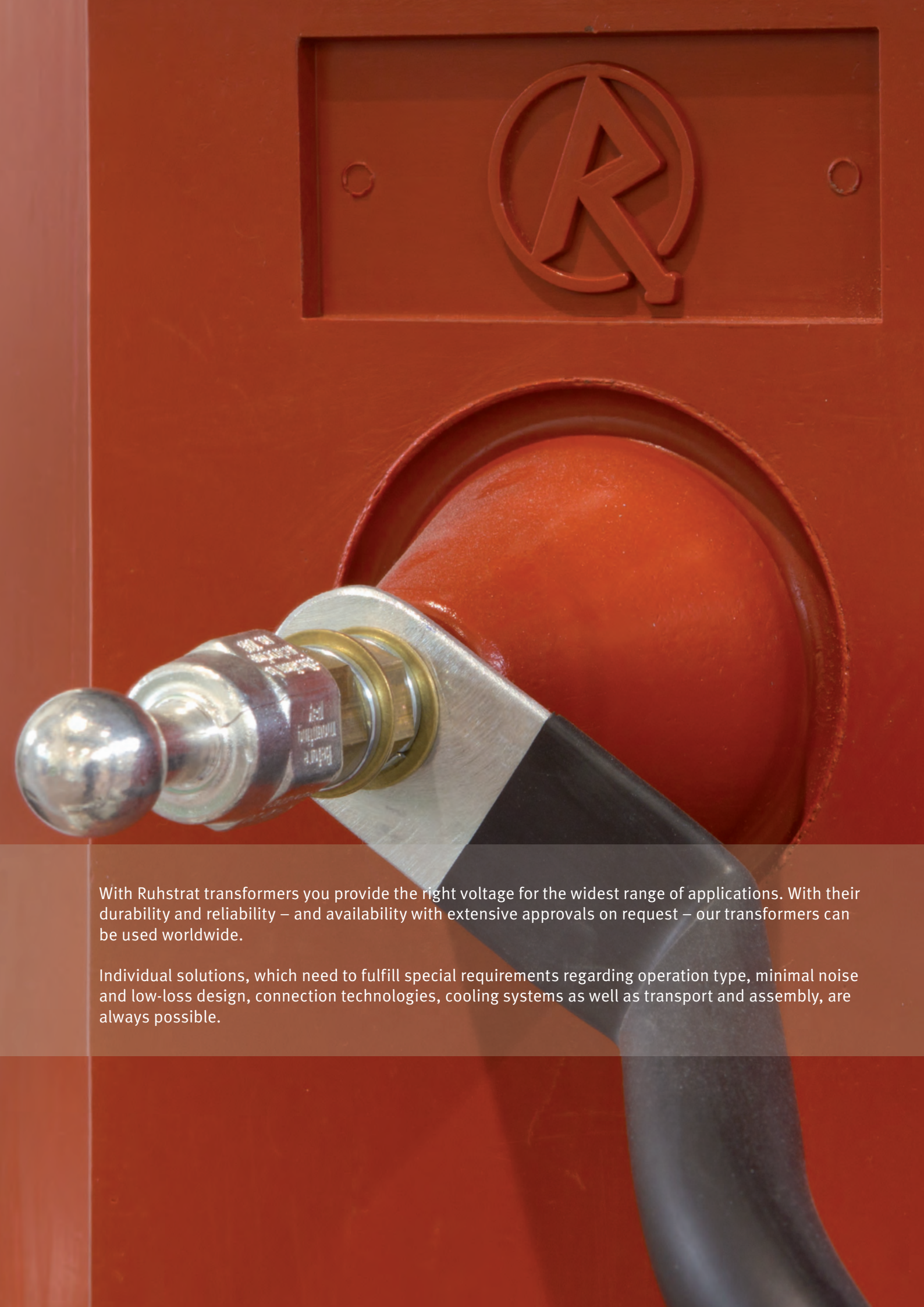
Ruhstrat®
A brand of the Eisenmann Group

Ruh-CaRT Basic
8 Years Warranty
<5pC partial discharges

CAST-RESIN TRANSFORMERS ACCORDING TO IEC 60076-11:2004, VDE 0532-76-11:2005-04, DIN EN 50588-1:2016-03, REGULATION (EU) NR. 548/2014



With Ruhstrat transformers you provide the right voltage for the widest range of applications. With their durability and reliability – and availability with extensive approvals on request – our transformers can be used worldwide.

Individual solutions, which need to fulfill special requirements regarding operation type, minimal noise and low-loss design, connection technologies, cooling systems as well as transport and assembly, are always possible.

CONTENTS

GENERAL

Ruhstrat offers cast-resin transformers with power outputs up to 20 MVA and series voltages up to 36 kV, as power converter, distribution or special transformers. Ruhstrat cast-resin transformers feature numerous functions which make them a very reliable and safe solution.

To ensure optimal products, materials from first-class suppliers are used, such as grain-oriented electric sheets, aluminium and copper coil material using band and foil technology, as well as high-quality insulating materials (cast resin, Mylar, Nomex).

The advantages for you as the customer are:

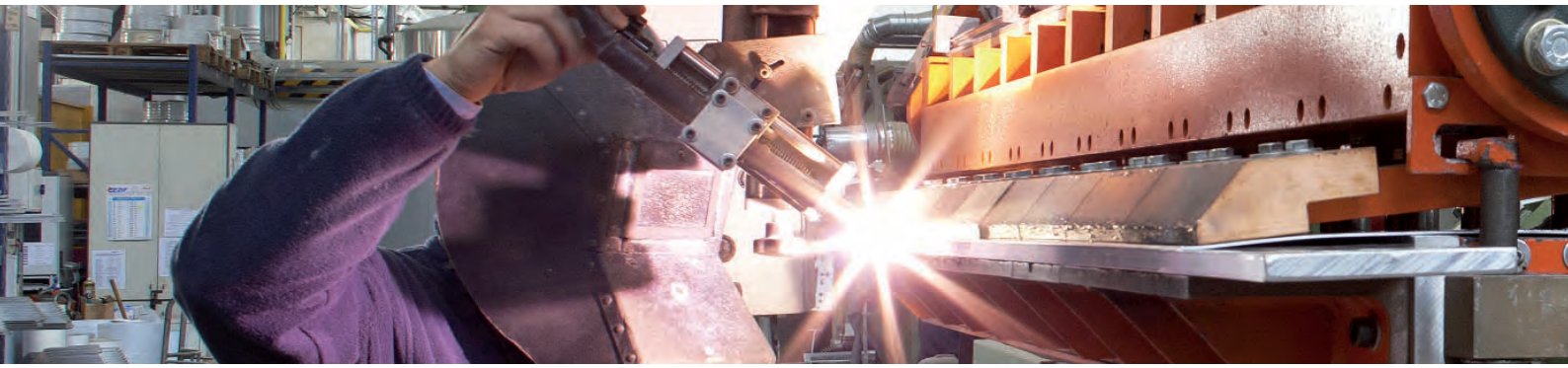
- Reliable control of high surge voltages
- Thermal reserves allow an overload within a specific time period
- Prevention of damage from temperature shocks
- Long service life
- Economical power conversion with reduced no-load losses

Certified safety

GL ISO 9001
GL Systems Certification

ZVEI

Ruhstrat cast-resin transformers are manufactured in accordance with IEC 60076-11:2004, VDE 0532-76-11:2005-04, DIN EN 50588-1:2016-03, Regulation (EU) Nr. 548/2014 as well as special country-specific regulations and customer requirements. Due to compliance with climate class C2, environmental class E2 and fire class F1, they fulfil the most stringent requirements for safe installation in residential and work environments.



Standard design of Ruhstrat cast-resin transformers

- HV material: Aluminium or copper
- LV material: Aluminium or copper
- Insulation class: F
- Climate class C2 / Environmental class E2 / Fire class F1 according to IEC/EN 60076-11:2004

Types of Ruhstrat cast-resin transformers

- Distribution transformer
- Transformer for 6, 12, 18 or 24 pulse rectifier operation
- Double-stack transformer and multi-winding transformer
- Step-up transformer
- Transformer for wind power
- Starting transformer
- Test transformer, e.g. in combination with a variable transformer

Project-specific types

Individual solutions, which fulfil special requirements with respect to the operating mode, low-noise and low-loss design, connection technology, cooling, transport and setup are possible at any time.

CAST-RESIN TRANSFORMERS – 10 KV

Input voltage	10 kV ± 2 × 2,5 %	**Insulation class**	12 / 28 / 75
Output voltage	400 V	**Insulation class**	‹1,1 / 3 / -
Winding material	Al / Al		
Winding temperature rise	100 / 100 K		
Frequency	50 Hz		
Vector group	Dyn5		
Vcc	6 %		
Environmental class/ Climate class/Fire class	E2 - C2 - F1 (Type Test Certificate CESI A9032391)		

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Power [kVA]	Losses	No-load losses [W]	Load loss [W]	Io	Lwa	Weight [kg]	Width [mm]	Depth [mm]	Height [mm]	Distance between wheels [mm]
100	AoAk-Reg548	280	1800	1,8	51	830	1200	600	1260	520
100	AoBk-Reg548	280	2050	1,8	51	800	1200	600	1200	520
160	AoAk-Reg548	400	2600	1,6	54	950	1200	600	1350	520
160	AoBk-Reg548	400	2900	1,6	54	1000	1250	600	1330	520
200	AoAk-Reg548	450	2955	1,4	55	1050	1250	600	1360	520
200	AoBk-Reg548	450	3300	1,4	55	1100	1250	600	1350	520
250	AoAk-Reg548	520	3400	1,2	57	1200	1350	600	1340	520
250	AoBk-Reg548	520	3800	1,2	57	1120	1300	600	1360	520
315	AoAk-Reg548	615	3875	1,1	58	1350	1350	750	1400	670
315	AoBk-Reg548	615	4535	1,1	58	1350	1350	750	1400	670
400	AoAk-Reg548	750	4500	1	60	1570	1350	750	1480	670
400	AoBk-Reg548	750	5500	1	60	1500	1350	750	1480	670
500	AoAk-Reg548	900	5630	0,9	60	1650	1350	750	1620	670
500	AoBk-Reg548	900	6410	0,9	60	1650	1400	750	1600	670
630	AoAk-Reg548	1100	7100	0,9	62	2000	1500	850	1700	670
630	AoBk-Reg548	1100	7600	0,9	62	1950	1450	850	1670	670
800	AoAk-Reg548	1300	8000	0,8	64	2400	1500	850	1800	670
1000	AoAk-Reg548	1550	9000	0,7	65	2900	1600	1000	1940	820
1250	AoAk-Reg548	1800	11000	0,7	67	3300	1650	1000	2050	820
1600	AoAk-Reg548	2200	13000	0,5	68	4050	1800	1000	2120	820
2000	AoAk-Reg548	2600	16000	0,5	70	4850	1900	1310	2160	1070
2500	AoAk-Reg548	3100	19000	0,4	71	5950	2050	1400	2340	1070
3150	AoAk-Reg548	3800	22000	0,4	74	7000	2150	1400	2360	1070

CAST-RESIN TRANSFORMERS – 20 KV

Input voltage	20 kV ± 2 × 2,5 %	**Insulation class**	24/ 50/ 95
Output voltage	400 V	**Insulation class**	‹1,1 / 3 / -
Winding material	Al/ Al		
Winding temperature rise	100/ 100 K		
Frequency	50 Hz		
Vector group	Dyn5		
Vcc	6 %		
Environmental class/ Climate class/Fire class	E2 - C2 - F1 (Type Test Certificate CESI A9032391)		

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Power [kVA]	Losses	No-load losses [W]	Load loss [W]	Io	Lwa	Weight [kg]	Width [mm]	Depth [mm]	Height [mm]	Distance between wheels [mm]
100	AoAk-Reg548	280	1800	1,8	51	920	1250	600	1280	520
100	AoBk-Reg548	280	2050	1,8	51	900	1250	600	1280	520
160	AoAk-Reg548	400	2600	1,6	54	1040	1250	600	1360	520
160	AoBk-Reg548	400	2900	1,6	54	1050	1250	600	1360	520
200	AoAk-Reg548	450	2955	1,4	55	1200	1350	600	1370	520
200	AoBk-Reg548	450	3300	1,4	55	1140	1350	600	1370	520
250	AoAk-Reg548	520	3400	1,2	57	1350	1350	680	1360	520
250	AoBk-Reg548	520	3800	1,2	57	1350	1350	680	1360	520
315	AoAk-Reg548	615	3875	1,1	58	1450	1350	750	1420	670
315	AoBk-Reg548	615	4535	1,1	58	1420	1350	750	1420	670
400	AoAk-Reg548	750	4500	1	60	1680	1450	750	1490	670
400	AoBk-Reg548	750	5500	1	60	1600	1450	750	1490	670
500	AoAk-Reg548	900	5630	0,9	60	1790	1450	750	1620	670
500	AoBk-Reg548	900	6410	0,9	60	1800	1450	750	1620	670
630	AoAk-Reg548	1100	7100	0,9	62	2150	1550	850	1730	670
630	AoBk-Reg548	1100	7600	0,9	62	2150	1550	850	1730	670
800	AoAk-Reg548	1300	8000	0,8	64	2550	1550	850	1840	670
1000	AoAk-Reg548	1550	9000	0,7	65	3150	1650	1000	1980	820
1250	AoAk-Reg548	1800	11000	0,7	67	3650	1750	1000	2070	820
1600	AoAk-Reg548	2200	13000	0,5	68	4600	1900	1000	2150	820
2000	AoAk-Reg548	2600	16000	0,5	70	5550	2000	1310	2230	1070
2500	AoAk-Reg548	3100	19000	0,4	71	6300	2150	1310	2350	1070
3150	AoAk-Reg548	3800	22000	0,4	74	8250	2300	1400	2510	1070

DETAILED VIEW

LV connections
upwards (standard) or downwards version (on request)

Lifting eyebolts
conform to the DIN-580 standards with safety hooking at 4 points

Rating plate

HV connections
upwards (standard) or downwards version (on request)

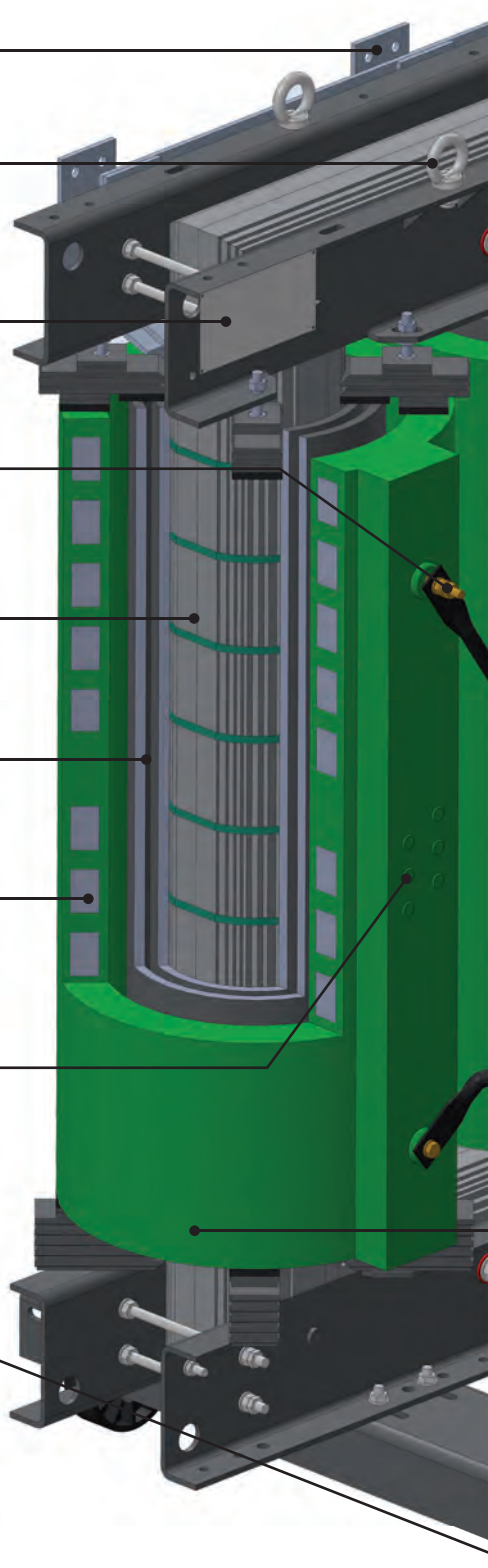
Core in three columns
made of magnetic steel laminations with high-permeability oriented crystals, available with different level of losses

LV windings
made of aluminium strip foil (available in copper) impregnated in resin under vacuum

HV windings
made of aluminium strip coils (available in copper) and cast in resin under vacuum

Off-load tapping links
on the HV side to adapt the primary voltage to the mains, which can be set with transformer switched OFF

Carriage with bi-directional rollers
The carriage allows safe movement and is pre-equipped for the mounting of an IP reinforced boxes



- HV winding material: Aluminium or copper
- LV winding material: Aluminium or copper
- Insulation class: F
- Environment class: E2/E3/E4
- Climate class: C2
- Fire class: F1

Terminal box

for temperature probes

Temperature monitoring

The operating temperature is checked by
Pt100 sensor or PTC which are mounted in the LV windings

Delta connection

Structure, armatures and carriage

made in strong painted sheet steel
(available on request hot – dip galvanized)

Earthing terminals

Pulling holes

HV epoxy resin insulation

makes the transformer suitable for low maintenance. Class 155°C (F) insulating material, withstanding a temperature rise of 100K

TECHNICAL INFORMATION – ACCESSORIES AND MONITORING

In addition to the basic components of a transformer – such as the iron core, HV and LV winding and the mechanical frame – additional cast-resin transformer equipment is usually needed for integrating the transformer in the particular electrical system.

We offer the following optional equipment: Protective enclosures, transformer monitoring units, vibration dampers, fixed ball points for connecting an earthing and short-circuiting device, as well as cross-flow fans.

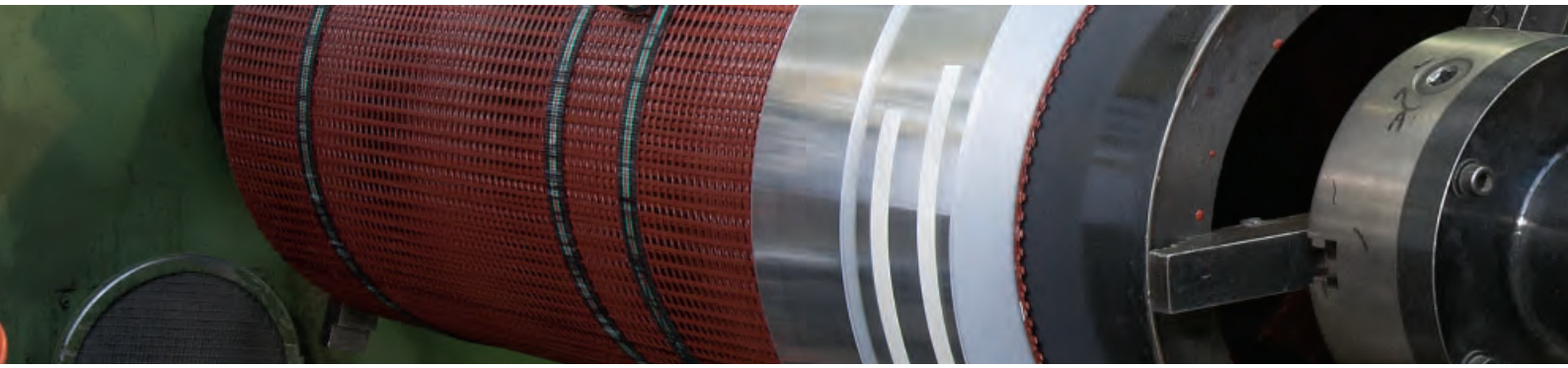
Protective enclosures for cast-resin transformers
The technical concept of the protective enclosure allows decentral installation of the transformers directly at the load centres (feeders). To protect the cast-resin transformer against environmental influences and to protect operating personnel from contact with live parts, we offer various protective enclosures for the transformers.

The protective enclosure is designed for single installation of Ruhstrat cast-resin transformers in electrical facilities, for indoor areas (IP20 or IP21) and for outdoor installation (IP31). The standard enclosures are designed for power ranges from 160 kVA to 2500 kVA. For transformers with higher power, protective enclosures are customized for individual requirements.

Enclosure

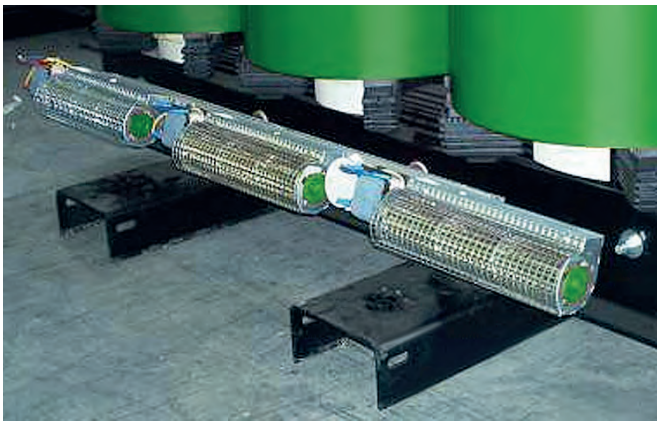
The enclosure is made of self-supporting sheet steel components, which are designed as single components for high inherent stability. Installation of the single components for use with existing transformers can be carried out quickly with no special knowledge. Four masonry bolts anchor the enclosure in the floor. To prevent noise, there is no mechanical connection to the transformer itself.

The protective enclosures for indoor installation are made of synthetic coated sheet steel components (standard colour: RAL 7035). In the enclosures for outdoor installation, the sheet steel



CRT Power [kVA]	Weight [kg]	Length [mm]	Width [mm]	Height [mm]
100-160	140	1700	950	1580
200-250-315	160	1800	1000	1680
400-500	180	1900	1050	1950
630-800	210	2050	1100	2200
1000-1250	280	2300	1310	2500
1600-2000	300	2500	1310	2700
2500-3150	370	2700	1400	2900

Technical data enclosure



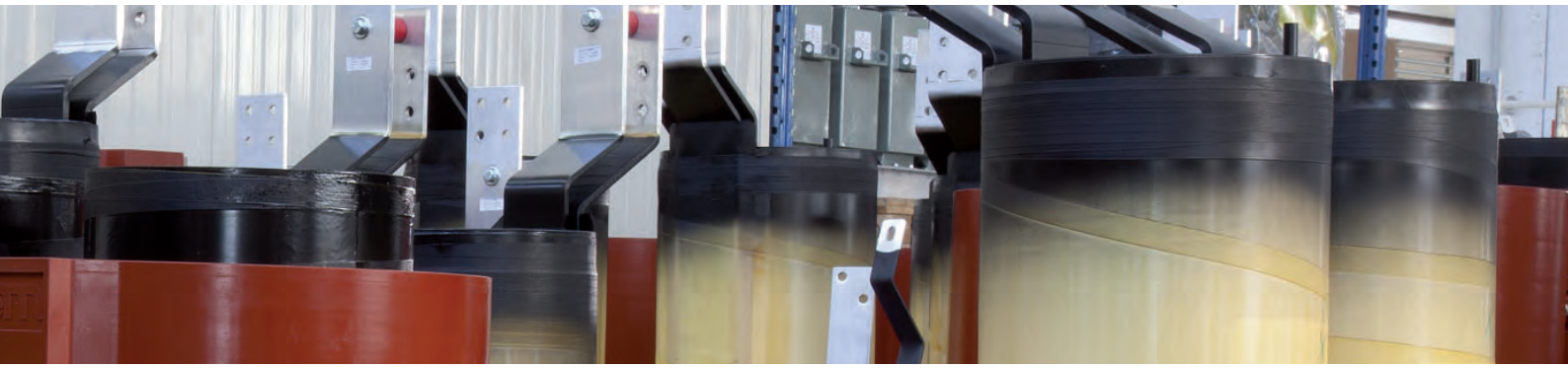
Cross-flow fan: Increase power by up to 40 % by installing cross-flow fans

components are additionally galvanized and the ventilation slots are made of seawater-proof unpainted sheet aluminium. All enclosure parts are earthed by means of earthing bolts. As standard equipment, the enclosure features two cable holders for cables routed from below. The cables are guided within the enclosure to the transformer connections. For connections routed from above or from the side, cable entries or flanged frames can be provided on request in the top or the side walls.

The natural ventilation within the enclosure and the construction of the enclosure surface is designed so that there is no power reduction as compared with the open version with protection type IP00.

Increased power with cross-flow fans

To increase the power output, the cast-resin transformer with natural cooling (AN) can be converted to forced cooling (AF) by installing cross-flow fans. The power output can be increased by up to 40 % in this way. This option gives planning personnel further freedom in the design of the plant.



TECHNICAL INFORMATION – ACCESSORIES AND MONITORING

Surge arrester

HV winding connections

Generally, it is possible to make use of the increased power output in forced cooling mode (AF) in normal operation without affecting the service life.

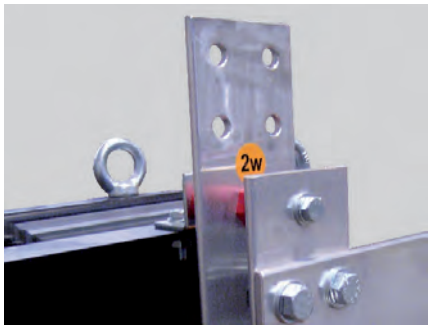
The safety concept preferably provides for a distributor network with two or more cast-resin transformers. If the transformers are dimensioned so that approx. 70 % of the power output is required in normal operation – an optimal design for reasons of economy – in the event that one transformer fails, the increased power output due to forced cooling of the other transformer would be sufficient to compensate for the total output of the failed transformer without restrictions.

Electrical connections

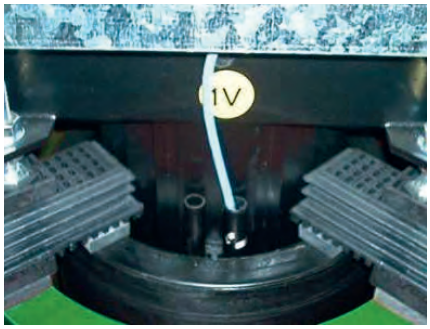
High-voltage and low-voltage connections are located opposite each other on the side walls of the transformer. The high-voltage connection points are mechanically and electrically integrated in the high-voltage cast resin coil, together with the tapping bars for the voltage conversion (standard ± 2 × 2.5 %). The low-voltage connecting rails, including the star point, lead out through the top.

These are the standard connections for the Dyn5 vector group; other project-specific connections are available on request.

HV winding connections with ball connection bolts



LV winding connections

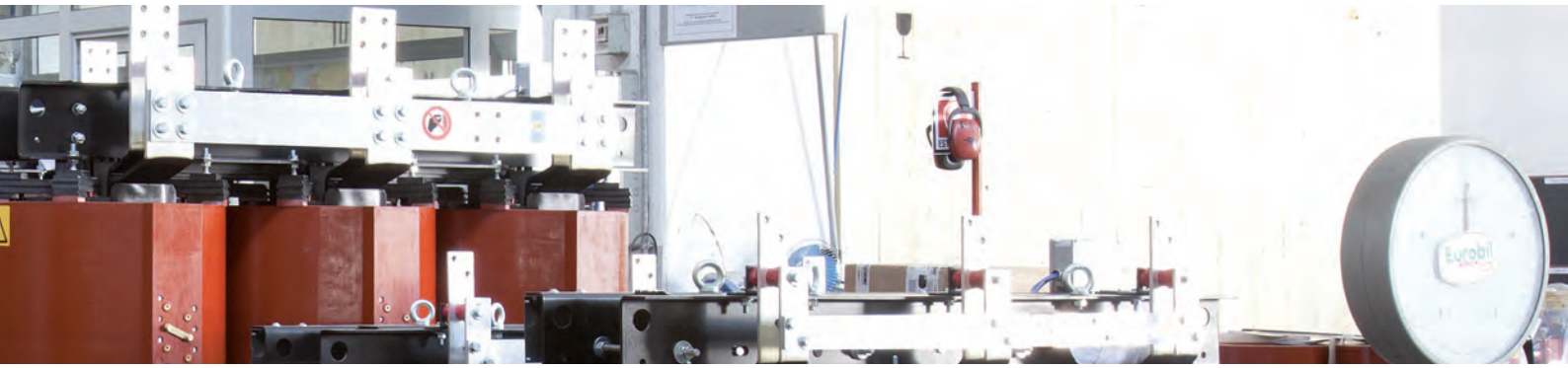


Temperature sensor

Temperature monitoring

PTC thermistor sensors with a high resistance value at the respective response temperature are provided for temperature monitoring of each cast-resin transformer. Since the LV and HV windings are in thermal equilibrium, the thermistors are attached to the LV winding for insulation purposes. Above all, they protect the vacuum cast high-voltage windings against excessive temperatures, which can occur in case of overloads, insufficient cooling and/or high ambient temperatures. On request, thermistor sensors are also available for core monitoring via PT100.

Suitable monitoring and triggering devices are available for monitoring of the cast-resin transformers.



TRANSFORMERS FOR MARINE APPLICATIONS

Ruhstrat offers a wide range of cast-resin transformers for naval and offshore applications, each manufactured to a high level of performance and reliability in terms of quality and safety.

Transformers for marine applications – main features:

- Optimized design based on specific harmonic loads
- Compact dimensions, lightweight materials
- Designs can be adapted to the dimensional constraints of any installation
- Specific cooling enclosure
- Rated power: Max 20 MVA
- Insulation levels: Max 36 kV
- Frequency: 50 or 60 Hz
- Degree of protection: Max IP55
- Standard colour (UK): RAL 7035 (color available on request)
- Cooling system: AN (Natural Air), AN / AF (natural air/forced air) or AF / WF (forced air/forced water)
- Constructive configuration for each transformer: Max 24 pulse

Cast-resin transformer for marine application with water-cooled enclosure

THIS IS RUHSTRAT

Ruhstrat is a leading technology supplier with the main focus on electrical testing, voltage optimizing and transformers.

Founded in 1888, the electro-technical company has established itself world-wide as the main supplier of customized solutions.

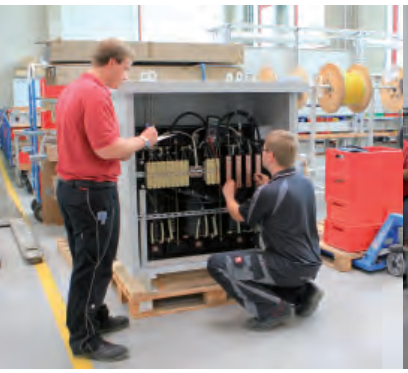
Since mid-2015, Ruhstrat operates under the name Eisenmann Thermal Solutions, which is a subsidiary of Eisenmann SE. Eisenmann is a leading global industrial solutions provider for surface finishing, material flow automation, environmental engineering and thermal process technology. The company develops and builds custom manufacturing, assembly and logistics plants that are highly flexible, energy- and resource-efficient. Today, Eisenmann has a workforce of approximately 3,600 worldwide, with subsidiaries in Europe, the Americas and the BRIC countries.

Ruhstrat/Eisenmann Thermal Solutions in Bovenden

You wish for more information regarding Ruhstrat and our products? Just visit our website:
www.ruhstrat.com

You have questions regarding our cast-resin transformers and/or you require an offer? Under the link ***http://tinyurl.com/request-offer*** you will find various means to contact us.
It goes even quicker by scanning our QR-code (shown on the left side) using your smartphone or tablet.

Our sales team will be most pleased to consult you regarding all questions to our products.

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