BRITISH STANDARD

BS EN
50464-2-1:2007

Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2 500 kVA with highest voltage for equipment not exceeding 36 kV —

Part 2-1: Distribution transformers with cable boxes on the high-voltage and/or low-voltage side — General requirements

The European Standard EN 50464-2-1:2007 has the status of a British Standard

ICS 29.180

National foreword

This British Standard is the UK implementation of EN 50464-2-1:2007. It supersedes BS 7821-2.1:1995 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/14, Power transformers.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English version

Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2 500 kVA with highest voltage for equipment not exceeding 36 kV - Part 2-1: Distribution transformers with cable boxes on the high-voltage and/or low-voltage side - General requirements

Transformateurs triphasés de distribution immergés dans l'huile, 50 Hz, de 50 kVA à 2 500 kVA, de tension la plus élevée pour le matériel ne dépassant pas 36 kV - Partie 2-1: Transformateurs de distribution raccordés par boîtes à câble côté haute tension et/ou côté basse tension - Prescriptions générales

Ölgefüllte Drehstrom-Verteilungstransformatoren 50 Hz, 50 kVA bis 2 500 kVA, mit einer höchsten Spannung für Betriebsmittel bis 36 kV - Teil 2-1: Verteilungstransformatoren mit Kabelanschlusskästen auf der Ober- und/oder Unterspannungsseite - Allgemeine Anforderungen

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of the Harmonization Document HD 428.2.1 S1:1994, prepared by the Technical Committee CENELEC TC 14, Power transformers, was submitted to the formal vote for conversion into a European Standard and was approved by CENELEC as EN 50464-2-1 on 2006-12-01.

The following date was fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2007-12-01

The EN 50464 series consists of the following parts, under the general title “Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2 500 kVA with highest voltage for equipment not exceeding 36 kV”:

Part 1	General requirements
Part 2-1	Distribution transformers with cable boxes on the high-voltage and/or low-voltage side – General requirements
Part 2-2	Distribution transformers with cable boxes on the high-voltage and/or low-voltage side – Cable boxes type 1 for use on distribution transformers meeting the requirements of EN 50464-2-1
Part 2-3	Distribution transformers with cable boxes on the high-voltage and/or low-voltage side – Cable boxes type 2 for use on distribution transformers meeting the requirements of EN 50464-2-1
Part 3	Determination of the power rating of a transformer loaded with non-sinusoidal currents
Part 4	Requirements and tests concerning pressurised corrugated tanks

Contents

Figures

Introduction

EN 50464-1, Subclause 4.3 states that a distribution transformer could have different termination features.

The following constructional situations are possible.

i) Termination in open type (oil-air) bushings without protection. This is covered by EN 50464-1, EN 50180, EN 50386 and EN 50387.

ii) Termination in plug-in type bushings of inside or outside cone type. This is covered by EN 50464-1 and EN 50180.

iii) Termination in air filled or compound filled cable boxes or protective enclosure using open type and/or oil/compound oil-oil bushings, as defined in EN 50464-2-2.

iv) Flange boxes and similar solutions using open type bushings can also be used.

1 Scope

EN 50464-2-1 covers, in conjunction with EN 50464-1, distribution transformers under iii) and iv) above, up to 36 kV (the data from 24 kV to 36 kV are under consideration). Further documents exist which may be used by agreement between purchaser and manufacturer for cable boxes and enclosures. The dimensional requirements for cable boxes and protective enclosures are not enclosed in this document.

2 Definitions

For the purposes of this document, distribution transformers shall be classified according to the following definitions:

2.1
transformers with cable boxes, side mounted
transformer with electrical characteristics in the range defined in EN 50464-1, with facings on the transformer tank side for provision of cable boxes Type 1. These facings shall be on opposite sides of the transformer (as Figure 1)

2.2
transformers with cable boxes or similar, cover mounted
transformer with electrical characteristics in the range defined in EN 50464-1, with terminations mounted on the tank cover. The terminations exit in such a way as to provide for cables on opposite sides of the transformer. The type of termination can be either cable box Type 1 or cable box Type 2 (as per Figures 3 or 4)

2.3
unit substation transformer, side mounted
transformer with electrical characteristics in the range defined in EN 50464-1, having facings on the transformer tank side for provision of HV switchgear and LV equipment. These facings shall be on the same side of the transformer (as per Figure 2)

2.4
unit substation transformer, cover mounted
transformer with electrical characteristics in the range defined in EN 50464-1, with terminations mounted on the tank cover and enclosed in a flange box. Figure 5 shows a typical arrangement, however, dimension should be agreed between manufacturer and purchaser

2.5
cable boxes, Type 1
metallic box designed for receiving and protecting the ends of HV or LV cables so that the cable dielectric may be effectively sealed against moisture damage. A minimum protection of IP54 is required. These boxes are not specified in this section. A higher protection, IP65, may be necessary to satisfy termination requirements

2.6
cable boxes, Type 2
metallic or non metallic enclosure designed to prevent accidental contact with live parts. The enclosure can be common to HV and LV terminations or be independent for HV and LV. A protection between IP33 and IP55 is required and is subject to agreement between manufacturer and purchaser

2.7
flange box
enclosure designed to provide flanges for mounting ancillary equipment on opposite sides of the transformer as per Figures 5 and 6. The box is mounted on the cover of the transformer. The IP rating is dependent on the mounted equipment and is subject to agreement between manufacturer and purchaser

3 Electrical characteristics

These shall comply with EN 50464-1, Clause 3. In respect of EN 50464-1, 3.11 a), also list 1 for impulse withstand voltage is admitted. To derive the insulation and dielectric test level, the impulse withstand voltage shall be taken from EN 60076-3, Table 2, as agreed between manufacturer and purchaser.

4 Design characteristics

4.1 Type of oil preservation and degree of sealing

These shall comply with EN 50464-1, 4.1.

4.2 Terminal markings

These shall comply with EN 50464-1, 4.2.

4.3 Provision for cable box Type 1 connections

Facings shall be provided for mounting HV and LV bushing assemblies and cable boxes, as detailed in Figures 1, 2 and 3 of this document.

Fixing methods shall be provided on transformer facings positioned as defined on the appropriate drawings given in Figures 1, 2, and 3.

4.4 Provision for cable box Type 2

Facings shall be provided for mounting HV and LV bushings assemblies with cable box Type 2 as shown in Figures 4 and 5. The use of independent HV and LV enclosures shall be subject to agreement between manufacturer and purchaser.

5 Transformer requirements

5.1 Transformers with cable boxes, mounted on both sides

Limiting dimensions are indicated in Figure 1.

The underbase is generally in the form of skids, provided with axle holes.

Four jacking lugs shall be provided, if specified by the purchaser.

Two lifting fittings shall be provided of adequate section. These shall be positioned to facilitate lifting in a reasonably upright position, taking into account the cable box weight. These weights to be given by the purchaser if necessary.

Unless otherwise stated, cable boxes Type 1 as defined in 2.5 shall be fitted to the high voltage facing and a bushing assembly shall be fitted to the low voltage facing. The termination of the low voltage shall be specified by purchaser at time of enquiry.

Other accessories shall comply with EN 50464-1, Clause 5 and shall preferably be mounted on one end of the tank and shall not be obstructed by coolers

Unless otherwise agreed, two earthing terminals shall be fitted on the centre line, one below each connection facing, with the connection hole placed on the lower part of the tank.

5.2 Transformers with cable boxes, cover mounted

There are no limiting dimensions.

The accessories shall comply with Clause 5 of EN 50464-1.

5.2.1 Cable box Type 1

A cable box Type 1 shall be fitted to the high voltage flange. The termination of the low voltage shall be as specified by the purchaser at time of enquiry.

One method of cover mounting cable boxes Type 1 is shown in Figure 3 of this document which defines its own flange fitting that shall always be maintained.

5.2.2 Cable box Type 2

A cable box Type 2 is provided for either both high voltage and low voltage termination or only one of them. This shall be agreed between manufacturer and purchaser.

One method of cover mounting cable boxes Type 2 is shown in Figure 4 of this document.

5.3 Unit substation transformer, with cable boxes mounted on the same side

Limiting dimensions are indicated in Figure 2.

A stable fixing for HV switchgear equipment can be requested by the purchaser, in a position as indicated in Figure 2. The requirements of this fixing shall be capable of supporting an agreed load and designed so as to not load the facing flange.

An LV bushing plate assembly shall be provided on a mounting pocket. The mounting pocket flange face shall lie in the same plane as the face of the pocket provided for the HV ring main equipment. The termination of the low voltage shall be specified by the purchaser.

The flange face of the mounting pockets of HV/LV shall be flat and sufficiently robust to prevent distortion and oil leakage when the agreed equipment is bolted thereto.

The transformer tank with its cover shall be capable of withstanding the combined loads of the agreed attached equipment without distortion. The transformer shall not be moved or lifted in this condition and shall be stable.

Lifting fittings shall be provided on the transformer's tank of adequate section to facilitate lifting that transformer and fittings in a reasonably upright position, with or without the agreed attached equipment.

5.4 Unit substation transformer with flange boxes, cover mounted

The general arrangement in the case of common HV and LV flange box is shown in Figure 5. For independent HV and LV enclosures, see 4.4. A typical flange for interfacing between the flange box and Type 2 cable boxes is shown in Figure 6.

The accessories shall comply with Clause 5 of EN 50464-1.

6 Distance between bushings

The distance between bushings is detailed in further sections of this document.

7 Tests

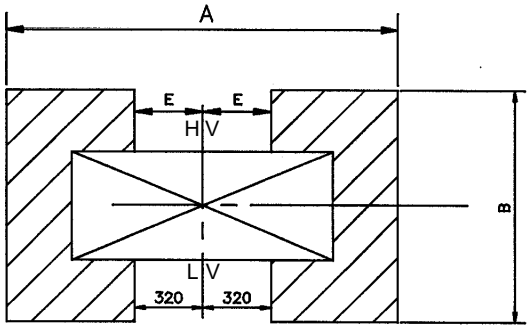
Type and routine tests of the transformers should be in accordance with EN 50464-1. The transformer may be tested without cable boxes.

If it is required to test with boxes attached, then in the case of fully insulated air filled boxes it is allowed to perform tests with the cable boxes filled with oil.

The fitting with oil is not allowed for the purpose of type testing air filled boxes.

Other test requirements may be required as a consequence of further sections of this document.

PLAN VIEW

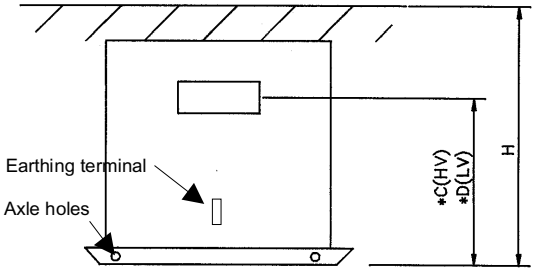


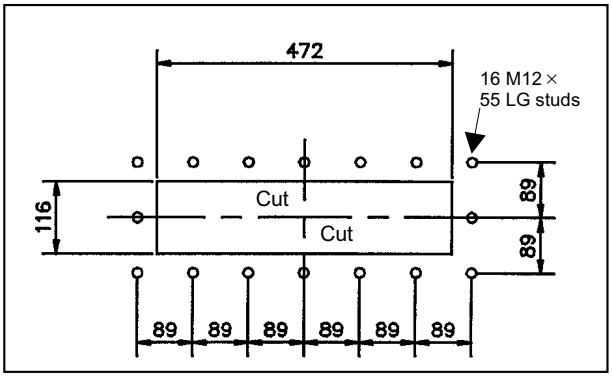
	E min.
For ≤ 12 kV	280
For ≤ 24 kV	360

E dimensions and HV flange size are suitable for partial or fully insulated cable boxes.

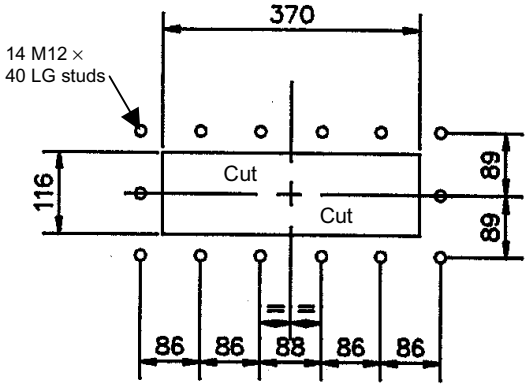
Shaded area indicates maximum protection beyond tank walls

SIDE VIEW





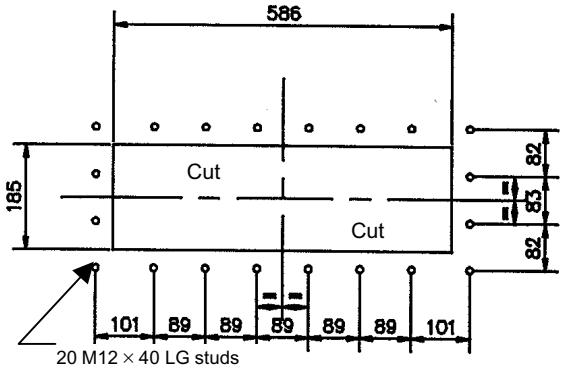
LV FLANGE



HV FLANGES for ≤ 12 kV

Rating kVA	A max.	B max.	*C	*D	H max.
160-200	1 350	1 050	1 200	1 100	1 550
230-315	1 680	1 145	1 320	1 320	1 750
400-500	1 700	1 220	1 320	1 320	1 830
630-800	1 830	1 320	1 320	1 320	1 980
1 000	1 980	1 420	1 3201	1 320	1 980
1 600	To be agreed between manufacturer and purchaser				
2 500	To be agreed between manufacturer and purchaser				

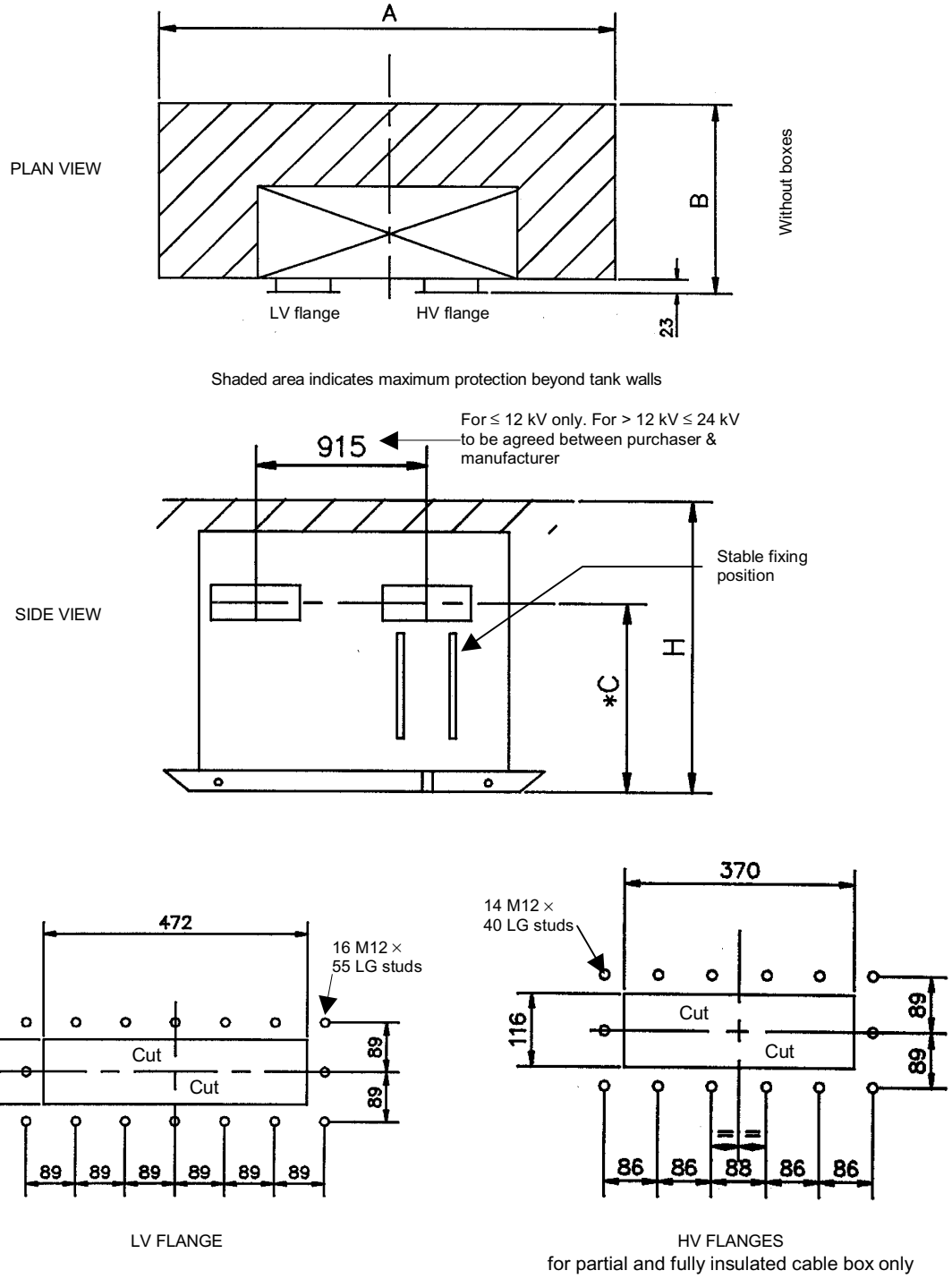
* Distances C and D can be altered at a purchaser's request.



HV FLANGES for > 12 kV & ≤ 24 kV

Hole sizes in cable boxes to be included in EN 50464-2-2.
All dimensions are in mm unless otherwise indicated

Figure 1 – Transformer with cable boxes, Type 1 side mounted – Limiting dimensions



Rating kVA	A max.	B max.	*C	H max.
315	1 800	970	1 320	1 700
500	1 900	970	1 320	1 750
800	2 100	970	1 320	1 800
1 000	2 300	970	1 320	1 850
1 600	To be agreed between manufacturer and purchaser			
2 500	To be agreed between manufacturer and purchaser			

* Distance C can be altered at a purchaser's request.

All dimensions are in mm unless otherwise indicated

Figure 2 – Unit substation transformer, with cable boxes Type 1 side mounted – Limiting dimensions

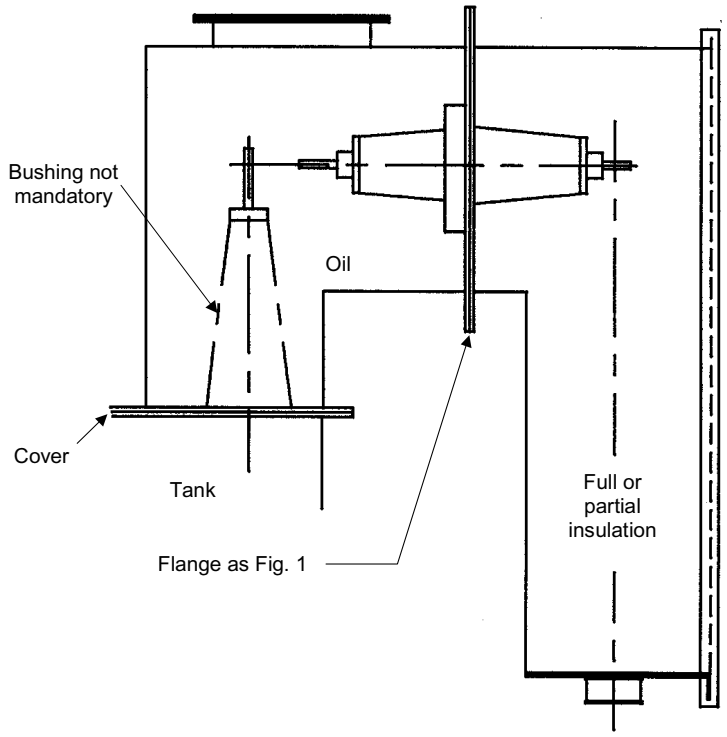
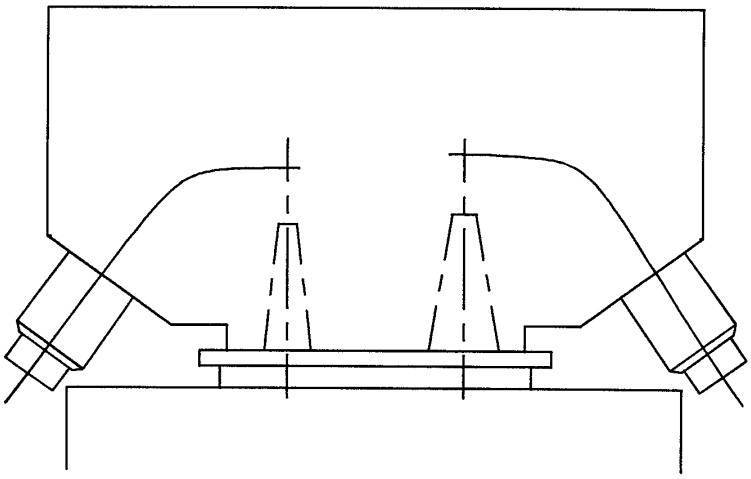
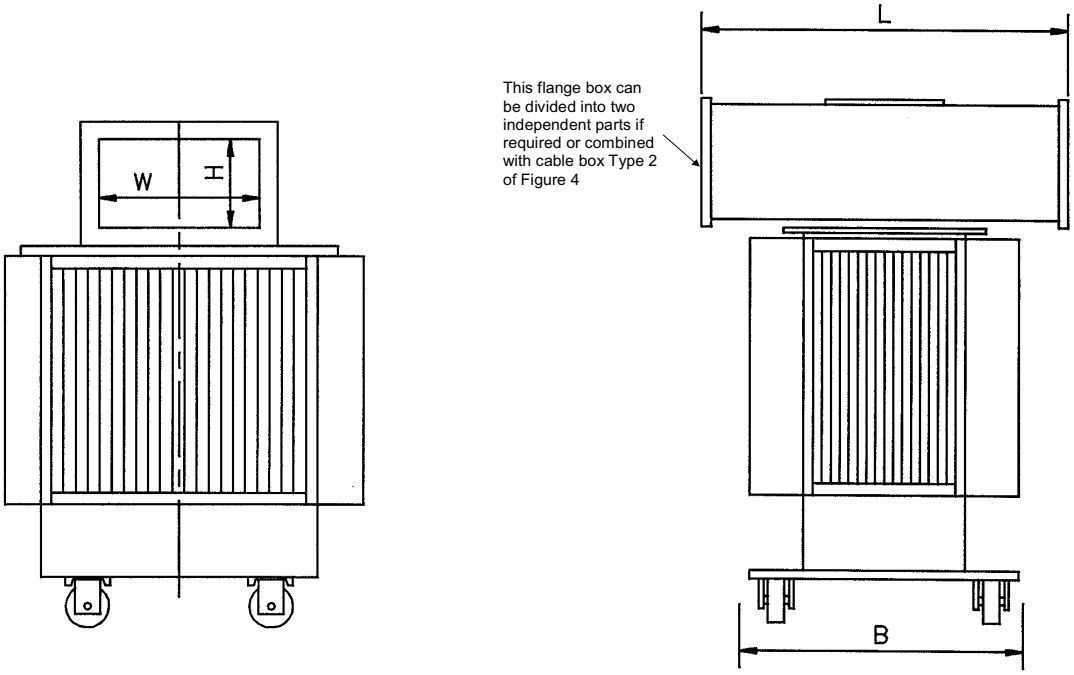


Figure 3 – Transformers with cable boxes, Type 1 cover mounted



Position and direction of the cable studs otherwise as shown above can be subject to agreement between manufacturer and purchaser

Figure 4 – Cover mounted, air filled common HV/LV cable box Type 2

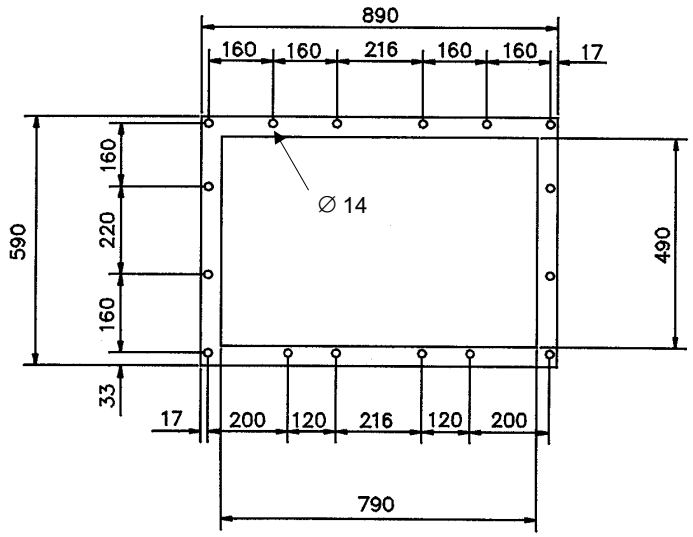


W, H and L are subject to agreement between manufacturer and purchaser

Typical dimensions		
KVA	L	B max.
315 to 630	1 100	1 050
800 to 1 600	1 400	1 350

All dimensions are in mm unless otherwise indicated

Figure 5 – Unit substation transformers, cover mounted



LV and HV flange

All dimensions are in mm unless otherwise indicated

Figure 6 – Typical flange for flange box

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