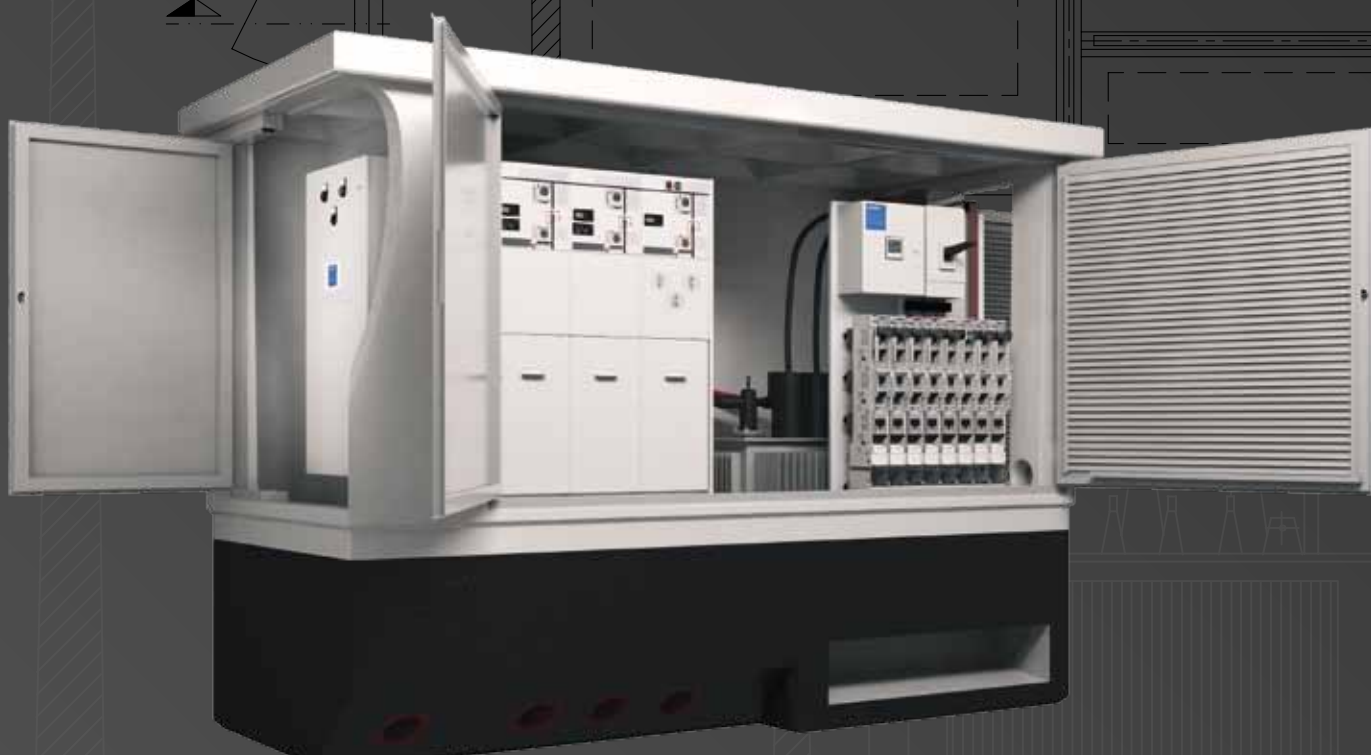


INTELLIGENT TRANSFORMER SUBSTATION HKP-E / HKP-E-U



THE PERFECT SUBSTATION FOR THE SMART GRID OF THE FUTURE

Manufactured in accordance with IEC 62271-202
(VDE 0670-202)

Suitable for use with transformers up to 630 kVA

Various options for external cladding design

Arc tested with a variety of MV switchgear systems,
including ABB Safe-Ring / Safe Plus, Ormazabal GAE,
Schneider FBX and Siemens 8DJH

Substation with separate telecontrol compartment for
communication link

Supplied with full complement of electrical equipment,
ready for connection

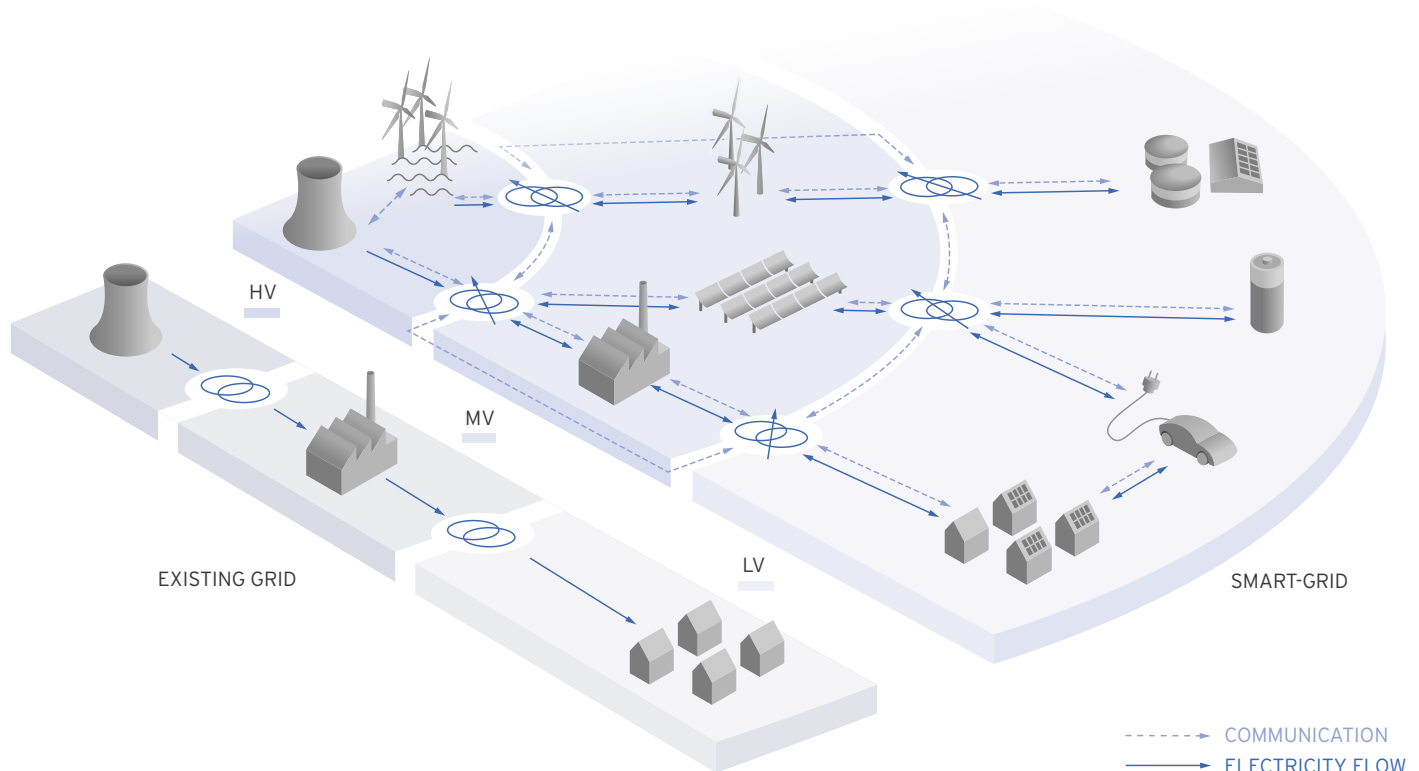
HKP-E-U is arc tested with air-insulated MV metering
panels, including Elley MF10/20 and Ormazabal GAE-1Mx

COMPETENCY
RIGHT FROM
THE START

THE SMART GRID OF THE FUTURE IS SWIFTLY BECOMING REALITY

The rapid conversion of transmission and distribution networks into an intelligent electricity grid (smart grid) is inevitable and is already a reality today in many service areas. The existing passive grid is essentially characterised by centralised generation and unidirectional load flow. In contrast, the active smart grid stands for decentralised generation and flexible load flow, regulated by intelligent control systems using communication and routing technology.

The implementation and operation of smart grids requires the use of intelligent system components at all levels, with the ability to communicate with one another, especially at the individual grid hubs. In medium voltage distribution networks, the transformer substations in particular must be optimised for future needs in order to meet the new demands placed on them, and they must be standardised to allow cost-effective grid operation.



WHAT REQUIREMENTS DOES THE SMART GRID POSE ON TRANSFORMER SUBSTATIONS?

In addition to the capability for continuous status monitoring with dedicated sensors, the grid hubs must incorporate actuators to enable the execution of local autonomous control algorithms. They must also perform centrally controlled grid management in their respective supply areas.

For the grid operator, this makes it possible to remedy faults more rapidly and hence reduce downtimes.

The standardised HKP-E/HKP-E-U transformer stations made by GRÄPER already enable the cost-effective integration of intelligent substation components as well as measurement and telecontrol technology, such as:

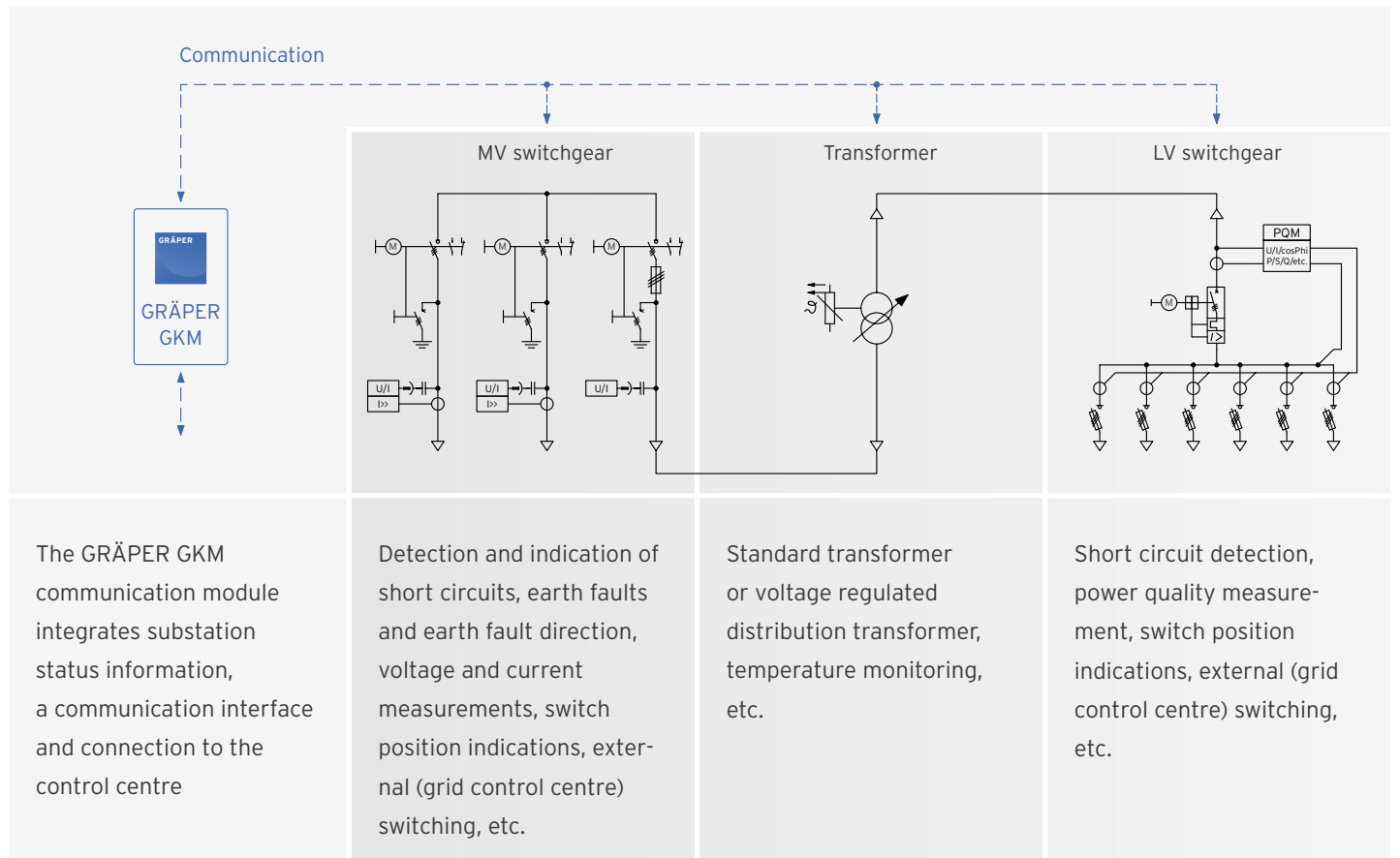
- voltage regulated distribution transformer
- MV switchgear systems with monitoring and telecontrol units
- LV distribution systems with monitoring and telecontrol units
- Communication interfaces in the substation, e.g. GRÄPER GKM
- Connection to the grid control centre via optical fibre, BPL, GSM, UMTS, Tetranet, etc.



THE HKP-E/HKP-E-U SUBSTATION AS AN INTEGRATED SYSTEM

On the one hand, the components of the HKP-E/HKP-E-U intelligent transformer substations are based on the refinement and extension of standardised and proven distribution network technology that has already been in use for many years. On the other hand, the development and implementation of new, equally robust substation components is essential to meet the additional demands on the electricity grid of the future.

The use of a voltage regulated distribution transformer, additional network sensors and communication units such as the GRÄPER GKM module permits active and controlled grid operation using both locally autonomous and centrally controlled substation automation.



SECONDARY SECTION

EXTENDED MODEL: HKP-E / HKP-E-U

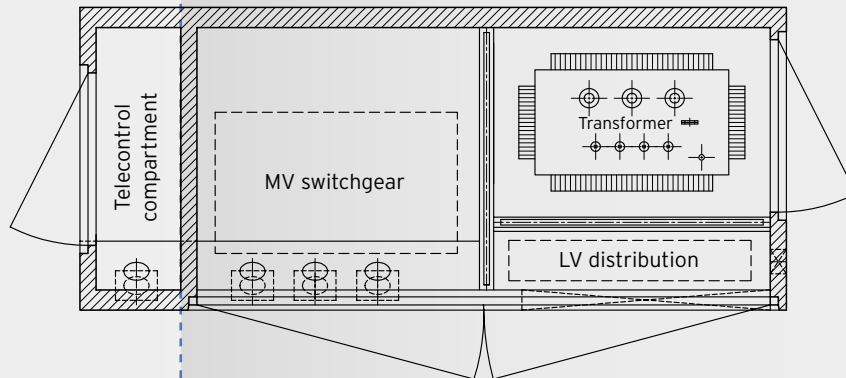
- Standard HKP / HKP-U substation extended with a physically separate telecontrol compartment
- Separate access to the telecontrol compartment for appropriately trained service staff (operational safety)
- Separation of secondary equipment from primary equipment (transformer compartment) improves ambient conditions for secondary equipment

PRIMARY SECTION

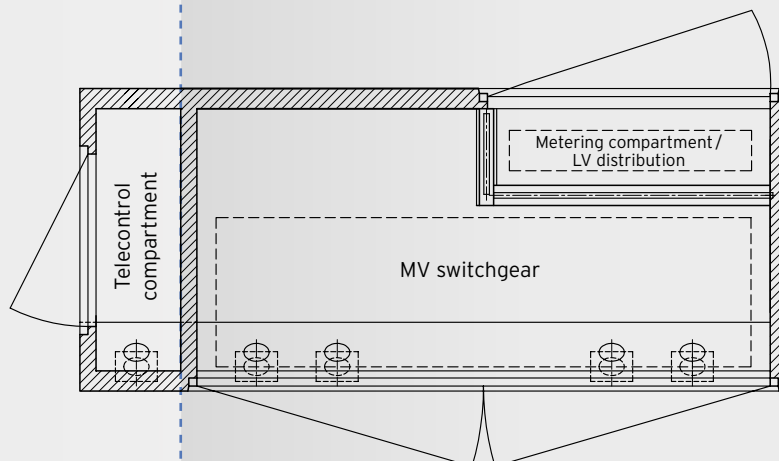
BASE MODEL: HKP / HKP-U

- Standard HKP / HKP-U substation complies with the following type tests:
 - Arc testing in accordance with IEC 62271-202
 - Thermal testing in accordance with IEC 62271-202
 - EMC testing in accordance with 26th German Federal Immission Control Ordinance (BimSchV)
 - Design certification in accordance with IEC 61439-2
- Separate access to the primary section for appropriately trained service staff, e.g. 20 kV fitters (operational safety)
- Enables different locking systems for primary and secondary equipment

HKP-E



HKP-E-U





1. SUBSTATION DESCRIPTION

The HKP-E / HKP-E-U compact substation is conceived as an intelligent and space-saving transformer substation with a wide range of equipment options. It has been optimised for use in the power range up to 630 kVA. The primary section of the substation with the MV switchgear, transformer* and LV distribution panel is physically separated from the secondary section containing the communication and telecontrol technology. The substation is manufactured in compliance with the relevant provisions such as IEC, DIN, VDE and UVV, and the following standards in particular:

- IEC 62271-202 (VDE 0671-202)
- DIN 1045:2008-08
- 26th BimSchV
- WHG (German Water Resources Act)

The substation has been successfully arc tested - and classified IAC-AB-20kA/1s - with all established switchgear manufacturers, including ABB, Ormazabal, Schneider Electric and Siemens. In addition, the HKP-E-U variant is suitable for use with air-insulated metering panels made by Elley and Ormazabal in arc tested versions classified as IAC-AB-20kA/1s.

2. CONSTRUCTION

The body of the station consists of two monolithically prefabricated concrete elements (body and roof). The MV cables are fed in using a watertight entry system (eg Hauff). An open cable entry slot in the basement allows to enter with the LV cables. It is also possible to feed in the MV cables through an open entry duct with a fixed attachment plate.

3. DOORS AND VENTILATION

All substation doors and ventilation components made by us can be manufactured from either galvanised steel or aluminium, depending on the customer's choice. The doors are equipped with door stops, copper earthing straps and swivel lever locks for either one or two profile cylinders. Two-point interlocking systems for each door leaf allow the doors to be closed without any risk of arcing. The ventilation grills are pick-proof and can be optionally fitted with stainless steel insect screens.

4. ELECTRICAL EQUIPMENT

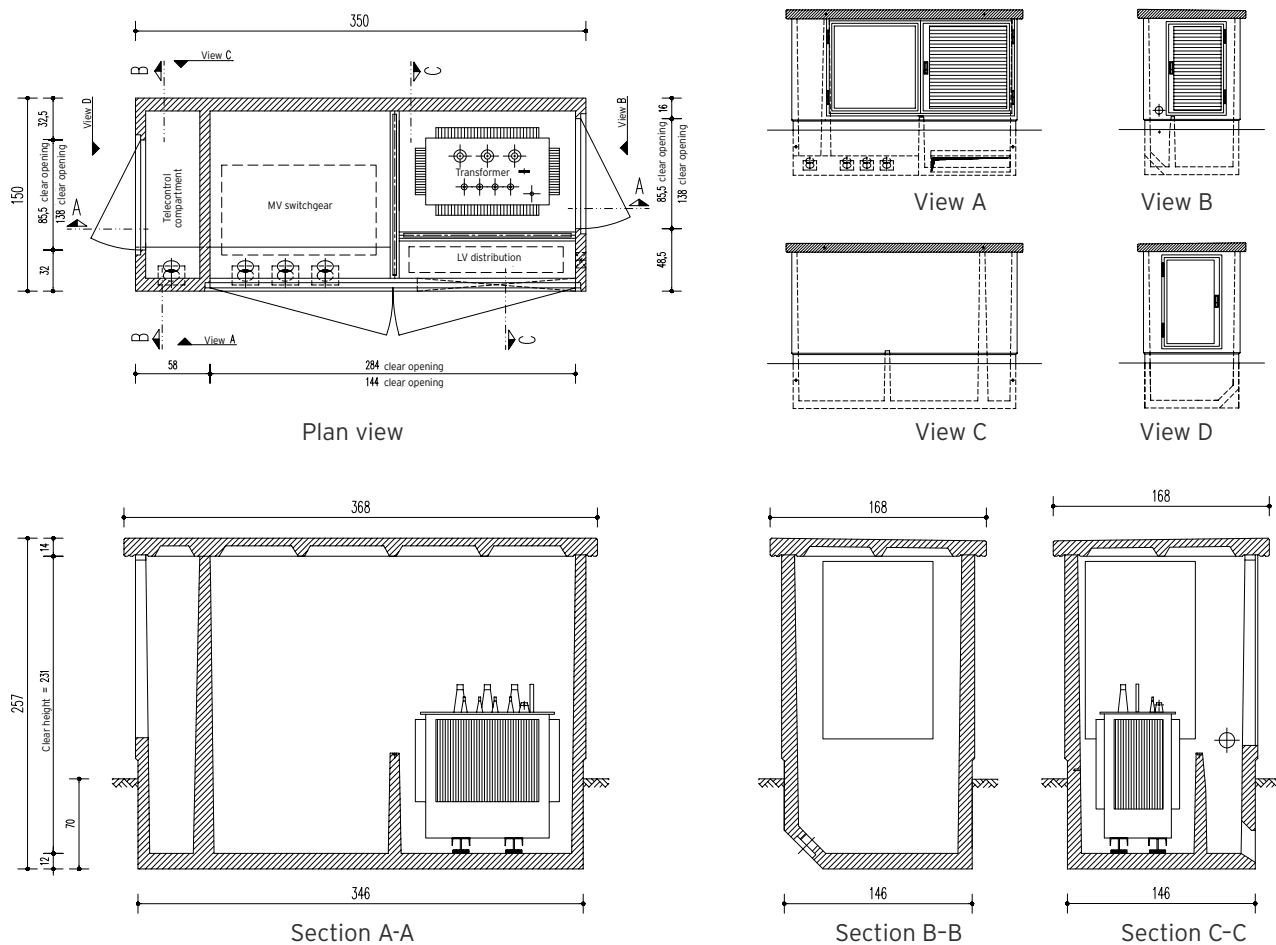
Fitting of the electrical equipment of the substation, including the medium voltage switchgear, transformer*, low voltage distribution metering panel, telecontrol system and communications module, MV and LV cables, earthing, etc. is performed at the factory according to customer specifications in compliance with IEC 62271-202.

5. TRANSPORT & INSTALLATION

The substation is delivered by truck to the site as a complete unit ready for connection and is set down in the foundation pit with the aid of a truck-mounted or mobile crane. Four lifting points in the base are provided for lifting the substation.

*n.a. in HKP-E-U

Technical drawing HKP-E



TECHNICAL DATA FOR HKP-E

Enclosure class:	K10 / K15 / K20 (depending on transformer dissipation class)
Protection rating:	IP23D as per EN 62271-202 (higher protection rating optionally available)
External dimensions:	W x D x H = 3,500 x 1,500 x 2,570 mm (plus 90 mm roof overhang all round)
Installation depth in basement:	approx. 700 mm
Height above ground level:	approx. 1,870 mm
Weight (total empty weight):	approx. 7.9 t (including approx. 1.3 t roof weight)
Lifting fittings:	substation anchors: 4 x RD30 / roof anchors: 4 x RD18

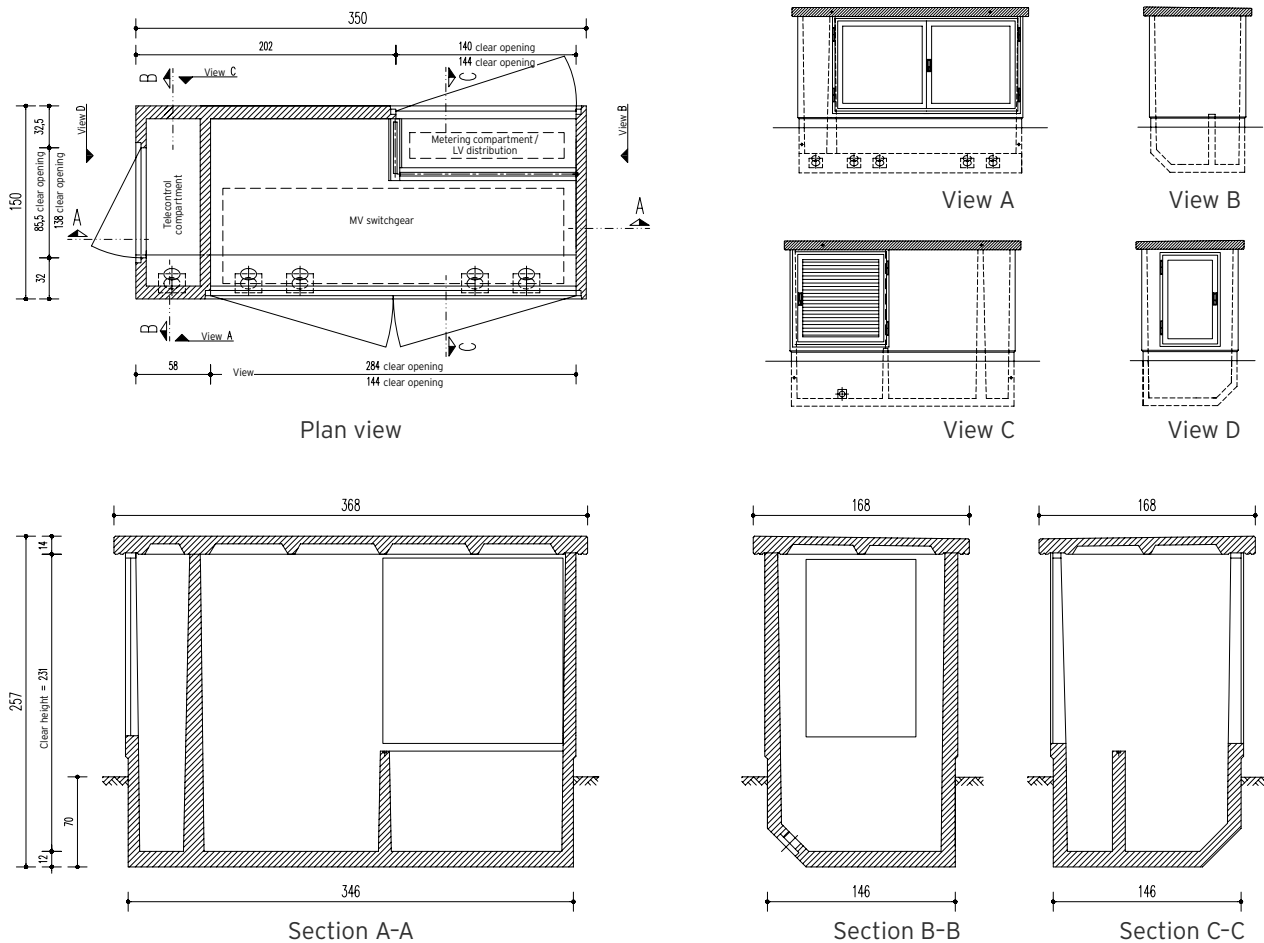
MAXIMUM NUMBER OF INSTALLED COMPONENTS

Transformer:	MV switchgear:	LV distribution:	Secondary equipment:
$P_{\max} = 630 \text{ kVA}$	SF6 gas-insulated, up to 4 bays	Rack distribution panel	Cabinet distribution panel
$L_{\max} = 1,300 \text{ mm}$	$W_{\max} = 1,450 \text{ mm}$	$W_{\max} = 1,350 \text{ mm}$	$W_{\max} = 850 \text{ mm}^{(1)}$
$H_{\max} = 2,100 \text{ mm}$	$H_{\max} = 1,400 \text{ mm}$	$H_{\max} = 1,400 \text{ mm}$	$H_{\max} = 1,350 \text{ mm}$
$W_{\max} = 870 \text{ mm}$	$D_{\max} = 850 \text{ mm}$	$D_{\max} = 300 \text{ mm}$	$D_{\max} = 350 \text{ mm}$

⁽¹⁾ Variant with $W_{\max} = 1,100 \text{ mm}$ available on request.



Technical drawing HKP-E-U



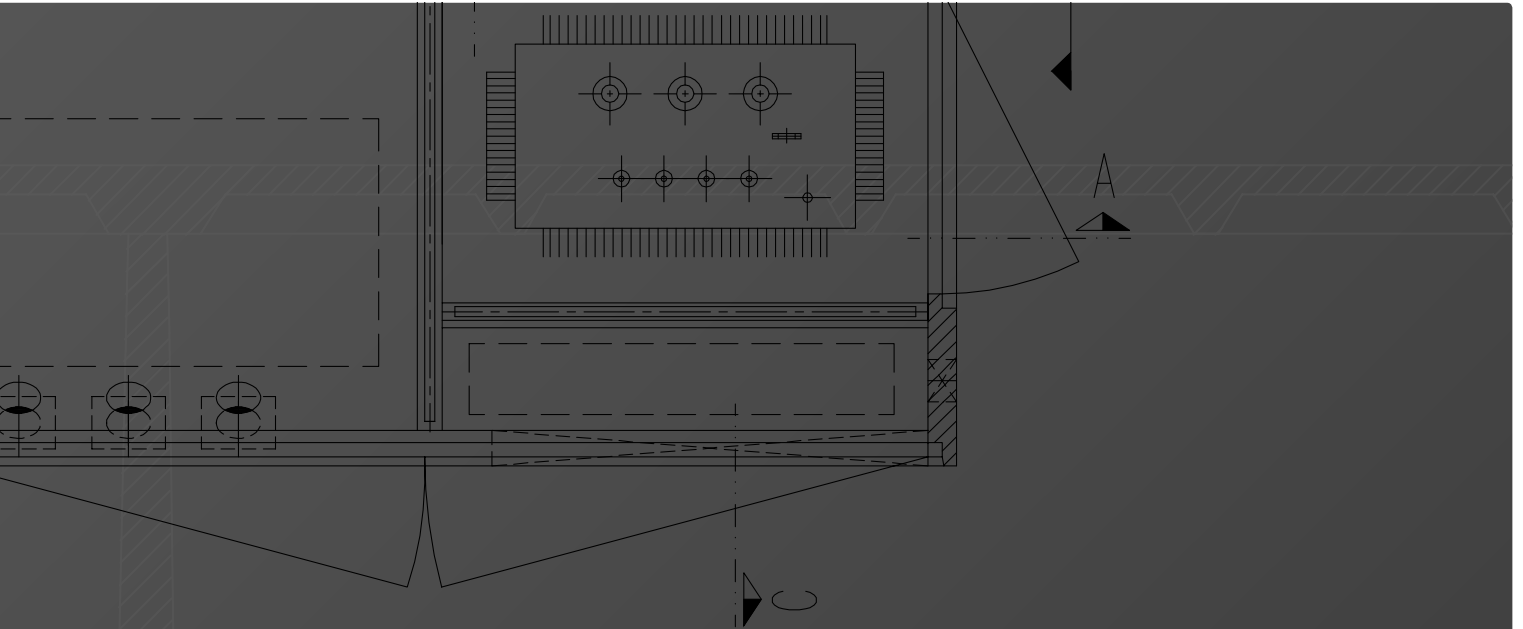
TECHNICAL DATA FOR HKP-E-U

Enclosure class:	K5 / K10 / K15 (depending on equipment power dissipation)
Protection rating:	IP23D as per EN 62271-202 (higher protection rating optionally available)
External dimensions:	W x D x H = 3,500 x 1,500 x 2,570 mm (plus 90 mm roof overhang all round)
Installation depth in basement:	approx. 700 mm
Height above ground level:	approx. 1,870 mm
Weight (total empty weight):	approx. 7.7 t (including approx. 1.3 t roof weight)
Lifting fittings:	substation anchors: 4 x RD30 / roof anchors: 4 x RD18

MAXIMUM NUMBER OF INSTALLED COMPONENTS

MV switchgear / MV metering panel:	LV distribution / metering panel:	Secondary equipment:
SF6 gas-insulated / air-insulated metering panel	Meter cabinet / rack distribution panel	Cabinet distribution panel
W _{max} = 2,700 mm	W _{max} = 1,350 mm	W _{max} = 850 mm ⁽¹⁾
H _{max} = 1,400 mm	H _{max} = 1,350 mm	H _{max} = 1,350 mm
D _{max} = 850 mm	D _{max} = 300 mm	D _{max} = 350 mm

⁽¹⁾ Variant with W_{max} = 1,100 mm available on request.



Specialist company as defined under § 19 I WHG
(German Water Resources Act)

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