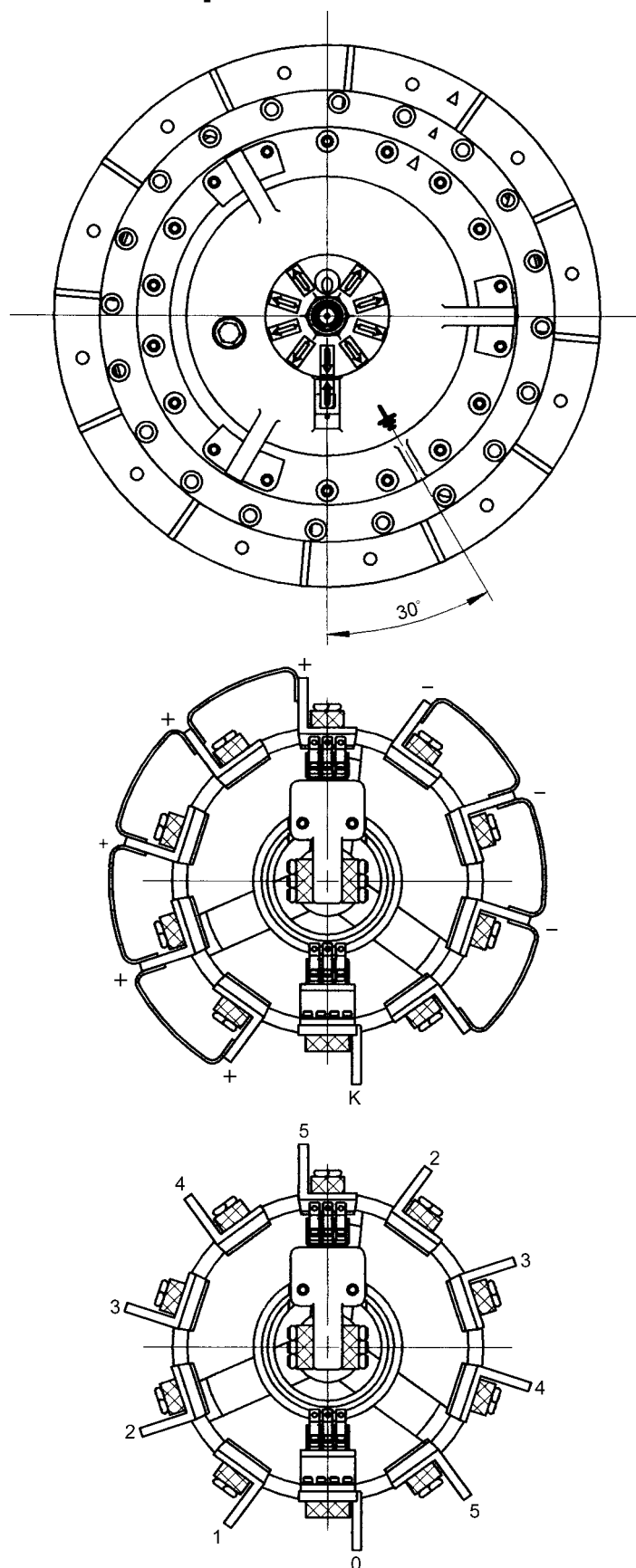
Fixed contact with double holes: ≥800A

## Appendix 21 Reversing(6×5),top cover hand wheel, relative position of contacts



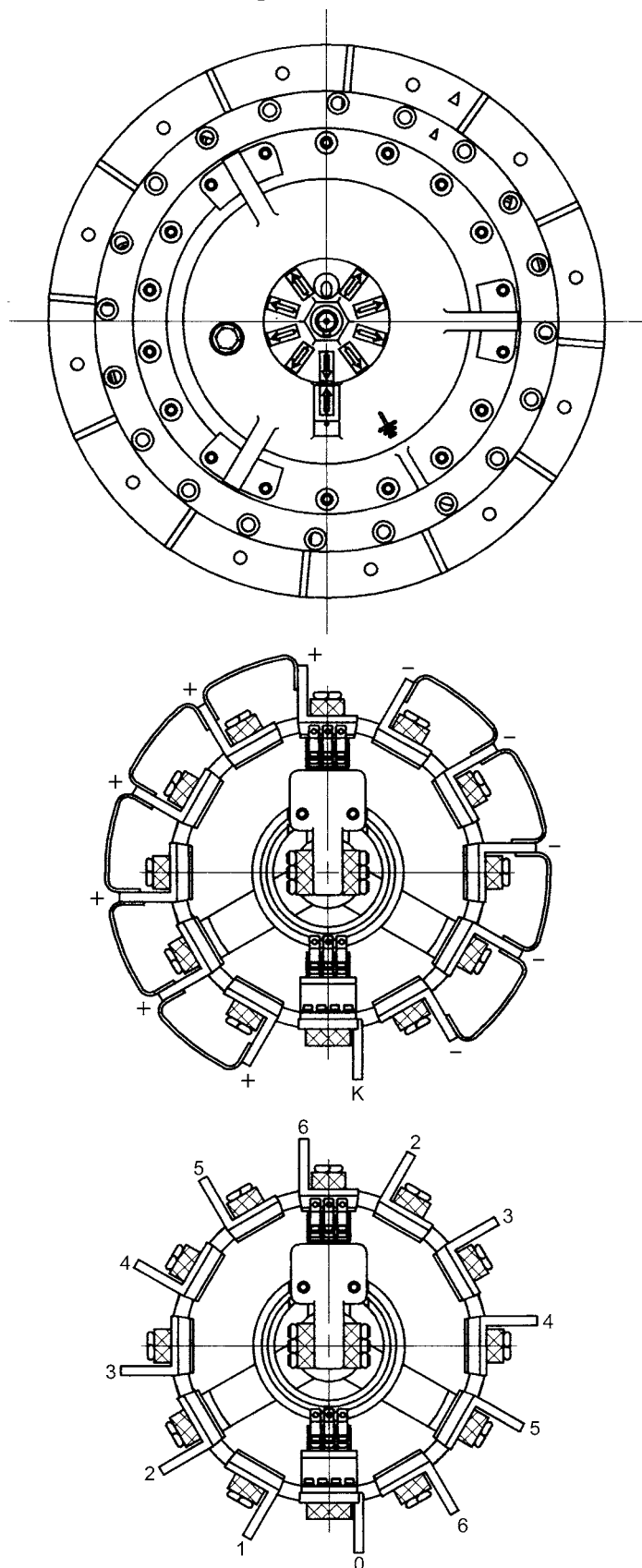
Unit: mm

## Appendix 22 Reversing(10×9),top cover hand wheel, relative position of contacts



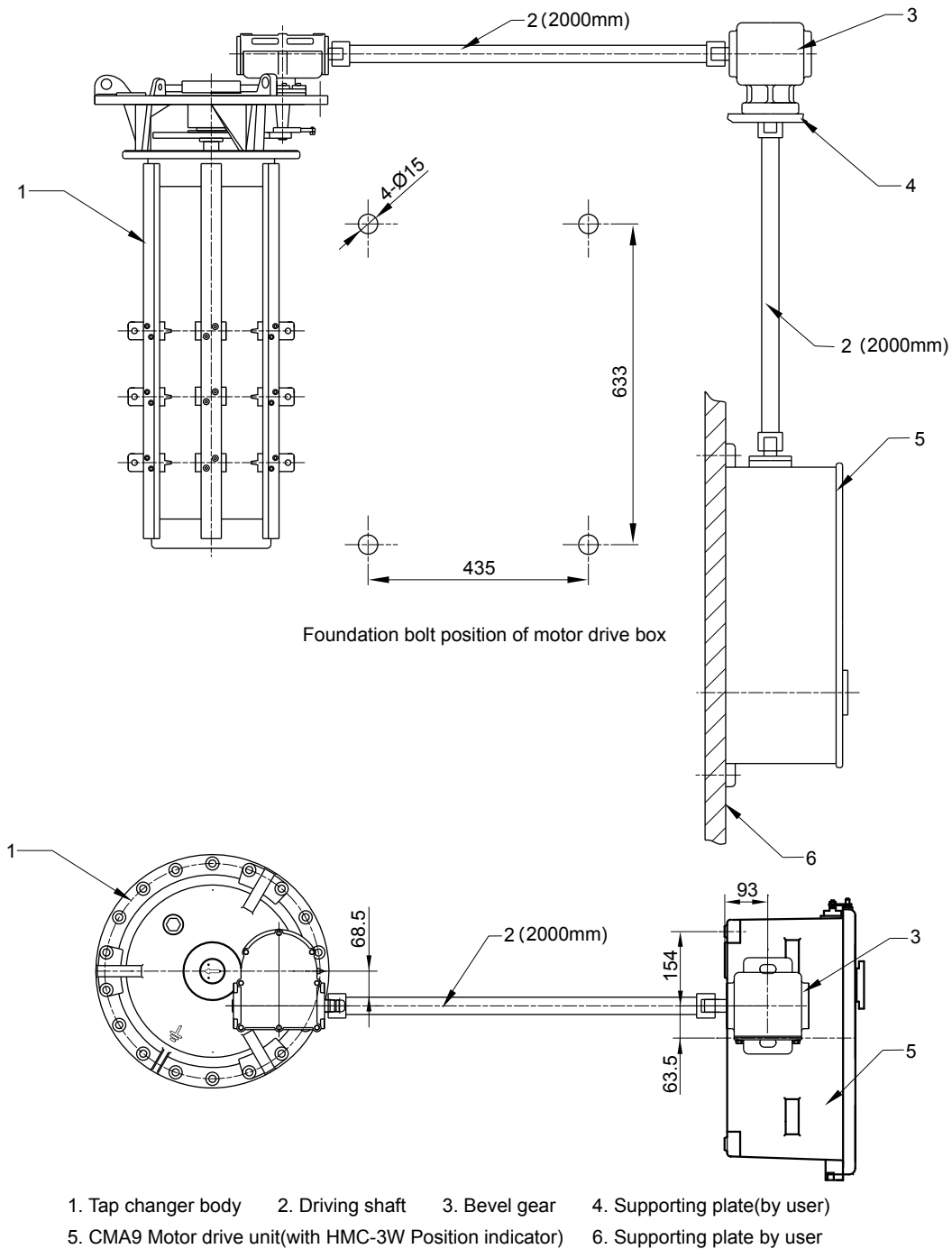
Unit: mm

## Appendix 23 Reversing(12×11),top cover hand wheel, relative position of contacts



Unit: mm

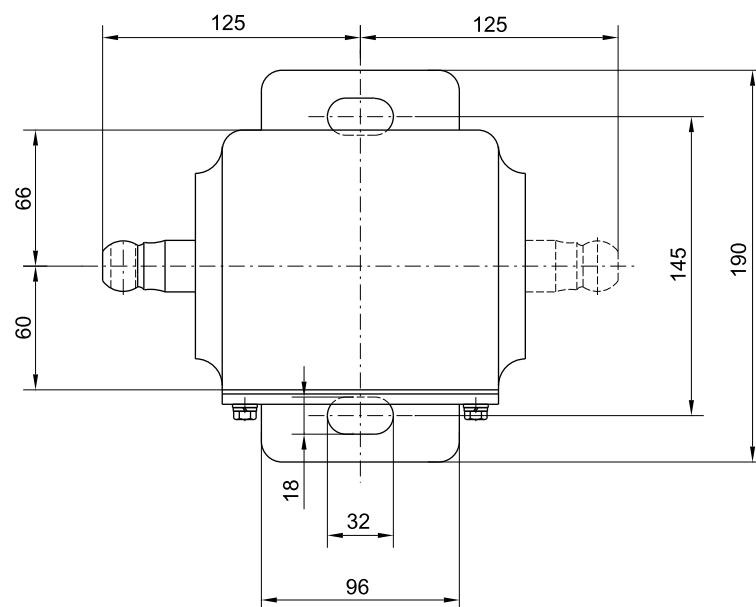
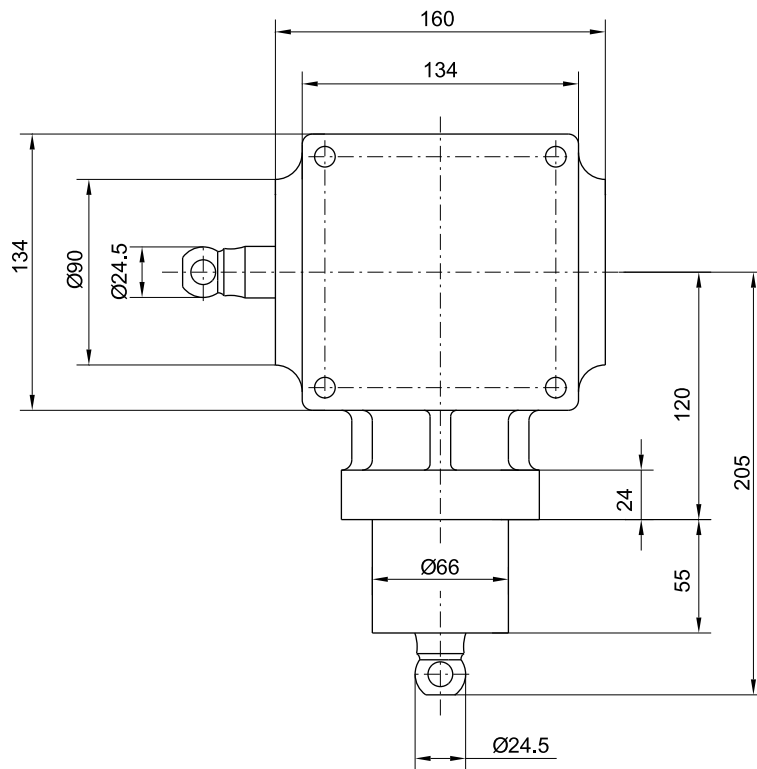
## Appendix 24 Ground motor drive, Tap changer installation illustrating drawing



Unit: mm

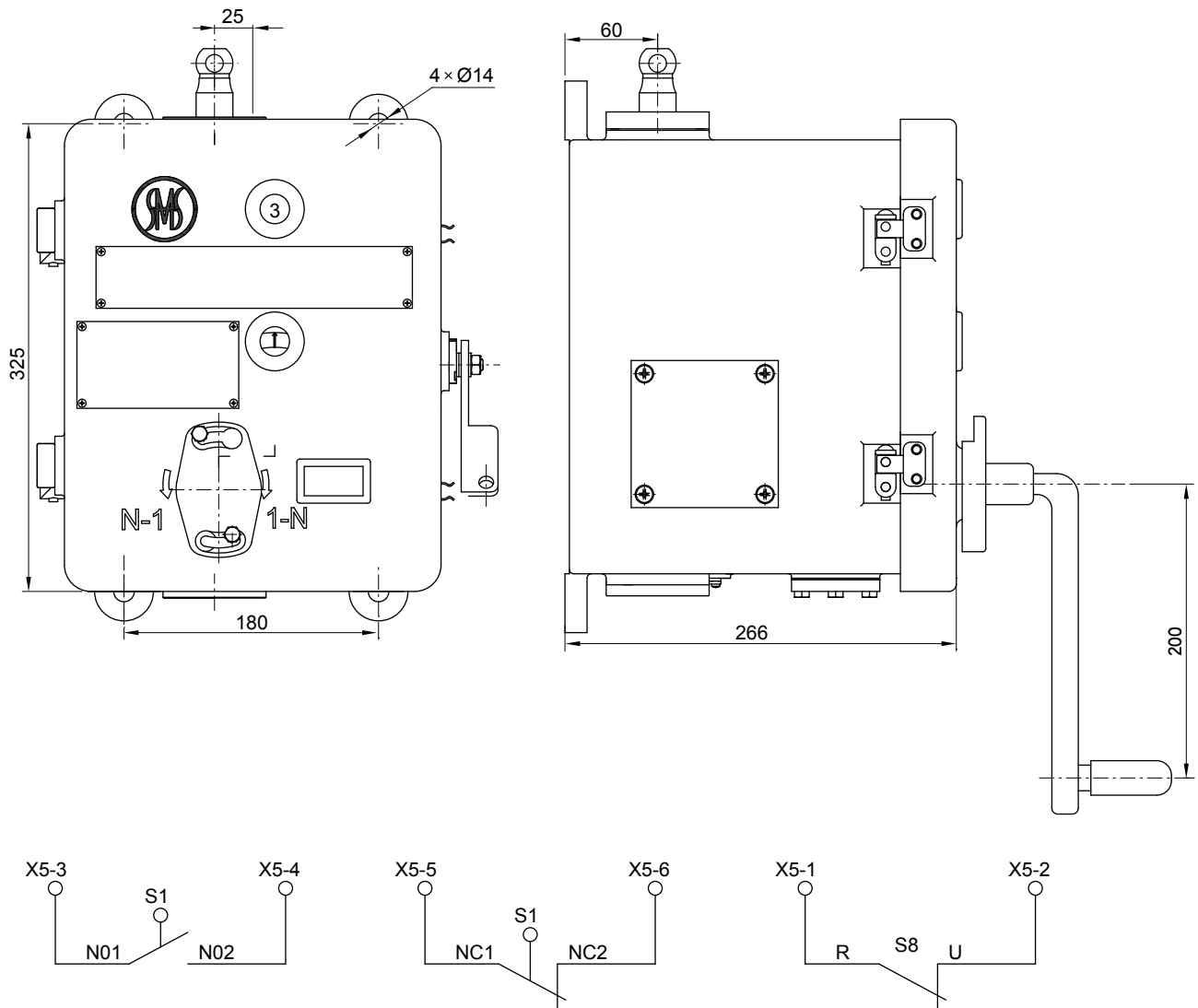




**Appendix 26 Bevel gear, Overall dimensions**

Unit: mm

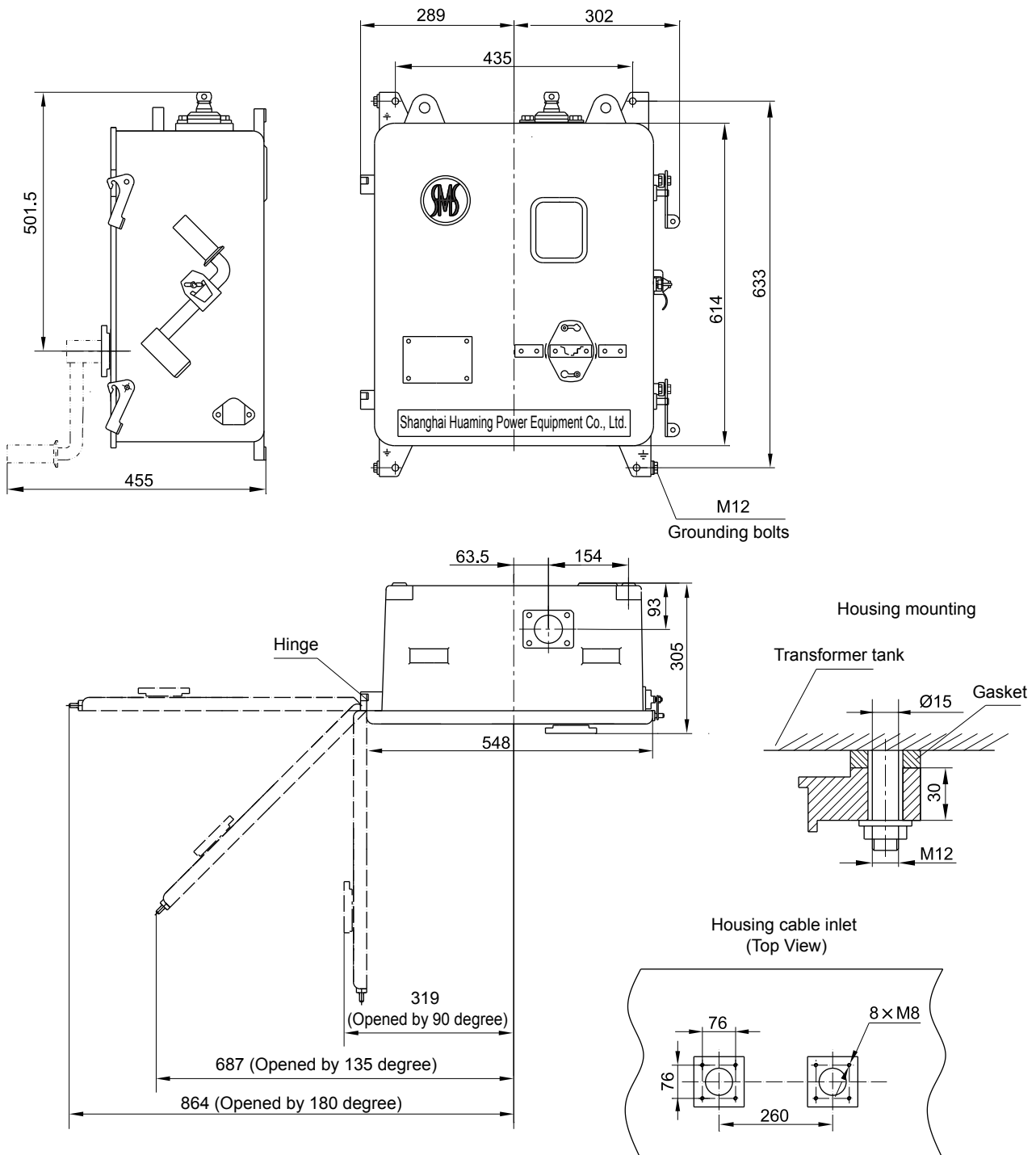
## Appendix 27 Side-manual operation, Overall dimensions



S1-N01, S1-N02 for in-operation signal, S1-NC1, S1-NC2 for operation in-position signal Leads out S8-R、S8-U from manual mechanism to terminals X5-1, X5-2, If handle crank is inserted in, then X5-1、X5-2 break; If handle crank is taken out, then X5-1、X5-2 close, User should take this terminal as blockout for manual mechanism and circuit breaker of transformer

Unit: mm

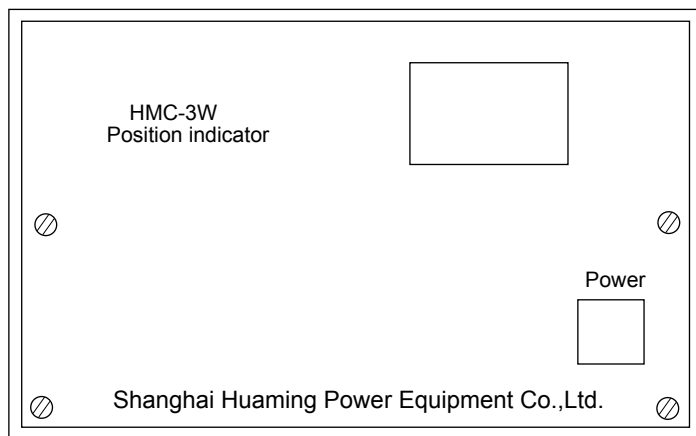
## Appendix 28 CMA9 Motor drive unit, overall dimensions



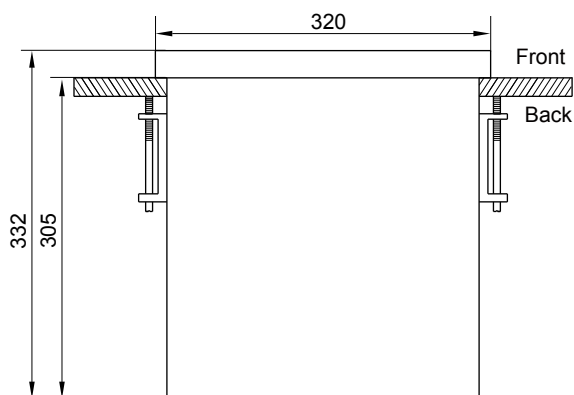
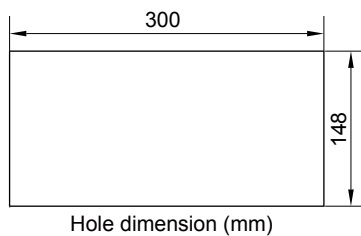
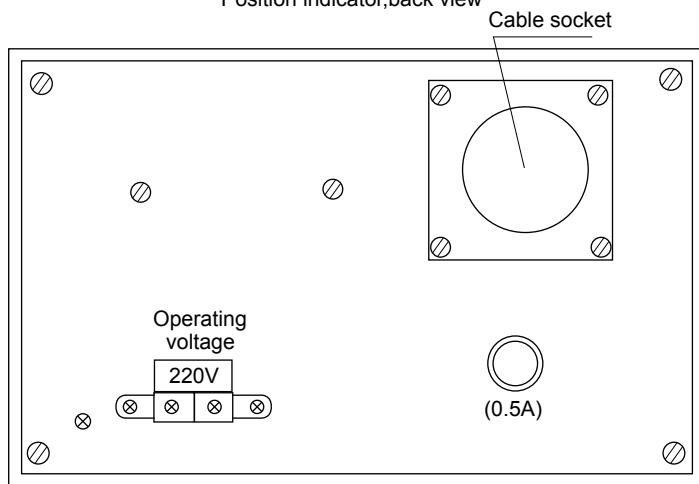
Unit: mm

## Appendix 29 HMC-3W Position indicator

Position indicator, front view



Position indicator, back view



Unit: mm

## **Guideline for operation and ordering**

It is recommended that the user keep all the operation and service data and get in touch with us during special occurrence, so that we can intercommunicate with each other concerning the operation and maintenance experience.

If under normal operation, there is any equipment malfunction and damage due to production quality within 18 months of the delivery date, we will perform any necessary repair free of charge for our customers.

The standard length of the leading cable for the display unit is 30 meters. Special requirement can be submitted while ordering.

We will provide our clients with the best quality products, superior service, and favorable price wholeheartedly. Thank you for the support and cooperation. Your suggestions and feedback regarding our products are warmly welcomed.







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STANDARD GRADE

# Nytro Libra

Electrical insulating oil

Nytro Libra is an uninhibited transformer oil that conforms to IEC 60296 Edition 4.0. Developed and formulated to deliver solid resistance to oil degradation, Nytro Libra provides good oxidation stability thanks to its natural inhibitors. This increases the possibilities for a longer transformer life with less maintenance.

## Designed for heavy duty

This product has been specially developed for use in oil-filled electrical equipment – including power and distribution transformers, rectifiers, circuit breakers and switchgears.

## Performance and benefits

Good heat transfer. Thanks to low viscosity and viscosity index, this standard grade offers extremely good heat transfer characteristics, ensuring heat is efficiently removed from core and windings.

Reliable oxidation stability. Developed and formulated to deliver good resistance to oil degradation, this grade also provides good oxidation stability for enhanced transformer life and minimum maintenance.

Very good low temperature properties. Naphthenic characteristics allow the transformer to start at the lowest possible temperature – without using pour point depressants.

High dielectric strength. This insulating oil both meets and exceeds the toughest demands on dielectric strength – when stored and handled correctly.

## Product description

Nytro Libra fulfils the requirements for IEC 60296 Edition 4.0 uninhibited oil. Nynas classify this product as a standard grade.

Nytro Libra is rigorously analysed and passes the following corrosion tests:

- ASTM D1275 method B
- IEC 62535
- DIN 51353

In accordance with IEC 60296 Edition 4.0, all additives are declared.

## There's more to us than this

We're delighted you chose one of our transformer oils. If you have any questions about other products and services, get in touch with your local Nynas contact. Besides top quality oils, we offer a wide range of services, including rapid delivery worldwide, sample analysis, training, seminars and much more. All you have to do is ask. Find out more at [www.nynas.com](http://www.nynas.com)



# Nytro Libra

PROPERTY	UNIT	TEST METHOD	SPECIFICATION LIMITS		TYPICAL DATA
			MIN	MAX	
1 - Function					
Viscosity, 40°C	mm <sup>2</sup> /s	ISO 3104		12.0	9.5
Viscosity, -30°C	mm <sup>2</sup> /s	ISO 3104		1800	1050
Pour point	°C	ISO 3016		-40	-51
Water content	mg/kg	IEC 60814		30	<20
Breakdown voltage					
- Before treatment	kV	IEC 60156	30		40-60
- After treatment	kV	IEC 60296	70		>70
Density, 20°C	kg/dm <sup>3</sup>	ISO 12185		0.895	0.877
DDF at 90°C		IEC 60247		0.005	<0.001
2 - Refining/stability					
Appearance		IEC 60296	Clear, free from sediment		complies
Acidity	mg KOH/g	IEC 62021		0.01	<0.01
Interfacial tension	mN/m	EN 14210	40		48
Corrosive sulphur		DIN 51353	non-corrosive		non-corrosive
Potentially corrosive sulphur		IEC 62535	non-corrosive		non-corrosive
Corrosive sulphur		ASTM D 1275 B	non-corrosive		non-corrosive
DBDS	mg/kg	IEC 62697-1		not detectable	not detectable
Antioxidant	wt %	IEC 60666		not detectable	not detectable
Metal passivator additives	mg/kg	IEC 60666		not detectable	not detectable
2-Furfural and related compounds content	mg/kg	IEC 61198		0.05	<0.05
Aromatic content	%	IEC 60590			9
3 - Performance					
Oxidation stability at 120°C, 164 h		IEC 61125 C			
Total acidity	mg KOH/g			1.2	0.57
Sludge	wt %			0.8	0.18
DDF at 90°C				0.500	0.063
4 - Health, safety and environment (HSE)					
Flash point, PM	°C	ISO 2719	135		150
PCA	wt %	IP 346		3	<3
PCB		IEC 61619	not detectable		not detectable

Nytro Libra is an uninhibited insulating oil, meeting IEC 60296 Ed.4 (2012) General specifications.

Severely Hydrotreated Insulating Oil  
Issuing date: 30/09/2014



# Nytro Libra



## SAFETY DATA SHEET

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1 Product identifier

Product name                      Nytro Libra  
 Product description              Insulating oil  
 Product type                        Liquid.

#### 1.2 Identified uses

**Identified uses**

Manufacture of substance- Industrial  
 Distribution of substance- Industrial  
 Formulation and (re)packing of substances and mixtures- Industrial  
 Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.  
 Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in professional equipment including maintenance and related material transfers.

Uses advised against	Reason
None known.	

#### 1.3 Details of the supplier of the safety data sheet

Nynas AB  
 P.O. Box 10700  
 SE-121 29 Stockholm  
 SWEDEN  
 +46 8 602 12 00  
 www.nynas.com  
 e-mail address of person              ProductHSE@nynas.com  
 responsible for this SDS

#### 1.4 Emergency telephone number

National advisory body/Poison Centre  
 Telephone number                      +44 (0) 1235 239 670  
 Hours of operation                      24 hour service

### SECTION 2: Hazards identification

#### 2.1 Classification of the substance or mixture

Product definition                      Mixture  
Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]  
 Asp. Tox. 1, H304

Classification according to Directive 1999/45/EC [DPD]

Not classified.

#### 2.2 Label elements

##### Hazard pictograms



Signal word                              Danger  
 Hazard statements                      May be fatal if swallowed and enters airways.

##### Precautionary statements

Prevention                                Not applicable.  
 Response                                IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.

## SECTION 2: Hazards identification

Storage Not applicable.

Disposal Dispose of waste product or used containers according to local regulations.

## 2.3 Other hazards

Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII No.

Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII No.

## SECTION 3: Composition/information on ingredients

Substance/mixture

Mixture

Product/ingredient name	Identifiers	%	Classification		Type
			67/548/EEC	Regulation (EC) No. 1272/2008 [CLP]	
Distillates (petroleum), hydrotreated light naphthenic	REACH #: 01-2119480375-34 EC: 265-156-6 CAS: 64742-53-6 Index: 649-466-00-2	50 - 70	Not classified.	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), hydrotreated light paraffinic	REACH #: 01-2119487077-29 EC: 265-158-7 CAS: 64742-55-8 Index: 649-468-00-3	0 - 50	Not classified.	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), hydrotreated heavy paraffinic	REACH #: 01-2119484627-25 EC: 265-157-1 CAS: 64742-54-7 Index: 649-467-00-8	0 - 50	Not classified.	Not classified.	[2]
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	REACH #: 01-2119474878-16 EC: 276-737-9 CAS: 72623-86-0 Index: 649-482-00-X	0 - 50	Not classified.	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), solvent-refined light naphthenic	REACH #: 01-2119480374-36 EC: 265-098-1 CAS: 64741-97-5 Index: 649-458-00-9	0 - 5	Not classified.	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), solvent-refined heavy naphthenic	REACH #: 01-2119483621-38 EC: 265-097-6 CAS: 64741-96-4 Index: 649-457-00-3	0 - 5	Not classified.	Asp. Tox. 1, H304	[1] [2]
				See Section 16 for the full text of the H statements declared above.	

Annex I Nota L applies to the base oil(s) in this product. Nota L - The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346.

## Type

[1] Substance classified with a health or environmental hazard

[2] Substance with a workplace exposure limit

[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII

[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII

## SECTION 4: First aid measures

### 4.1 Description of first aid measures

Eye contact	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation, blurred vision or swelling occurs and persists, obtain medical advice from a specialist.
Inhalation	If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If casualty is unconscious and: If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Immediately obtain specialist medical assessment and treatment for the casualty. Call a physician.
Skin contact	Remove contaminated clothing and shoes. Wash with soap and water. Handle with care and dispose of in a safe manner. Seek medical attention if skin irritation, swelling or redness develops and persists.
Ingestion	Accidental high pressure injection through the skin requires immediate medical attention. Do not wait for symptoms to develop. Always assume that aspiration has occurred. Do not induce vomiting as there is high risk of aspiration. Never give anything by mouth to an unconscious person. Seek professional medical attention or send the casualty to a hospital. Do not wait for symptoms to develop.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply. Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces.

### 4.2 Most important symptoms and effects, both acute and delayed

#### Potential acute health effects

Eye contact	Eye contact may cause redness and transient pain.
Inhalation	Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.
Skin contact	No known significant effects or critical hazards.
Ingestion	Nausea or vomiting. Aspiration hazard if swallowed. Can enter lungs and cause damage. Ingestion (swallowing) of this material may result in an altered state of consciousness and loss of coordination.

### 4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician	Due to low viscosity there is a risk of aspiration if the product enters the lungs. Ingestion (swallowing) of this material may result in an altered state of consciousness and loss of coordination. Treat symptomatically.
Specific treatments	Always assume that aspiration has occurred.

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

Suitable extinguishing media	Use dry chemical, CO <sub>2</sub> , water spray (fog) or foam.
Unsuitable extinguishing media	Do not use direct water jets on the burning product; they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

### 5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture	In a fire or if heated, a pressure increase will occur and the container may burst. This substance will float and can be reignited on surface water.
Hazardous combustion products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H <sub>2</sub> S, SO <sub>x</sub> (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

### 5.3 Advice for firefighters

**SECTION 5: Firefighting measures**

Special precautions for fire-fighters	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures**

For non-emergency personnel	<p>Keep non-involved personnel away from the area of spillage. Alert emergency personnel. Except in case of small spillages, the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. Stop leak if safe to do so. Avoid direct contact with the product. Stay upwind/keep distance from source. In case of large spillages, alert occupants in downwind areas.</p> <p>Eliminate all ignition sources if safe to do so. Spillages of limited amounts of product, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which will presumably limit the exposure to dangerous concentrations.</p> <p>Note : recommended measures are based on the most likely spillage scenarios for this material; however, local conditions (wind, air temperature, wave/current direction and speed) may significantly influence the choice of appropriate actions. For this reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken.</p>
For emergency responders	<p>Small spillages: normal antistatic working clothes are usually adequate.</p> <p>Large spillages: full body suit of chemically resistant and thermal resistant material should be used. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note : gloves made of PVA are not water-resistant, and are not suitable for emergency use. Safety helmet, antistatic non-skid safety shoes or boots. Goggles and /or face shield, if splashes or contact with eyes is possible or anticipated.</p> <p>Respiratory protection : A half or full-face respirator with filter(s) for organic vapours (and when applicable for H<sub>2</sub>S) a Self Contained Breathing Apparatus (SCBA) can be used according to the extent of spill and predictable amount of exposure. If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA's should be used.</p>

**6.2 Environmental precautions**

Prevent product from entering sewers, rivers or other bodies of water. If necessary dike the product with dry earth, sand or similar non-combustible materials. In case of soil contamination, remove contaminated soil and treat in accordance with local regulations. In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific floating absorbents.

If possible, large spillages in open waters should be contained with floating barriers or other mechanical means. If this is not possible, control the spreading of the spillage, and collect the product by skimming or other suitable mechanical means. The use of dispersants should be advised by an expert, and, if required, approved by local authorities.

**6.3 Methods and materials for containment and cleaning up**

Small spill	Stop leak if without risk. Absorb spilled product with suitable non-combustible materials.
Large spill	Large spillages may be cautiously covered with foam, if available, to limit vapour cloud formation. Do not use water jet. When inside buildings or confined spaces, ensure adequate ventilation. Transfer collected product and other contaminated materials to suitable containers for recovery or safe disposal.

**SECTION 6: Accidental release measures**

6.4 Reference to other sections

See Section 1 for emergency contact information.  
 See Section 8 for information on appropriate personal protective equipment.  
 See Section 13 for additional waste treatment information.

**SECTION 7: Handling and storage**

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

General information

Obtain special instructions before use. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use and store only outdoors or in a well-ventilated area.

Avoid release to the environment.

7.1 Precautions for safe handling

Protective measures

Do not ingest. Avoid contact with skin. Avoid breathing fume/mist. Use personal protective equipment as required.

Prevent the risk of slipping. Take precautionary measures against static discharge. Avoid splash filling of bulk volumes when handling hot liquid product.

Note: see section 8 for personal protective equipment and section 13 for waste disposal.

Advice on general occupational hygiene

Ensure that proper housekeeping measures are in place. Contaminated materials should not be allowed to accumulate in the workplaces and should never be kept inside the pockets. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash hands thoroughly after handling. Change contaminated clothes at the end of working shift.

7.2 Conditions for safe storage, including any incompatibilities

Storage area layout, tank design, equipment and operating procedures must comply with the relevant European, national or local legislation. Storage installations should be designed with adequate bunds in case of leaks or spills. Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations.

Store separately from oxidising agents.

Recommended materials for containers, or container linings use mild steel, stainless steel. Not suitable : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Compatibility should be checked with the manufacturer.

Keep only in the original container or in a suitable container for this kind of product. Keep containers tightly closed and properly labelled. Protect from sunlight. Empty containers may contain harmful, flammable/combustible or explosive residue or vapours. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards.

**SECTION 8: Exposure controls/personal protection**

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
Oil mist	<b>AFS 2005:17 (Sweden, 12/2011).</b> TWA: 1 mg/m <sup>3</sup> 8 hour(s). Form: mist and fume STEL: 3 mg/m <sup>3</sup> 15 minute(s). Form: mist and fume



**SECTION 8: Exposure controls/personal protection**

Recommended monitoring procedures If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to European Standard EN 689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances.

Derived effect levels

Product/ingredient name	Type	Exposure	Value	Population	Effects
Distillate (petroleum), hydrotreated light naphthenic	DNEL	Long term Inhalation	5,4 mg/m <sup>3</sup>	Workers	Local
Distillate (petroleum), Hydrotreated Light Paraffinic	DNEL	Long term Inhalation	5,4 mg/m <sup>3</sup>	Workers	Local
Distillates (petroleum), hydrotreated heavy paraffinic	DNEL	Long term Inhalation	5,4 mg/m <sup>3</sup>	Workers	Local
Distillates (petroleum), solvent-refined light naphthenic	DNEL	Long term Inhalation	5,4 mg/m <sup>3</sup>	Workers	Local
Distillates (petroleum), solvent-refined heavy naphthenic	DNEL	Long term Inhalation	5,4 mg/m <sup>3</sup>	Workers	Local

Predicted effect concentrations

No PECs available.

**8.2 Exposure controls**

Appropriate engineering controls

Mechanical ventilation and local exhaust will reduce exposure via the air. Use oil resistant material in construction of handling equipment. Store under recommended conditions and if heated, temperature control equipment should be used to avoid overheating.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Wash contaminated clothing before reuse.

Eye/face protection

If potential exists for splashing, use goggles.

Skin protection

Hand protection

Wear oil-resistant protective gloves (e.g. nitril rubber). PVC gloves. Neoprene gloves.

Body protection

Wear protective clothing if there is a risk of skin contact. Change contaminated clothes at the end of working shift.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

**SECTION 9: Physical and chemical properties****9.1 Information on basic physical and chemical properties**Appearance

Physical state

Liquid.

Colour

Light yellow

Odour

Odourless/Light petroleum.

Odour threshold

Not available.

**Nytro Libra****SECTION 9: Physical and chemical properties**

pH	Not applicable.
Melting point/freezing point	-51°C
Initial boiling point and boiling range	>250°C
Flash point	Closed cup: >140°C [Pensky-Martens.]
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	Not available.
Vapour pressure	160 Pa @ 100 °C
Vapour density	Not available.
Density	0,88 g/cm³ [15°C]
Solubility(ies)	Insoluble in water.
Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	>270°C
Decomposition temperature	>280°C
Viscosity	Kinematic (40°C): 0,096 cm²/s (9,6 cSt)
Explosive properties	Not available.
Oxidising properties	Not available.
DMSO extractable compounds for base oil substance(s) according to IP346	< 3%

**SECTION 10: Stability and reactivity**

10.1 Reactivity	No specific test data related to reactivity available for this product or its ingredients.
10.2 Chemical stability	Stable under normal conditions.
10.3 Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
10.4 Conditions to avoid	Oxidising agent.
10.5 Incompatible materials	Keep away from extreme heat and oxidizing agents.
10.6 Hazardous decomposition products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H <sub>2</sub> S, SO <sub>x</sub> (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

**SECTION 11: Toxicological information**

## 11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Distillate (petroleum), hydrotreated light naphthenic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours
	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
Distillate (petroleum), Hydrotreated Light Paraffinic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours
	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-

## SECTION 11: Toxicological information

Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
Distillates (petroleum), hydrotreated heavy paraffinic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours
	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours
Distillates (petroleum), solvent-refined heavy naphthenic	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours
	LD50 Dermal	Rabbit	>5000 mg/kg	-
Distillates (petroleum), solvent-refined light naphthenic	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours
	LD50 Dermal	Rabbit	>5000 mg/kg	-

Irritation/Corrosion

Skin Based on available data, the classification criteria are not met.

Eyes Based on available data, the classification criteria are not met.

Respiratory Based on available data, the classification criteria are not met.

Sensitiser

Skin Based on available data, the classification criteria are not met.

Carcinogenicity

Conclusion/Summary Based on available data, the classification criteria are not met.

Reproductive toxicity

Conclusion/Summary Based on available data, the classification criteria are not met.

Aspiration hazard

Product/ingredient name	Result
Distillate (petroleum), hydrotreated light naphthenic	ASPIRATION HAZARD - Category 1
Distillate (petroleum), Hydrotreated Light Paraffinic	ASPIRATION HAZARD - Category 1
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	ASPIRATION HAZARD - Category 1
Distillates (petroleum), solvent-refined heavy naphthenic	ASPIRATION HAZARD - Category 1
Distillates (petroleum), solvent-refined light naphthenic	ASPIRATION HAZARD - Category 1

Potential acute health effects

Inhalation Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.

Ingestion Nausea or vomiting. Aspiration hazard if swallowed. Can enter lungs and cause damage. Ingestion (swallowing) of this material may result in an altered state of consciousness and loss of coordination.

Skin contact No known significant effects or critical hazards.

Eye contact Eye contact may cause redness and transient pain.

Potential chronic health effects

Chronic effects No known significant effects or critical hazards.

Carcinogenicity No known significant effects or critical hazards.

Mutagenicity No known significant effects or critical hazards.

Teratogenicity No known significant effects or critical hazards.

Developmental effects No known significant effects or critical hazards.

Fertility effects No known significant effects or critical hazards.

Other information Not available.

## SECTION 11: Toxicological information

## Specific hazard

## SECTION 12: Ecological information

## 12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
Distillate (petroleum), hydrotreated light naphthenic	Acute IC50 >100 mg/l	Algae	48 hours
Distillate (petroleum), Hydrotreated Light Paraffinic	Acute LC50 >100 mg/l Acute IC50 >100 mg/l	Fish Algae	96 hours 48 hours
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Acute LC50 >100 mg/l Acute LC50 >100 mg/l	Fish Fish	96 hours 96 hours
Distillates (petroleum), hydrotreated heavy paraffinic	Acute EC50 >100 mg/l	Fish	96 hours
Distillates (petroleum), solvent-refined heavy naphthenic	Acute IC50 >100 mg/l Acute EC50 >100 mg/l	Algae Fish	48 hours 96 hours
Distillates (petroleum), solvent-refined light naphthenic	Acute IC50 >100 mg/l Acute LC50 >100 mg/l	Algae Fish	48 hours 96 hours

## Conclusion/Summary

Aquatic toxicity data on base oils indicate LC50 values of > 100 mg/l, which is considered as low toxicity.

## 12.2 Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Distillate (petroleum), hydrotreated light naphthenic	-	-	Inherent
Distillate (petroleum), Hydrotreated Light Paraffinic	-	-	Inherent
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	-	-	Inherent
Distillates (petroleum), hydrotreated heavy paraffinic	-	-	Inherent
Distillates (petroleum), solvent-refined heavy naphthenic	-	-	Inherent
Distillates (petroleum), solvent-refined light naphthenic	-	-	Inherent

## Conclusion/Summary

Inherently biodegradable.

## 12.3 Bioaccumulative potential

## Conclusion/Summary

The product has a potential to bioaccumulate.

## 12.4 Mobility in soil

## Mobility

High mobility in soil predicted, based on log Kow > 3.0.

## 12.5 Results of PBT and vPvB assessment

No.

No.

## 12.6 Other adverse effects

Insoluble in water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

## SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

### 13.1 Waste treatment methods

#### Product

##### Methods of disposal

Where possible (e.g. in the absence of relevant contamination), recycling of used substance is feasible and recommended. This substance can be burned or incinerated, subject to national/local authorizations, relevant contamination limits, safety regulations and air quality legislation. Contaminated or waste substance (not directly recyclable): Disposal can be carried out directly, or by delivery to qualified waste handlers. National legislation may identify a specific organization, and/or prescribe composition limits and methods for recovery or disposal.

##### Hazardous waste

Within the present knowledge of the supplier, this product is not regarded as hazardous waste, as defined by EU Directive 91/689/EEC.

#### Packaging

##### Methods of disposal

The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

## SECTION 14: Transport information

### International transport regulations

This product is not regulated for carriage according to ADR/RID, ADN, IMDG, ICAO/IATA.

### 14.7 Transport in bulk according to Annex I of MARPOL 73/78 and the IBC Code

Mineral oil.

## SECTION 15: Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

#### EU Regulation (EC) No. 1907/2006 (REACH)

#### Annex XIV - List of substances subject to authorisation

#### Substances of very high concern

None of the components are listed.

#### Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Not applicable.

#### Other EU regulations

##### Europe inventory

All components are listed or exempted.

##### 15.2 Chemical Safety Assessment

This product contains substances for which Chemical Safety Assessments are still required.

## SECTION 16: Other information

### Revision comments

Not available.

Indicates information that has changed from previously issued version.

### Abbreviations and acronyms

ATE = Acute Toxicity Estimate

CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]

DNEL = Derived No Effect Level

EUH statement = CLP-specific Hazard statement

PNEC = Predicted No Effect Concentration

RRN = REACH Registration Number

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

## SECTION 16: Other information

Classification	Justification
Asp. Tox. 1, H304	Calculation method

Full text of abbreviated H statements      H304      May be fatal if swallowed and enters airways.

Full text of classifications [CLP/GHS]      Asp. Tox. 1, H304      ASPIRATION HAZARD - Category 1

Full text of abbreviated R phrases      Not applicable.

Full text of classifications [DSD/DPD]      Not applicable.

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Date of previous issue      2013-08-14.

Version      3

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

## Identification of the substance or mixture

Product definition Mixture  
Product name Nytro Libra

Identified uses	Sector of uses [SU]:	Process categories [PROC]:	Product categories [PC]:	Article categories [AC]:	Environmental release categories [ERC]:	SpERC
Manufacture of substance -Industrial	3, 8, 9	1, 2, 3, 4, 8a, 8b, 15	Not applicable.	Not applicable.	1, 4	ESVOC SpERC 1.1.v1
Distribution of substance- Industrial	3	1, 2, 3, 4, 8a, 8b, 9, 15	Not applicable.	Not applicable.	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7	ESVOC SpERC 1.1b.v1
Formulation and (re) packing of substances and mixtures -Industrial	3, 10	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15	Not applicable.	Not applicable.	2	ESVOC SpERC 2.2.v1
Uses in Coatings - Industrial	3	1, 2, 3, 4, 5, 7, 8a, 8b, 10, 13, 15	Not applicable.	Not applicable.	4	ESVOC SpERC 4.3a.v1
Uses in Coatings - Professional	22	1, 2, 3, 4, 5, 8a, 8b, 10, 11, 13, 15, 19	Not applicable.	Not applicable.	8a, 8d	ESVOC SpERC 8.3a.v1
Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers. -Industrial	3	1, 2, 3, 4, 8a, 8b, 9	Not applicable.	Not applicable.	7	ESVOC SpERC 7.13a.v1
Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers. - Professional	22	1, 2, 3, 8a, 9, 20	Not applicable.	Not applicable.	9a, 9b	ESVOC SpERC 9.13b.v1

## Section 1: - Title

Short title of the exposure scenario Insulating oil (classified as Asp. Tox. 1, H304 only; IP346<3%; <20.5cSt@40oC)

List of use descriptors

**Identified use name:** Manufacture of substance- Industrial  
Distribution of substance- Industrial  
Formulation and (re)packing of substances and mixtures- Industrial  
Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.  
Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in professional equipment including maintenance and related material transfers.

**Subsequent service life relevant for that use:** No.

**Market sector by type of chemical product:** Not applicable.

**Article category related to subsequent service life:** Not applicable.



## Section 1: - Title

Environmental contributing scenarios

Health Contributing Scenarios

Number of the ES

Industry Association

Concawe

Generic exposure scenario

01, 01a, 02, 13a, 13b

Processes and activities covered by the exposure scenario

01- Manufacture of the substance or use as a process chemical or extraction agent within closed or contained systems. Includes incidental exposures during recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).

01a- Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incidental exposures during its sampling, storage, unloading, maintenance and associated laboratory activities.

02- Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.

13a- Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.

13b- Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in professional equipment including maintenance and related material transfers.

Additional information

## Section 2: - Exposure controls

Product characteristics

Substance is complex UVCB. Predominantly hydrophobic

Frequency and duration of use

Continuous release.

Environment factors not influenced by risk management

Local freshwater dilution factor: 10  
Local marine water dilution factor: 100

Technical conditions and measures at process level (source) to prevent release

Common practices vary across sites thus conservative process release estimates used.

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil

Risk from environmental exposure is driven by freshwater sediment.  
No wastewater treatment required. Prevent discharge of undissolved substance to or recover from onsite wastewater.

Risk management measures - Water

Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of <sup>3</sup> (%): 0  
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of <sup>3</sup> (%): 0

Organisational measures to prevent/limit release from site

Do not apply industrial sludge to natural soils. sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal

During manufacturing, no waste of the substance is generated.

Conditions and measures related to external recovery of waste

During manufacturing, no waste of the substance is generated.



## Section 2: - Exposure controls

Contributing scenario controlling worker exposure for 0:

Product characteristics	Liquid, vapour pressure < 0.5 kPa at STP.
Concentration of substance in mixture or article	Covers percentage substance in the product up to 100% (unless stated differently).
Physical state	liquid
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).
Other given operational conditions affecting workers exposure	<p>Operation is carried out at elevated temperature (&gt; 20°C above ambient temperature). Assumes a good basic standard of occupational hygiene is implemented.</p> <p>Aspiration hazard if swallowed.</p> <p>Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract.</p> <p>Aspiration of hydrocarbon substances can result in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death.</p> <p>This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage.</p> <p>Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties.</p> <p>Do not induce vomiting as there is high risk of aspiration.</p> <p>If swallowed, call a Poison Control Centre or doctor immediately.</p>

Contributing scenarios - Operational conditions and risk management measures

General exposures (closed systems)  
Handle substance within a closed system.

General exposures (closed systems)  
with sample collection  
Handle substance within a closed system. Wear suitable gloves tested to EN374.

Process sampling  
Sample via a closed loop or other system to avoid exposure.

Laboratory activities  
Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. Wear suitable gloves tested to EN374.

Bulk transfers  
Ensure material transfers are under containment or extract ventilation. Wear chemical-resistant gloves (tested to EN374) in combination with 'basic' employee training.

Equipment cleaning and maintenance  
Drain down and flush system prior to equipment break-in or maintenance.  
Retain drain-downs in sealed storage pending disposal or for subsequent recycle.  
Clear spills immediately. Wear chemical-resistant gloves (tested to EN374) in combination with specific activity training.

Bulk product storage  
Store substance within a closed system. Wear suitable gloves tested to EN374.

Conditions and measures related to personal protection and hygiene

Personal protection	See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment).
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## Section 3: - Exposure estimation and reference to its source

Website:	Not applicable.
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### Section 3: - Exposure estimation and reference to its source

#### Exposure estimation and reference to its source - Environment: 2:

Exposure assessment (environment): Not available.

Exposure estimation The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

#### Exposure estimation and reference to its source - Workers: 1:

Exposure assessment (human): Not available.

Exposure estimation The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

### Section 4: - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet. Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.
Health	<p>The CLP hazard statement H304: May be fatal if swallowed and enters airways (the DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vomited following ingestion.</p> <p>A DNEL (derived no effect levels) cannot be derived.</p> <p>This general qualitative CSA (chemical safety assessment) approach aims to reduce/avoid contact or incidents with the substance.</p> <p>However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.</p> <p>Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.</p> <p>There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.</p> <p>For any substance, classifies as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then seek immediate medical assistance.</p>

# Axialventilatoren



## Inhaltsübersicht

Kapitel	Seite
Anwendung . . . . .	1
Sicherheitshinweise . . . . .	1
Transport, Lagerung . . . . .	2
Montage . . . . .	2
Betriebsbedingungen . . . . .	4
Inbetriebnahme . . . . .	4
Instandhaltung, Wartung, Reinigung . . . . .	5
Hersteller . . . . .	6
Serviceadresse . . . . .	6



## Anwendung

Ziehl-Abegg Axialventilatoren der Baureihen **FA, FB, FC, FE, FL, FN, FH, FS, VR, VN** (Typenbezeichnung siehe Typenschild) mit integriertem Außenläufer-Asynchronmotor sind keine gebrauchsfertigen Produkte, sondern als Komponenten für Klima-, Be- und Entlüftungsanlagen konzipiert. Eine spezielle Motorauslegung ermöglicht die Drehzahlsteuerung durch Spannungsabsenkung. Bei Betrieb an Frequenzumrichtern beachten Sie die Hinweise im Abschnitt Betriebsbedingungen.



Die Ventilatoren dürfen erst betrieben werden, wenn sie ihrer Bestimmung entsprechend eingebaut sind und die Sicherheit durch Schutzeinrichtungen nach DIN EN ISO 13857 (DIN EN ISO 12100) oder sonstige bauliche Schutzmaßnahmen sichergestellt ist.



## Sicherheitshinweise

- Die Ventilatoren sind zur Förderung von Luft oder luftähnlichen Gemischen bestimmt. Der Einsatz in explosionsgefährdeten Bereichen zur Förderung von Gas, Nebel, Dämpfen oder deren Gemisch ist nicht zulässig. Die Förderung von Feststoffen oder Feststoffanteilen im Fördermedium ist ebenfalls nicht zulässig.
- Montage, elektrischen Anschluss und Inbetriebnahme nur von ausgebildetem Fachpersonal (Definition nach DIN EN 50 110, IEC 364) vornehmen lassen.
- Gefahr durch elektrischen Strom!** Der Rotor ist weder schutzisoliert noch schutzgeerdet nach DIN EN 60204-1, daher muss durch den Errichter der Anlage der Schutz durch Hindernisse oder durch Anordnung außerhalb des Handbereichs nach DIN VDE 0100-410 Anhang B vorgehen werden, bevor der Motor an Spannung gelegt wird.
- Betreiben Sie den Ventilator nur in den auf dem Typenschild angegebenen Bereichen und nur für die, laut Ihrer Bestellung, bestimmungsgemäßen Anwendung.
- Ziehl-Abegg Ventilatoren können, bei bestimmungsgemäßem Gebrauch, bis zu einer Umgebungstemperatur von -40°C eingesetzt werden. Bei einem Einsatz unterhalb -10°C und max. -40°C ist es Voraussetzung, dass keine außergewöhnlichen äußeren Einwirkungen wie, stoßartige mechanische Belastungen auf das Material einwirken. Bei 1~ Motoren mit Betriebskondensator bis -25°C. Beachten Sie die maximale Umgebungstemperatur auf dem Typenschild.
- Die max. zul. Betriebsdaten auf dem Typenschild gelten für eine Luftdichte  $\rho = 1,2 \text{ kg/m}^3$ .
- In die Wicklung eingebaute Temperaturwächter (TB) oder Kaltleiter arbeiten als Motorschutz und müssen angeschlossen werden!
- Bei Ausführung mit Kaltleiter zulässige Prüfspannung max. 2,5 V beachten!
- Bei Motoren ohne Temperaturwächter ist zwingend ein Motorschutzschalter zu verwenden!

# Ventilatori assiali



## Indice

Capitolo	Pagina
Impiego . . . . .	1
Norme di sicurezza . . . . .	1
Trasporto, Immagazzinaggio . . . . .	2
Montaggio . . . . .	2
Condizioni di funzionamento . . . . .	4
Messa in servizio . . . . .	4
Manutenzione, pulizia . . . . .	5
Costruttore . . . . .	6
Indirizzi per l'assistenza . . . . .	6



## Impiego

Ventilatori assiali Ziehl-Abegg delle serie **FA, FB, FC, FE, FL, FN, FH, FS, VR, VN** (denominazione del tipo vedi la targhetta di identificazione) con motore integrato **asincrono a rotore esterno** non sono prodotti pronti all'uso ma componenti per impianti di climatizzazione, aerazione e aspirazione. Una progettazione speciale del motore permette di regolare la velocità in funzione dell'abbassamento della tensione. In caso di esercizio con convertitori di frequenza osservate le indicazioni riportate nel paragrafo "Condizioni di funzionamento".



I ventilatori possono essere fatti funzionare solamente se sono montati in ottemperanza al loro scopo funzionale e se la sicurezza è garantita attraverso dispositivi di sicurezza secondo DIN EN ISO 13857 (DIN EN ISO 12100) o attraverso altre soluzioni costruttive.



## Norme di sicurezza

- I ventilatori sono progettati per il convogliamento di aria o di fluidi simili. Non è permesso usare i ventilatori in zone pericolose con rischio di deflagrazione per il convogliamento di gas, nebbie, vapori o loro miscele. Allo stesso modo non è permesso convogliare sostanze solide o particelle solide sospese nei fluidi.
- Il montaggio, il collegamento elettrico e la messa in funzione devono essere eseguiti esclusivamente da personale qualificato ed istruito (definizione secondo DIN EN 50 110, IEC 364).
- Pericolo dovuto alla presenza di corrente elettrica!** Il rotore non dispone né di isolamento rinforzato né di collegamento a terra secondo DIN EN 60204-1, pertanto il realizzatore dell'impianto ha l'obbligo di provvedere ad una protezione adeguata tramite ostacoli o disposizione fuori dalla portata di mano conformemente a DIN VDE 0100-410 allegato B prima che venga applicata tensione al motore.
- Fate funzionare il ventilatore solamente nei campi indicati dalla targhetta di identificazione e solo per gli scopi previsti in conformità al vostro ordine.
- Se utilizzati conformemente alla loro destinazione, i ventilatori Ziehl-Abegg possono essere utilizzati ad una temperatura ambiente massima di -40°C. Per l'utilizzo a temperature inferiori a -10°C e max. -40°C è assolutamente indispensabile che il materiale non sia esposto ad azioni esterne anomale come le sollecitazioni meccaniche impulsive. In caso di motori monofase con condensatore di rifasamento no a -25°C. Rispettare la massima temperatura ambiente indicata sulla targhetta di identificazione.
- I dati di esercizio massimi permessi riportati sulla targhetta di identificazione sono validi per una densità dell'aria di  $\rho = 1,2 \text{ kg/m}^3$ .

- Die Einhaltung der EMV-Richtlinie gilt in Verbindung mit unseren Regel- und Steuergeräten. Werden die Ventilatoren mit Komponenten anderer Hersteller komplettiert, so ist der Hersteller oder Betreiber der Gesamtanlage für die Einhaltung der EMV-Richtlinie 2004/108/EG verantwortlich.
- Beachten Sie die Hinweise zu Instandhaltung und Wartung.
- Diese Montageanleitung ist Teil des Produktes und als solche zugänglich aufzubewahren.



## Transport, Lagerung

- Ziehl-Abegg-Ventilatoren sind ab Werk für die jeweils vereinbarte Transportart entsprechend verpackt.
- Transportieren Sie den/die Ventilator/-en entweder originalverpackt oder größere Ventilatoren an den dafür vorgesehenen Transportvorrichtungen (Bohrungen in Tragarmen, Wandringplatten) mit geeigneten Transportmitteln.
- Beachten Sie die Gewichtsangaben auf dem Typenschild.
- Nicht am Anschlusskabel transportieren!
- Vermeiden Sie Schläge und Stöße, besonders bei Geräten mit aufgebauten Ventilatoren.
- Achten Sie auf evtl. Beschädigung der Verpackung oder des Ventilators.
- Lagern Sie den Ventilator trocken und wettergeschützt in der Originalverpackung oder schützen Sie ihn bis zur endgültigen Montage vor Schmutz und Wettereinwirkung.
- Vermeiden Sie extreme Hitze- oder Kälteeinwirkung.
- Vermeiden Sie zu lange Lagerzeiträume (wir empfehlen max. ein Jahr) und überprüfen Sie vor dem Einbau die ordnungsgemäße Funktion der Motorlagerung.



## Montage

Montage, elektrischer Anschluss und Inbetriebnahme nur von ausgebildetem Fachpersonal vornehmen lassen.

- Es obliegt der Verantwortung des System- oder Anlagenherstellers, dass anlagenbezogene Einbau- und Sicherheitshinweise sich im Einklang mit den geltenden Normen und Vorschriften (DIN EN ISO 12100 / 13857) befinden.
  - **Ventilatoren Bauform A**, zur Befestigung am feststehenden Motorflansch Schrauben der Festigkeitsklasse 8.8 verwenden und mit geeigneter Schraubensicherung versehen. Zul. Anzugsmomente: M4 = 2,1 Nm; M6 = 9,5 Nm; M10 = 40 Nm; M12 = 70 Nm; bezogen auf Schrauben nach DIN EN ISO 4014 Reibwert  $\mu_{\text{ges}} = 0,12$
  - Motorbaugröße **068** angegebene Einschraubtiefe beachten.
  - **Ventilatoren Bauform Q mit Kunststoff-Wandringplatte**: Scheiben DIN 125 zur Befestigung verwenden. Zul. Anzugsmomente: M8 = 10 Nm; M10 = 21 Nm
- Für alle Bauarten von Ventilatoren gilt:
  - Nicht verspannt einbauen. Anbauflächen müssen eben sein.

- *I termocontatti (TK) oppure termistore integrati nell'avvolgimento funzionano come salvamotore e devono essere collegati!*
- *Nell'esecuzione con termistore osservare la massima tensione di prova di 2,5 V!*
- *In caso di motori senza termocontatto deve essere assolutamente essere usato un salvamotore!*
- *La conformità con la direttiva per la compatibilità elettromagnetica vale in abbinamento con i nostri apparecchi di regolazione e di controllo. Se i ventilatori vengono completati con componenti di altri produttori, allora il costruttore o il gestore dell'impianto sono responsabili per la conformità della direttiva di compatibilità elettromagnetica 2004/108/CE.*
- *Fate attenzione ai consigli sulla manutenzione.*
- *Le presenti istruzioni di montaggio costituiscono parte del prodotto e come tale vanno conservate in un luogo ben accessibile.*



## Trasporto, Immagazzinaggio

- *I ventilatori Ziehl-Abegg vengono imballati in fabbrica in modo adeguato per il relativo tipo di trasporto pattuito.*
- *Effettuare eventuali trasporti del ventilatore/dei ventilatori con l'imballaggio originale, o, in caso di ventilatori più grandi, utilizzando i dispositivi di trasporto predisposti (fori nei bracci portanti, piastre sull'anello per attacco a parete) e mezzi di trasporto idonei. Rispettare le indicazioni del peso sulla targhetta di identificazione.*
- *Rispettare le indicazioni del peso sulla targhetta di identificazione.*
- *Non usare cavo di alimentazione per il trasporto!*
- *Sono da evitare urti e colpi, in particolare nel caso di ventilatori montati su altre apparecchiature.*
- *Accertarsi dell'integrità dell'imballaggio e del ventilatore.*
- *Conservare il ventilatore nel suo imballaggio originale in un ambiente asciutto o al riparo dagli agenti atmosferici e dallo sporco fino al suo montaggio definitivo.*
- *Evitare le temperature estreme.*
- *Evitare lunghi periodi di immagazzinaggio (si consiglia massimo un anno) e controllare il corretto funzionamento motore prima del montaggio.*



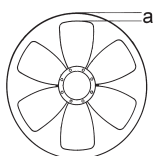
## Montaggio




Il montaggio, l'allacciamento elettrico e la messa a funzione devono essere eseguiti esclusivamente da personale specializzato.

- *È responsabilità del costruttore dell'impianto o del sistema far sì che le indicazioni di sicurezza e di montaggio relative all'impianto siano conformi alle norme e alle prescrizioni vigenti (DIN EN ISO 12100 / 13857).*
  - **Ventilatori della forma costruttiva A**, per il fissaggio alla flangia motore fissa, utilizzare viti della classe di resistenza 8.8 e applicare una colla frenafili idonea. Coppie di serraggio ammesse: M4 = 2,1 Nm; M6 = 9,5 Nm; M10 = 40 Nm; M12 = 70 Nm; valori riferiti a viti secondo DIN EN ISO 4014 coefficiente di attrito  $\mu_{\text{tot}} = 0,12$
  - In caso di motori della dimensione costruttiva **068**, rispettare la profondità di avvitamento indicata.
  - **Ventilatori di forma costruttiva Q con piastra anulare da parete in plastica**: Per il fissaggio utilizzare ranelle secondo DIN 125 Coppie massime di serraggio: M8 = 10 Nm; M10 = 21 Nm
- *Per tutti i tipi costruttivi di ventilatori vale:*
  - Non montare se sottoposto a tensione o carichi. Le superfici di montaggio devono essere piane.

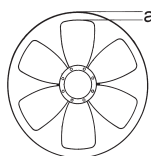




- Auf gleichmäßigen Spalt „a“ nach Abb. achten. Verspannung durch unebene Auflage kann durch Streifen des Laufrades zum Ausfall des Ventilators führen.



- Bei vertikaler Motorachse muss das jeweils untenliegende Kondenswasserloch geöffnet sein (gilt nicht bei Ventilatoren der Schutzart IP55).
- Motorbaugröße **068**: Kondenswasserbohrungen werden abhängig von der Einbaulage oder vom Anwendungsfall angebracht. Infos hierzu sind in den produktspezifischen Bestelltexten angegeben. Achten Sie darauf, dass Kondenswasserbohrungen nicht verschlossen werden!
- Der Ventilator darf nur an Stromkreise angeschlossen werden, die mit einem allpolig trennenden Schalter abschaltbar sind.
- Elektrischer Anschluss lt. Schaltbild a) im Klemmenkasten b) bei Kabelführung Schaltbild am Kabel oder Wandring
-  **Keine Metall-Stopfbuchsenverschraubungen bei Kunststoff-Klemmenkästen verwenden - Stromschlag bei fehlerhaftem Anschluss möglich!**
- Dichtung des Blindstopfens auch für Stopfbuchsenverschraubung verwenden.
- Bei erhöhter Beanspruchung (Nassräume) vormontierte Dichtungselemente verwenden.
- Je nach Art der Kabeleinführung Wasserablaufbogen vorsehen oder Dichtungskitt verwenden.
- Deckelverschraubungen bei Kunststoff-Klemmenkästen zusätzlich mit Dichtungskitt abdichten.
- Anzugsmomente für Deckelverschraubung: Ausführung Kunststoff 1,3 Nm, Ausführung Metall 2,6 Nm
- Ventilator-Anschlusskabel mit Kabelbindern an Berührungsschutzgitter oder Motorstreben befestigen.
- Je nach Ausführung können die Motoren
  - mit Kaltleitern, intern verschalteten Thermostatschaltern, herausgeführten Thermostatschaltern oder ohne thermischen Schutz ausgerüstet sein.
- Diese sind wie folgt anzuschließen:
  - Kaltleiter am Kaltleiterauslösegerät.
-  Intern verschaltete Thermostatschalter: Kein externer Anschluß möglich bzw. nötig.
-  **Achtung:** Thermostatschalter schalten nach Auslösung durch zu hohe Temperatur und Abkühlung wieder selbsttätig zu. Dabei kann der Ventilator anlaufen
- Herausgeführte Temperaturwächter sind so in den Steuerstromkreis einzufügen, dass im Störfall nach dem Abkühlen **kein selbsttätiges Wiedereinschalten** erfolgt. Gemeinsamer Schutz mehrerer Motoren über ein Schutzgerät ist möglich, hierfür sind die Temperaturwächter der einzelnen Motoren in Serie zu schalten. Bitte beachten, dass bei Temperaturstörung eines Motors **alle** Motoren gemeinsam abgeschaltet werden. In der Praxis werden deshalb Motoren in Gruppen zusammengefasst, um bei Störung eines Motors noch **Notbetrieb** mit verminderter Leistung fahren zu können.
- ohne thermischen Schutz: Motorschutzschalter verwenden!
- Wenn bei Ventilatormotoren für 1~ 230V +/-10% die Netzspannung dauerhaft über 240V liegt, kann es in Extremfällen vorkommen, dass der Temperaturwächter anspricht. Bitte verwenden Sie dann den nächst kleineren Kondensator.

- Osservare che il dimensione “a” sia sempre costante come rappresentato in gura. Se la posizione di montaggio non è piana le tensioni causate possono causare sfregamenti della girante e provocare guasti al ventilatore.



- Con l'asse del motore in posizione verticale, il foro di scarico condensa situato in basso deve essere aperto (non valido per ventilatori con grado di protezione IP55).
- Motori con dimensione costruttiva **068**: I fori per la condensa vengono realizzati a seconda della posizione di montaggio o del relativo caso di applicazione. Informazioni al riguardo sono riportate nei testi per l'ordinazione specifici del prodotto. Prestare attenzione che i fori per la condensa non vengano otturati o chiusi!
- Il ventilatore deve essere collegato solo a circuiti elettrici disinseribili tramite un interruttore agente su tutti i poli.
- Collegamento elettrico in base allo schema elettrico a) nella cassetta terminale b) in caso di versione con cavo schema elettrico sul cavo o sull'anello per attacco a parete
-  **Non utilizzare parti metalliche per rendere ermetiche le scatole di derivazione cavi in plastica - Possibili scariche di corrente in caso di errato collegamento.**
- Utilizzare la guarnizione anche per i particolari da avvitare alla scatola di derivazione cavi.
- Per impieghi particolarmente gravosi (umidità) usare guarnizioni premontate.
- A seconda del tipo di introduzione cavo prevedere un arco di drenaggio acqua o rendere ermetico con mastice.
- Rendere ermetico il pressacavo sulle scatole di derivazione cavi in plastica con il KIT di guarnizione.
- Coppia di serraggio per il pressacavo: esecuzione in plastica 1,3 Nm esecuzione in metallo 2,6 Nm
- Fissare il cavo di collegamento del ventilatore con delle fascette fermacavo sulla griglia di protezione contro il contatto accidentale o sul puntone del motore.
- A seconda dell'esecuzione, i motori
  - possono essere equipaggiati con conduttori a freddo, interruttori termostatici cablati internamente, interruttori termostatici esterni oppure essere privi di protezione termica.
- I dispositivi vanno collegati come segue:
  - Conduttori a freddo all'unità di attivazione per conduttori a freddo.
-  Interruttori termostatici cablati internamente: non è né possibile né necessario il collegamento esterno. **Attenzione:** In seguito alla loro attivazione e il successivo raffreddamento, gli interruttori termostatici si reinseriscono automaticamente. Ciò può provocare l'avviamento del ventilatore.
- I termostati esterni vanno inseriti nel circuito elettrico di comando in modo tale che, in caso di guasto, dopo il loro raffreddamento essi **non possano reinserirsi automaticamente**. È possibile realizzare la protezione in comune di diversi motori tramite un unico dispositivo di protezione, a tale scopo occorre collegare in serie i termostati dei singoli motori. Va tenuto presente che in caso di anomalie termiche di un motore **tutti** i motori verranno disinseriti contemporaneamente. Nell'impiego pratico si preferisce pertanto riunire i motori in diversi gruppi in modo che, in caso di guasto di un motore, possa essere realizzato ancora un **funzionamento di emergenza** a potenza ridotta.
- Senza protezione termica: utilizzare un interruttore salvamotore!



## Betriebsbedingungen

- Ventilatoren nicht in explosionsfähiger Atmosphäre betreiben.
- Schalthäufigkeit:
  - Ventilatoren sind für Dauerbetrieb S1 bemessen.
  - Steuerung darf keine extremen Schaltbetriebe zulassen!
- Ziehl-Abegg Axialventilatoren sind für den Betrieb an Frequenzumrichter geeignet, wenn folgende Punkte beachtet werden:
  - Zwischen Umrichter und Motor sind **allpolig wirksame Sinusfilter** (sinusförmige Ausgangsspannung! Phase gegen Phase, Phase gegen Schutzleiter) einzubauen, wie sie von einigen Umrichterherstellern angeboten werden. Fordern Sie hierzu unsere Technische Information L-TI-0510 an.
  - **du/dt-Filter (auch Motor- oder Dämpfungsfiler genannt) dürfen nicht anstelle von Sinusfiltern eingesetzt werden.**
  - bei Verwendung von Sinusfiltern kann ggf. (Rückfrage beim Lieferanten des Sinusfilters) auf abgeschirmte Motorzuleitungen, auf Metall-Klemmenkästen und auf einen zweiten Erdleiteranschluss am Motor verzichtet werden.
- Wird der betriebsmäßige Ableitstrom von 3,5 mA überschritten, so sind die Bedingungen bezüglich Erdung gem. DIN EN 50 178, Abs. 5.2.11.1 zu erfüllen.
- Bei Drehzahlsteuerung durch elektronische Spannungsabsenkung (Phasenanschnitt) kann es je nach Einbausituation zu erhöhter Geräuschbildung durch Resonanzen kommen. Hier empfehlen wir die Verwendung des Frequenzumformers Fcontrol mit integriertem Sinusfilter.
- **Bei Fremdfabrikaten von Spannungssteuergerten und Frequenzumrichtern zur Drehzahlsteuerung unserer Ventilatoren können wir keine Gewährleistung für die ordnungsgemäße Funktion und für Schäden am Motor übernehmen.**
- A-bewerteter Schallleistungspegel grösser 80 dB(A) möglich, siehe Produktkatalog.
- IP55- Ventilatoren mit schleifender Dichtung können zusätzliche Geräusche verursachen.



## Inbetriebnahme

- Vor Erstinbetriebnahme prüfen:
  - Einbau und elektrische Installation fachgerecht abgeschlossen.
  - Sicherheitseinrichtungen montiert (→ Berührungsschutz).
  - Montagerückstände und Fremdkörper aus Ventilatorraum entfernt.
  - Schutzleiter angeschlossen.
  - Temperaturwächter/Motorschuttschalter fachgerecht angeschlossen und funktionsfähig.
  - Kabeleinführung dicht (siehe "Montage").
  - Stimmen Einbaulage und Anordnung der Kondenswasserlöcher überein.
  - Stimmen Anschlussdaten mit Daten auf Typenschild überein.
  - Stimmen die Daten des Betriebskondensators (1~ Motor) mit den Daten auf dem Typenschild überein.
  - Drehrichtung entspricht Drehrichtungspfeil auf Ventilatorflügel bzw. Ventilatorgehäuse.
- Inbetriebnahme darf erst erfolgen, wenn alle Sicherheitshinweise überprüft und eine Gefährdung ausgeschlossen ist.



## Condizioni di funzionamento

- *Se con motori di ventilatori per alimentazione monofase a 230V +/-10% la tensione di rete è costantemente superiore a 240V, in casi estremi può verificarsi l'attivazione del termostato. In questi casi utilizzare il successivo condensatore più piccolo.*
- *Non far funzionare i ventilatori in atmosfera esplosiva.*
- *Frequenza di commutazione:*
  - *I ventilatori sono progettati per il funzionamento continuo S1.*
  - *Il comando non deve permettere commutazioni troppo frequenti.*
- *I ventilatori assiali Ziehl-Abegg sono idonei per l'esercizio con convertitori di frequenza a patto che vengano rispettati i seguenti punti:*
  - *Tra convertitore e motore bisogna montare filtri sinusoidali **onnipolari efficaci** (tensione d'uscita sinusoidale, tra fase e fase, tra fase e cavo di terra), come vengono offerti da produttori di convertitori. Richiedete le nostre informazioni tecniche L-TI-0510.*
  - ***Filtri du/dt (chiamati anche filtri per motori o filtri di smorzamento) non devono essere utilizzati al posto dei filtri sinusoidali.***
  - *Con l'uso dei filtri sinusoidali si può rinunciare a linee di alimentazione per motori protette, a scatole di derivazione cavi di metallo e a un secondo collegamento a terra. Eventuali domande devono essere rivolte al fornitore del filtro sinusoidale.*
- *Se si supera la corretta corrente dispersa di 3,5 mA occorre usare la massa DIN EN 50 178, Art. 5.2.11.1.*
- *In caso di controllo del numero di giri attraverso la riduzione elettronica della tensione (intervento in fase) è possibile che si generi una elevata emissione acustica a causa di effetti di risonanza, a seconda della posizione di montaggio. In tal caso raccomandiamo l'impiego del convertitore di frequenza Fcontrol con filtro sinusoidale incorporato.*
- ***Impiegando dispositivi per il controllo a tensione e convertitori di frequenza di marca diversa per il controllo del numero di giri dei nostri ventilatori, la nostra azienda non può assumersi alcuna responsabilità in caso di danni al motore né garantirne il funzionamento corretto.***
- *È possibile un livello di potenza sonora ponderato A superiore a 80 dB(A), vedi il catalogo dei prodotti.*
- *I ventilatori IP55 con guarnizione strisciante possono causare rumori addizionali.*



## Messa in servizio

- *Da controllare prima della messa in servizio iniziale:*
  - *Il montaggio e l'allacciamento elettrico sono stati correttamente eseguiti.*
  - *I dispositivi di sicurezza sono stati montati (→ Protezione).*
  - *L'attrezzatura per il montaggio e i corpi estranei sono stati allontanati dal ventilatore.*
  - *Il cavo di messa a terra sia stato allacciato.*
  - *I protettori termici e il salvamotore sono stati correttamente allacciati e se sono funzionanti.*
  - *L'uscita cavo è ermetica (vedere "Montaggio").*
  - *La posizione di montaggio e quella dei fori di scarico condensa concordano.*
  - *I dati di allacciamento concordano con quelli dello schema.*
  - *I dati del condensatore di rifasamento (motore monofase) concordano con quelli dello schema.*
  - *Il senso di rotazione corrisponde alla direzione indicata dalla freccia sull'aletta ovvero sul corpo del ventilatore.*
- *La messa in esercizio deve avvenire solamente se tutte le indicazioni di sicurezza sono state verificate e se non è più possibile incorrere in qualche rischio.*

- Auf ruhigen Lauf achten. Starke Schwingungen durch unruhigen Lauf (Unwucht), z.B. durch Transportschaden oder unsachgemäße Handhabung, können zum Ausfall führen.



## Instandhaltung, Wartung, Reinigung

- **Bei allen Arbeiten am Ventilator im Gefahrenbereich:**
  - Nur durch ausgebildetes Fachpersonal vornehmen lassen.
  - Sicherheits- und Arbeitsvorschriften (DIN EN 50 110, IEC 364) beachten.
  - Der Rotor muss still stehen!
  - Stromkreis ist unterbrochen und gegen Wiedereinschalten gesichert.
  - Spannungsfreiheit feststellen.
  - Keine Wartungsarbeiten am laufenden Ventilator!
- **Halten Sie die Luftwege des Ventilators frei und sauber - Gefahr durch herausfliegende Gegenstände!**
- **Nassreinigung unter Spannung kann zum Stromschlag führen - Lebensgefahr!**
- Regelmäßige Inspektion, ggf. mit Reinigung erforderlich um Unwucht durch Verschmutzung zu vermeiden.
  - Durchströmungsbereich des Ventilators säubern.
- Der komplette Ventilator darf mit einem feuchten Putztuch gereinigt werden.
- Zur Reinigung dürfen keine aggressiven, lacklösenden Reinigungsmittel verwendet werden.
- **Verwenden Sie keinesfalls einen Hochdruckreiniger oder Strahlwasser zur Reinigung.**
- Vermeiden Sie Wassereintritt in den Motor und die elektrische Installation.
- Nach dem Reinigungsprozess muss der Motor zum Abtrocknen 30 Minuten bei 80-100% der max. Drehzahl betrieben werden, damit eventuell eingedrungenes Wasser verdunsten kann.
- Der Ventilator ist durch Verwendung von Kugellagern mit „Lebensdauerschmierung“ wartungsfrei. Nach Beendigung der Fettgebrauchsdauer (bei Standardanwendung ca. 30-40.000 h) ist ein Lageraustausch erforderlich.
- Achten Sie auf untypische Laufgeräusche!
- Achten Sie auf schwingungsarmen Lauf!
- Lagerwechsel nach Beendigung der Fettgebrauchsdauer oder im Schadensfalle durchführen (nicht bei Motorbaugröße 068). Fordern Sie dazu unsere Wartungsanleitung an oder wenden Sie sich an unsere Reparaturabteilung (Spezialwerkzeug!).
- Verwenden Sie bei Wechsel von Lagern nur Originalkugellager (Sonderbefettung Ziehl-Abegg).
- Bei allen anderen Schäden (z.B. Wicklungsschäden) wenden Sie sich bitte an unsere Reparaturabteilung.
- Bei 1~ Motoren kann die Kondensatorkapazität nachlassen, die Lebenserwartung beträgt ca. 30.000 Std. gem. DIN EN 60252.
- **Außenaufstellung: Bei längeren Stillstandszeiten in feuchter Atmosphäre wird empfohlen die Ventilatoren monatlich für mindestens 2 Std. in Betrieb zu nehmen, damit eventuell eingedrungene Feuchtigkeit verdunstet.**
- Ventilatoren der Schutzart IP55 oder höher: vorhandene verschlossene Kondenswasserbohrungen mindestens halbjährlich öffnen.
- Nach Laufraddemontage und Wiedermontage ist es zwingend notwendig, die gesamte rotierende Einheit nach DIN ISO 1940, T1 neu auszuwuchten.



## Manutenzione, pulizia

- **Durante tutti i lavori sul ventilatore all'interno della zona di pericolo:**
  - I lavori di riparazione devono essere eseguiti esclusivamente da personale qualificato e istruito.
  - Osservare le norme di sicurezza e le prescrizioni sul lavoro (DIN EN 50 110, IEC 364).
  - Il rotore deve essersi arrestato!
  - Il circuito elettrico è interrotto e bloccato contro accensione accidentale.
  - Accertare l'assenza di tensione.
  - Non effettuare lavori di manutenzione sul ventilatore in funzione!
- **Tenete puliti i canali di conduzione dell'aria del ventilatore - Elementi catapultati fuori possono rappresentare un forte pericolo!**
- **La pulizia con acqua sull'apparecchio sotto tensione può causare folgorazione - pericolo di morte!**
- È necessario effettuare ispezioni regolari e all'occorrenza rimuovere eventuali depositi presenti, al fine di evitare uno squilibrio dovuto alla presenza di sporcizia.
  - Pulire la zona del ventilatore attraversata dal flusso d'aria.
- Il ventilatore completo può essere pulito con un panno umido.
- Per la pulizia non è consentito utilizzare detergenti aggressivi o contenenti solventi.
- **In nessun caso adoperare un'idropulitrice ad alta pressione o getti d'acqua per la pulizia.**
- Evitare la penetrazione di acqua all'interno del motore e dell'installazione elettrica.
- Dopo la pulizia il motore deve essere asciugato facendolo funzionare per 30 minuti con 80-100% della velocità massima in modo da far evaporare eventuali residui di acqua penetrata all'interno.
- Grazie all'impiego di cuscinetti a sfere con "lubrificazione a vita", il ventilatore è esente da manutenzione. Al termine della durata di utilizzo del grasso (in caso di impiego standard ca. 30-40.000 h) è necessario sostituire il cuscinetto.
- Prestare attenzione all'eventuale presenza di rumori di funzionamento inusuali.
- Assicurare il funzionamento privo di vibrazioni!
- Effettuare la sostituzione dei cuscinetti al termine della durata di utilizzo del grasso o in presenza di danni (non per motori della dimensione costruttiva 068). A tale scopo richiedere le nostre istruzioni di manutenzione o rivolgersi al nostro reparto di riparazione (attrezzo speciale!).
- Nel cambio cuscinetti usare esclusivamente cuscinetti a sfere originali (ingrassaggio speciale Ziehl-Abegg).
- Per tutti i danni di altro tipo (ad es. danni agli avvolgimenti) rivolgersi cortesemente al nostro reparto di riparazione.
- In caso di motori monofase è possibile che si verichi una riduzione della capacità del condensatore, il ciclo di vita si aggira intorno a ca. 30.000 ore secondo DIN EN 60252.
- **Installazione all'aperto: In caso di fermate prolungate in atmosfera umida si consiglia di fare funzionare i ventilatori ogni mese per ca. 2 ore, al fine di fare evaporare l'umidità accumulatasi all'interno.**
- Ventilatori con grado di protezione IP55 o superiore: con scadenza almeno semestrale aprire gli eventuali fori per la condensa chiusi.
- In caso di smontaggio e successivo rimontaggio della girante è indispensabile eseguire nuovamente l'equilibratura dell'intera unità rotante secondo DIN ISO 1940,-1.

## Hersteller

Unsere Produkte sind nach den einschlägigen internationalen Vorschriften gefertigt.

Haben Sie Fragen zur Verwendung unserer Produkte oder planen Sie spezielle Anwendungen, wenden Sie sich bitte an:

**Ziehl-Abegg AG**  
**Heinz-Ziehl-Straße**  
**D-74653 Künzelsau**  
**Tel. 07940/16-0**  
**Fax 07940/16-300**  
**info@ziehl-abegg.de**

### **Serviceadresse**

Länderspezifische Serviceadressen siehe Homepage unter **[www.ziehl-abegg.com](http://www.ziehl-abegg.com)**

## Costruttore

*I nostri prodotti vengono fabbricati in conformità alle norme internazionali vigenti in materia.*

*In caso di quesiti relativi all'impiego dei nostri prodotti, rivolgersi cortesemente a:*

**Ziehl-Abegg AG**  
**Heinz-Ziehl-Strasse**  
**D-74653 Kuenzelsau**  
**Tel. 07940/16-0**  
**Fax 07940/16-300**  
**info@ziehl-abegg.de**

### **Indirizzi per l'assistenza**

*Per gli indirizzi di assistenza nei diversi Paesi, consultare la homepage sotto **[www.ziehl-abegg.com](http://www.ziehl-abegg.com)***

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# EG-Einbauerklärung

im Sinne der EG-Richtlinie Maschinen 2006/42/EG, Anhang II B

## Die Bauart der unvollständigen Maschine:

- Axialventilator FA.., FB.., FC.., FE.., FS.., FT.., FH.., FL.., FN.., VR.., VN..
- Radialventilator RA.., RD.., RE.., RF.., RG.., RH.., RK.., RM.., RR.., RZ.., GR.., ER..
- Querstromventilator QK.., QR.., QT.., QD.., QG..

## Motorbauart:

- Asynchron-Innen- oder -Außenläufermotor (auch mit integriertem Frequenzumrichter)
- Elektronisch kommutierter Innen- oder Außenläufermotor (auch mit integriertem EC-controller)

entspricht den Anforderungen von Anhang I Artikel 1.1.2, 1.1.5, 1.4.1, 1.5.1 der EG-Richtlinie Maschinen 2006/42/EG.

Hersteller ist die **Ziehl-Abegg AG**  
**Heinz-Ziehl-Straße**  
**D-74653 Künzelsau**

## Folgende harmonisierte Normen sind angewandt:

EN 60204-1:2006	Sicherheit von Maschinen; Elektrische Ausrüstung von Maschinen; Teil 1: Allgemeine Anforderungen
EN ISO 12100:2003	Sicherheit von Maschinen; Grundbegriffe, allgemeine Gestaltungsleitsätze
EN ISO 13857:2008	Sicherheit von Maschinen; Sicherheitsabstände gegen das Erreichen von Gefahrstellen mit den oberen Gliedmaßen
Hinweis:	Die Einhaltung der EN ISO 13857:2008 bezieht sich nur dann auf den montierten Berührschutz, sofern dieser zum Lieferumfang gehört.

Die speziellen Technischen Unterlagen gemäß Anhang VII B sind erstellt und vollständig vorhanden.

Bevollmächtigte Person für das Zusammenstellen der speziellen Technischen Unterlagen ist: Herr Dr. O. Sadi, Anschrift siehe oben.

Auf begründetes Verlangen werden die speziellen Unterlagen an die staatliche Stelle übermittelt. Die Übermittlung kann elektronisch, auf Datenträger oder auf Papier erfolgen. Alle Schutzrechte verbleiben bei o. g. Hersteller.

**Die Inbetriebnahme dieser unvollständigen Maschine ist so lange untersagt, bis sichergestellt ist, dass die Maschine, in die sie eingebaut wurde, den Bestimmungen der EG-Richtlinie Maschinen entspricht.**

Künzelsau, 29.12.2009

Dr. O. Sadi - Technischer Leiter Lufttechnik  
i.V. *Technical Director Air Movement Division*



# Dichiarazione di incorporazione CE

ai sensi della Direttiva CE sulle macchine 2006/42/CE, allegato II B

## Il tipo costruttivo della quasi-macchina:

- Ventilatori assiali FA., FB., FC., FE., FS., FT., FH., FL., FN., VR., VN..
- Ventilatori radiali RA., RD., RE., RF., RG., RH., RK., RM., RR., RZ., GR., ER..
- Ventilatori a flusso trasversale QK., QR., QT., QD., QG..

## Tipo di costruzione motore:

- Motore asincrono a rotore interno o esterno (anche con convertitore di frequenza integrato)
- Motore a rotore interno o esterno a commutazione elettronica (anche con controllore EC integrato)

**è conforme ai requisiti di cui all'allegato I, articolo 1.1.2, 1.1.5, 1.4.1, 1.5.1 della Direttiva CE sulle macchine 2006/42/CE.**

**Il costruttore è la**                    **Ziehl-Abegg AG**  
**Heinz-Ziehl-Straße**  
**D-74653 Künzelsau**

## Sono state applicate le seguenti norme armonizzate:

EN 60204-1:2006	Sicurezza delle macchine; equipaggiamento elettrico delle macchine; parte 1: Requisiti generali
EN ISO 12100:2003	Sicurezza della macchine; concetti fondamentali, principi generali di progettazione
EN ISO 13857:2008	Sicurezza della macchine; distanze di sicurezza per impedire il raggiungimento di zone pericolose con gli arti superiori
Avvertenza:	Il rispetto della norma EN ISO 13857:2008 si riferisce alla protezione contro il contatto accidentale montata solo qualora essa faccia parte della fornitura.

I documenti tecnici specifici secondo l'allegato VII B sono stati redatti e sono integralmente disponibili.

La persona autorizzata a raccogliere i documenti tecnici specifici è: Dr. O. Sadi, per l'indirizzo vedi sopra. Su richiesta motivata i documenti specifici vengono trasmessi all'autorità statale. La trasmissione può essere effettuata con mezzi elettronici, su supporto dati o in forma cartacea. Tutti i diritti di protezione rimangono di proprietà del costruttore sopraindicato.

**La messa in funzione della presente quasi-macchina è vietata finché non è assicurato che la macchina all'interno della quale essa è stata montata sia conforme ai requisiti della Direttiva CE sulle macchine.**

Künzelsau, li 29.12.2009

Dr. O. Sadi - Direttore tecnico del settore Tecnica di ventilazione

i.V. *Technical Director Air Movement Division*



# PICCOLO TERMOSTATO

## KTO 011 / KTS 011

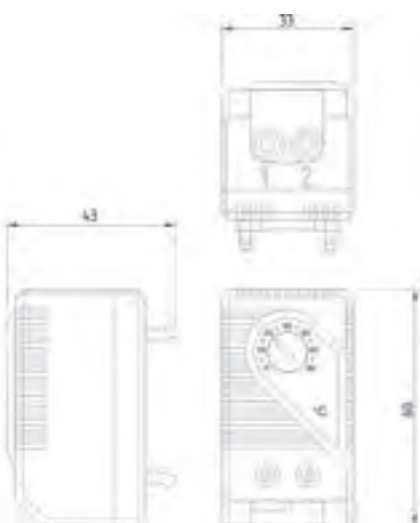


- > Ampio campo di regolazione
- > Piccole dimensioni

- > Semplice montaggio
- > Grande potere di apertura

**KTO 011:** contatto di apertura (NC) per la regolazione di apparecchi di riscaldamento. Il contatto apre quando la temperatura sale.

**KTS 011:** contatto di chiusura (NO) per la regolazione di apparecchi di raffreddamento, ventilatori con filtro, scambiatori di calore, ecc. e per il comando di elementi di segnalazione in caso di surriscaldamento. Il contatto chiude quando la temperatura sale.



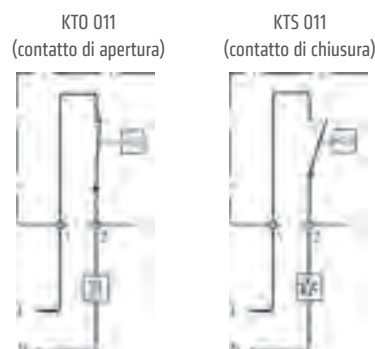
### DATA TECNICI

Isteresi di commutazione	7 K (tolleranza $\pm 4$ K)
Sonda	A bimetallo
Tipo di contatto	A scatto
Durata utile	> 100.000 cicli
Potere di apertura max.	250 V AC, 10 (2) A 120 V / AC, 15 (2) A 30 W DC da 24 V DC a 72 V DC
Corrente di accensione max.	16 A AC per 10 sec.
Connessione <sup>1</sup>	Morsetto bipolare, coppia di serraggio max 0,5 Nm: Filo rigido 2,5 mm <sup>2</sup> (AWG 14) Filo flessibile 1,5 mm <sup>2</sup> (AWG 16)
Fissaggio	Clip per guida DIN da 35 mm, EN 60715
Alloggiamento	Plastica UL94 V-0, grigio luminoso
Dimensioni	60 x 33 x 43 mm
Peso	Circa 40 g
Posizione di montaggio	Qualsiasi
Temperatura ambiente di funzionamento/magazzinaggio	-45 °C ... +80 °C (-49 °F ... +176 °F)
Umidità ambientale di funzionamento/magazzinaggio	max. 90 % RH (senza condensa)
Tipo di protezione	IP20

<sup>1</sup> Per la connessione con cavi flessibili devono essere utilizzati i terminali a boccia.

**Nota importante:** Il sistema dei contatti nel termostato può subire influenze dall'ambiente, di conseguenza la resistenza di contatto può variare. Questo può condurre ad una caduta del voltaggio oppure ad un surriscaldamento dei contatti.

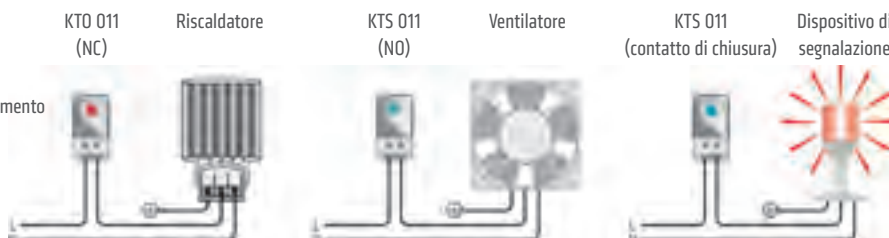
### Schema di collegamento



### Esempi di collegamento

riscaldamento

ventilatore con filtro, apparecchio di raffreddamento, dispositivo di segnalazione



Campi di regolazione	Cod. art. Contatto di apertura (NC)	Cod. art. Contatto di chiusura (NO)	Omologazioni			
0 °C ... +60 °C	01140.0-00	01141.0-00	VDE	-	-	EAC
-10 °C ... +50 °C	01142.0-00	01143.0-00	VDE	UL File No. E164102	-	EAC
+20 °C ... +80 °C	01159.0-00	01158.0-00	VDE	UL File No. E164102	CSA	EAC
+32 °F ... +140 °F	01140.9-00	01141.9-00	VDE	UL File No. E164102	CSA	EAC
+14 °F ... +122 °F	01142.9-00	01143.9-00	VDE	UL File No. E164102	CSA	EAC
0 °C ... +60 °C	01146.9-00	01147.9-00	VDE	UL File No. E164102	CSA	EAC





## SEZIONE 2

### 2.4 DICHIARAZIONE DI CONFORMITA'

F.Cherubin	prima emissione	A.Schiavo	07/08/2015	00
<i>Preparato da</i>	<i>Descrizione</i>	<i>Approvato da</i>	<i>data</i>	<i>Rev</i>

MANUALE D'USO





**DICHIARAZIONE CE DI CONFORMITÀ PER TRASFORMATORI ED APPARECCHIATURE IN OLIO**  
**EC DECLARATION OF CONFORMITY FOR OIL TRANSFORMERS AND OIL EQUIPMENTS**



Costruttore <i>Manufacturer</i>	<b>S.E.A. Società Elettromeccanica Arzignanese S.p.A.</b>
Categoria <i>Category</i>	<b>OTN ECO+P</b>
Codice <i>Code</i>	<b>TR00137678500000.</b>
Potenza <i>Rated Power</i>	<b>30000 kVA</b>
Matricola <i>Serial Number</i>	<b>MAT116206</b>
Anno di Costruzione <i>Year of Manufacture</i>	<b>2018</b>
Cliente <i>Customer</i>	<b>02405</b>
Conferma Ordine <i>SEA Reference</i>	<b>VEN016041 - 10</b>

**DICHIARIAMO CHE IL TRASFORMATORE O L'APPARECCHIATURA IN OGGETTO È CONFORME A QUANTO PRESCRITTO DA:**  
**DECLARE THAT THE TRANSFORMER OR THE EQUIPMENT MENTIONED ABOVE IS IN ACCORDANCE WITH THE PRESCRIPTION OF:**

Direttive <i>Directives</i>	<b>2009/125/CE</b>
Norme Internazionali <i>International Standards</i>	<b>IEC 60076-1</b> <b>IEC 60076-6</b> (Limitatamente ai reattori / <i>Limited to reactors</i> ) <b>EN 12100</b>
Norme Nazionali <i>National Standards</i>	<b>CEI EN 60076-1</b> <b>CEI EN 60076-6</b> (Limitatamente ai reattori / <i>Limited to reactors</i> )

**DICHIARANTE E PERSONA AUTORIZZATA A COSTITUIRE IL FASCICOLO TECNICO**  
**DECLARANT AND PERSON AUTHORISED TO COMPILE THE TECHNICAL FILE**

Cognome Nome / <i>Surname Name</i>	<b>Sartori Angelo</b>
Posizione / <i>Position</i>	<b>Direttore Generale / <i>General Manager</i></b>
Indirizzo / <i>Address</i>	Via Leonardo Da Vinci, 14 - 36071 Tezze di Arzignano (VI) - Italy
Luogo / <i>Place</i> : Tezze di Arzignano	Data / <i>Date</i> : 17/9/2018

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Direttive pertinenti ma non applicabili:  
*Relevant Directive but not applicable:*

2006/42/CE Direttiva Macchine  
Esclusione secondo articolo 2, lettera l.  
*2006/42/CE Machine Directive*  
*Excluded by article 2, letter l.*

2014/30/UE Direttiva Compatibilità Elettromagnetica  
Esclusione secondo articolo 2, comma 2, lettera d.  
*2014/30/UE Electromagnetic Compatibility Directive*  
*Excluded by article 2, sub 2, letter d.*

2014/35/UE Direttiva Bassa Tensione  
Superamento limiti applicabilità della Direttiva stabiliti da articolo 1.  
*2014/35/UE Low Voltage Directive*  
*Exceeding the scope of Directive indicated in article 1.*

