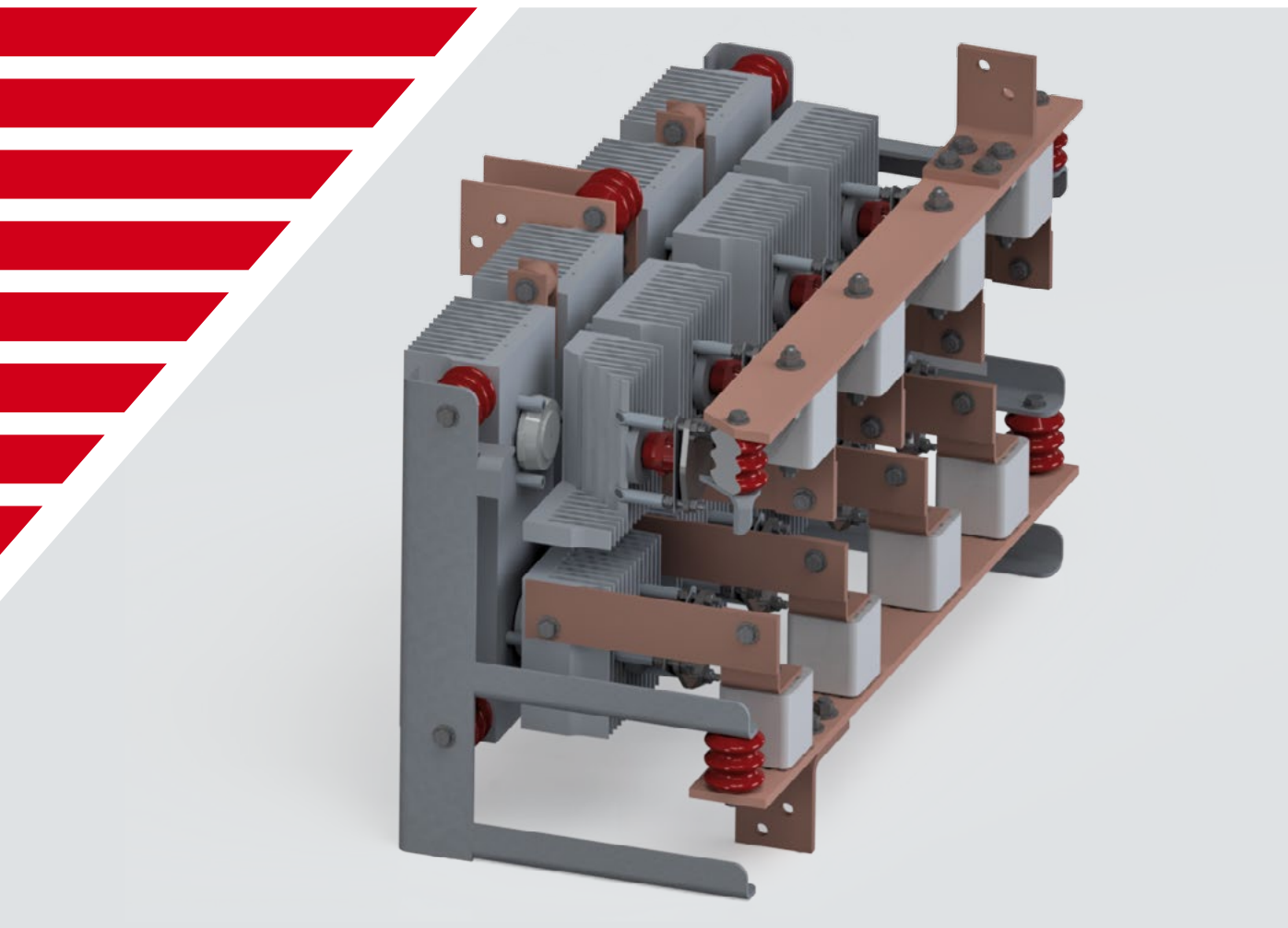


TracFeed® GR

English



Diode Rectifiers

RELIABLE TRACTION POWER SUPPLY WITH RECTIFIERS FROM RAIL POWER SYSTEMS

Application

Rectifiers with natural air cooling are used for the DC traction power supply. Power diodes in a three-phase bridge circuit convert AC into DC with nominal voltages up to DC 3000 V.

Our years of experience and high product quality standards guarantee cost-effective, reliable solutions for our clients.

Design

Rectifiers are designed in cabinet form for indoor use in electrical switch rooms. The diodes and fuses are combined into modules (power blocks) and can be accessed easily from the front.

Reduced system harmonics are obtained by rectifiers connected to transformers with different vector groups on the AC side and on the DC side, either in series or in parallel connection. This leads to 12- or 24-pulse operation.

Nominal voltages above DC 1500 V can be achieved via a series connection of either diodes or rectifiers.

The power terminals of the rectifier can be located at either the top or bottom of the cabinet, enabling easy power cable connection.

Suitable for the TracFeed® TDx, these rectifiers can also be linked via busbars in a variety of different ways. This allows an easier installation.



State of the art rectifiers and switchboards for traction power supply: compact, efficient and reliable

Features

Power blocks feature wafer diodes which are cooled on both sides, providing:

- Modular and compact design of traction rectifiers
- Natural (air-) convection in a:
 - B6 or B12 circuit in a single cabinet,
 - B24 connection by combination of two B12 circuits.

Reliability

The rectifiers meet the specific demands of railway applications through their:

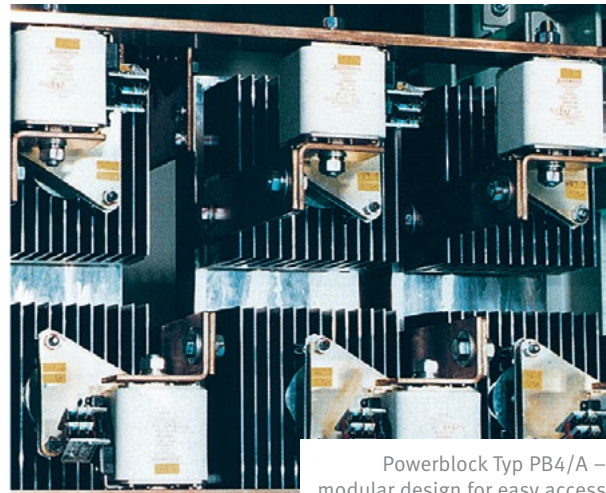
- High overload capacity
- High blocking ability
- Short-circuit withstand ability
- Low maintenance requirements and
- Short repair times

They are designed for operational load peaks caused by starting vehicles or short circuits.

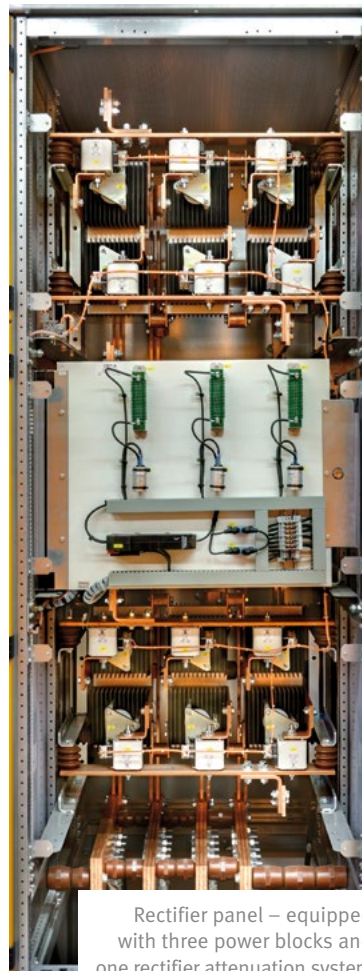
Connection

Rectifiers are typically set up in sequence with the DC switchboard. Individual rectifiers or a combination with return feeder panels are also possible.

A connection to the main busbar of the switchboard can be made using cables or a direct busbar connection.



Powerblock Typ PB4/A – modular design for easy access



Rectifier panel – equipped with three power blocks and one rectifier attenuation system



LOAD LIMIT CURVE FOR SUBSTATION RECTIFIERS

Surge suppression

Surges occur in DC railway systems because of atmospheric influences (lightning strikes) or switching. Railway rectifiers are protected against atmospheric overvoltages by surge arresters. A rectifier attenuation system is used for protection against operational surges and as an aid for power diode commutation. It is selected as a function of the power diodes, and is selected as a function of the rated voltage and the rectifier connection.

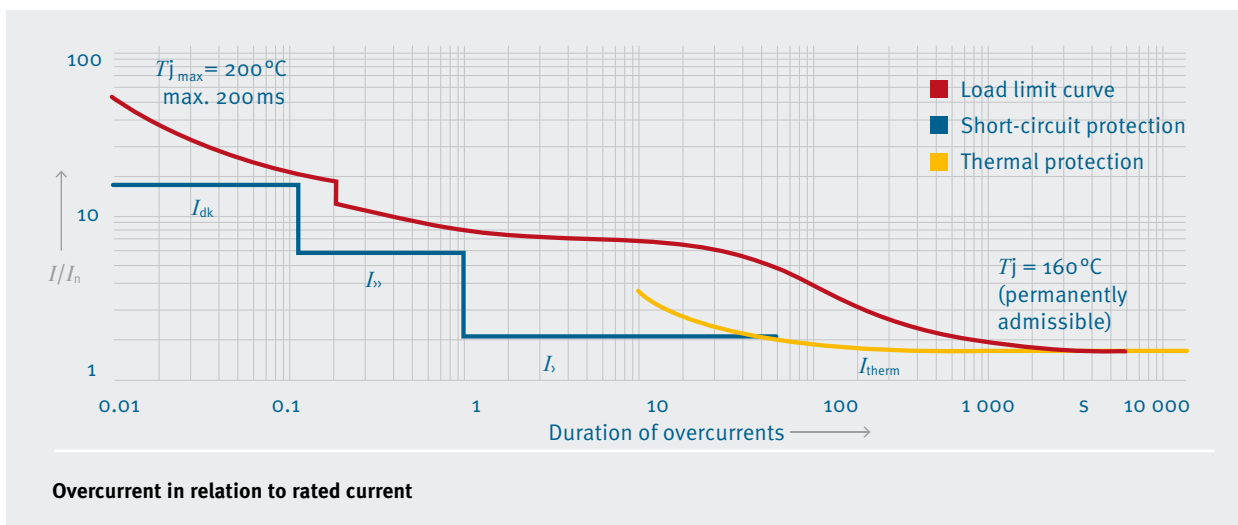
Varistors, which have the advantage of high overload capacity compared to an RC circuit, are used for surge suppression at the DC end.

Commutation is supported by an RC circuit at the three-phase end.

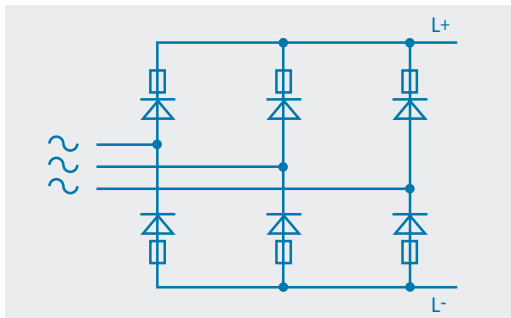
Overload protection

The current state of the art design involves three-stage protection with instantaneous overcurrent tripping (short-circuit release), time-dependent overcurrent release and thermal overcurrent protection.

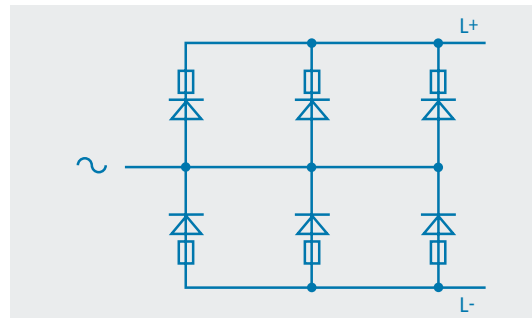
The protection settings are made in accordance with the desired load and overload capacity of the rectifier.



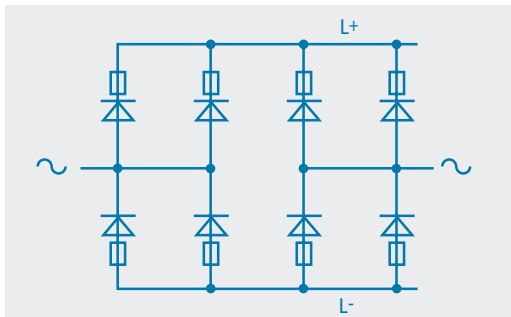
Connections of powerblock and attenuation systems



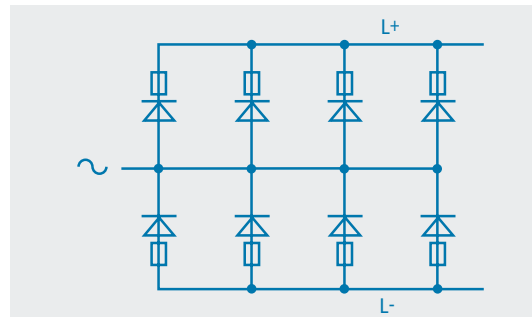
Powerblock 1



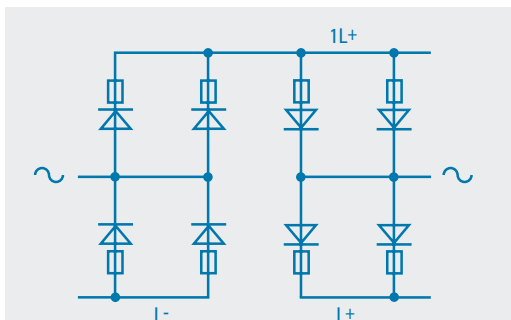
Powerblock 2



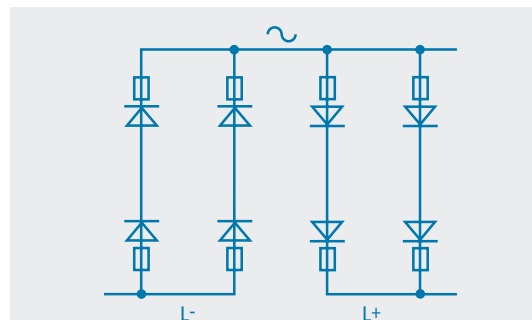
Powerblock 3



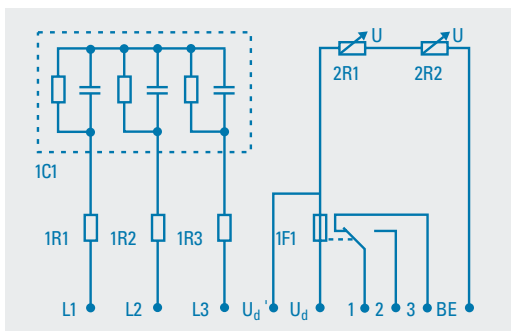
Powerblock 4



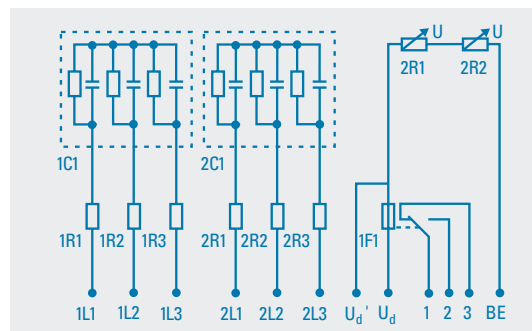
Powerblock 5



Powerblock 6



Rectifier attenuation system 1



Rectifier attenuation system 2



Rated currents and voltages for rectifiers

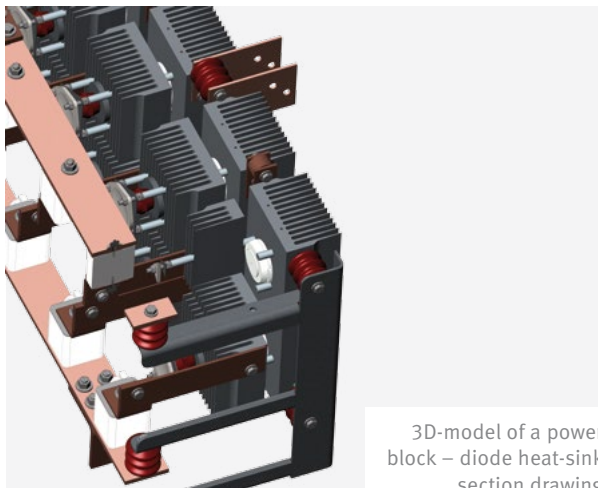
U_n V	I_{th} A	I_n Duty class ¹ A V / VI	Number of pulses 6/12-p/r	Diodes per phase			Powerblock Number/Type	Attenuation system Number/Type	Width mm	Rectifier Type
				parallel	Series	Type				
750	1400	950	6	1	1	D2200N	1xPB1/A	1xGB1/A	800	GR1/A
750	2550	1700	6	2	1	D2200N	2xPB1/A	1xGB1/A	800	GR2/A
750	2550	1700	12p	2x1	1	D2200N	2xPB1/A	1xGB2/A	800	GR3/A
750	3650	2450	6	3	1	D2200N	3xPB2/A	1xGB1/A	800	GR4/A
750	4800	3200	6	4	1	D2200N	3xPB4/A	1xGB1/A	1000	GR5/A
750	4800	3200	12p	2x2	1	D2200N	3xPB3/A	1xGB2/A	1000	GR6/A
1500	1200	800	6	1	1	D1800N	1xPB1/B	1xGB1/B	800	GR1/B
1500	2300	1550	6	2	1	D1800N	2xPB1/B	1xGB1/B	800	GR2/B
1500	2300	1550	12p	2x1	1	D1800N	2xPB1/B	1xGB2/B	1000	GR3/B
1500	3400	2250	6	3	1	D1800N	3xPB2/B	1xGB1/B	800	GR4/B
1500	4500	3000	6	4	1	D1800N	3xPB4/B	1xGB1/B	1000	GR5/B
1500	4500	3000	12p	2x2	1	D1800N	3xPB3/B	1xGB2/B	1000	GR6/B
3000	1200	800	6/12r	1	2	D1800N	2xPB1/C	2xGB1/B	800	GR1/C
3000	2300	1550	6	2	2	D1800N	3xPB6/C	1xGB1/C	1000	GR7/C
3000	2300	1550	6/12r	2	1	D1800N	3xPB5/C	2xGB1/B	1000	GR8/C
3000	3400	2250	6/12r	3	1	D1800N	2x3xPB2/C	2xGB1/B	1600	GR4/C
3000	4500	3000	6/12r	4	1	D1800N	2x3xPB4/C	2xGB1/B	2000	GR5/C
3000	4500	3000	12/24p/r	2x2	1	D1800N	2x3xPB3/C	2xGB2/B	2000	GR6/C

¹ Duty class EN 50328:2003 / IEC 62590:2010

Standard dimensions of panel height: 2265 mm; frame depth: 1350 mm for TracFeed® TDx, 1200 mm for TracFeed® TDx-L
IP at side: IP30; IP at top / bottom: IP00, cable connection from below

Standardized duty classes

Overloads after rated currents	0 %	150% / 2h	150% / 2h	150% / 2h	300% / 1min
EN 50328:2003 / IEC 62590:2010	I	V	V	V	VI



Selection table

Ambient temperature	$T_u = 40^\circ\text{C}$
Max. continuous current at T_u	I_{th}
Diodes used	D2200N, Fa. Infineon, VRRM = 2400V D1800N, Fa. Infineon, VRRM = 4400V
Max. junction temperature	160 °C permanent 200 °C for maximum 150 ms
Max. case temperature	150 °C permanent

WITHDRAWABLE DIODE RECTIFIER FOR TRACTION POWER SUPPLY

Application

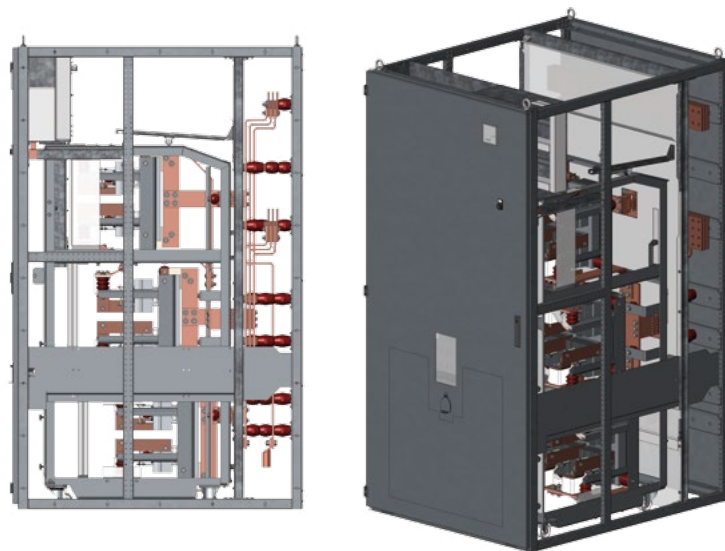
Withdrawable rectifiers open up more possibilities. The high existing accessibility for service work has since been improved upon. The bus bar and cable connection compartment is closed by a shutter for safety at work.

A switchgear truck provides the function of a disconnecter. It may be moved between operating and disconnected position behind the closed door. Various interlocking devices prevent any incorrect manual operations.

Design

The design is based on the tried and trusted non-withdrawable rectifier concept, thereby retaining the benefits of the latter. However, here the power block is positioned on a truck with movable floor. With this concept, all rectifier types for DC 750 V and DC 1 500 V are covered.

Design model of withdrawable rectifier



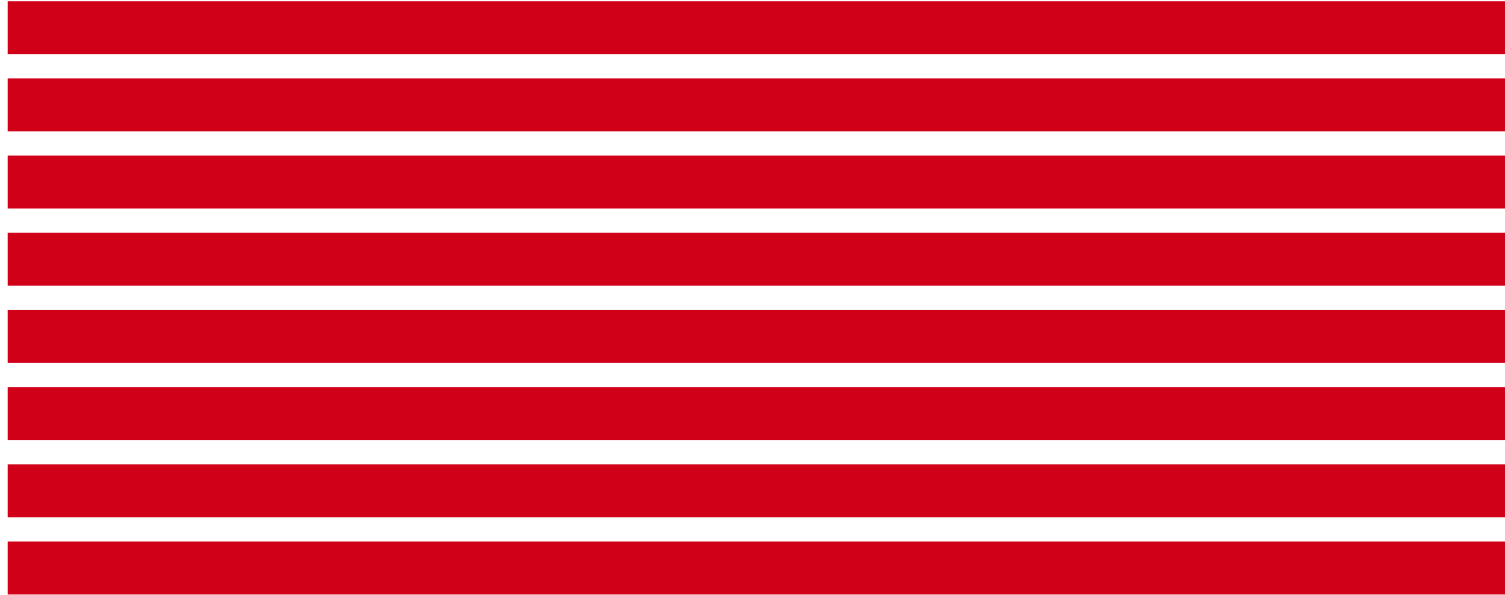
Rated currents and voltages for withdrawable rectifiers

U_n V	I_{th} A	I_n Duty class ¹ A V / VI	Number of pulses 6/12-p/r	Diodes per phase			Powerblock Number/Type	Attenuation system Number/Type	Width mm	Rectifier Type
				parallel	Series	Type				
750	1400	950	6	1	1	D2200N	1xPB1/A	1xGB1/A	900	GR1/A
750	2550	1700	6	2	1	D2200N	2xPB1/A	1xGB1/A	900	GR2/A
750	2550	1700	12p	2x1	1	D2200N	2xPB1/A	1xGB2/A	1100	GR3/A
750	3650	2450	6	3	1	D2200N	3xPB2/A	1xGB1/A	900	GR4/A
750	4800	3200	6	4	1	D2200N	3xPB4/A	1xGB1/A	1100	GR5/A
750	4800	3200	12p	2x2	1	D2200N	3xPB3/A	1xGB2/A	1100	GR6/A
1500	1200	800	6	1	1	D1800N	1xPB1/B	1xGB1/B	900	GR1/B
1500	2300	1550	6	2	1	D1800N	2xPB1/B	1xGB1/B	900	GR2/B
1500	2300	1550	12p	2x1	1	D1800N	2xPB1/B	1xGB2/B	1100	GR3/B
1500	3400	2250	6	3	1	D1800N	3xPB2/B	1xGB1/B	900	GR4/B
1500	4500	3000	6	4	1	D1800N	3xPB4/B	1xGB1/B	1100	GR5/B
1500	4500	3000	12p	2x2	1	D1800N	3xPB3/B	1xGB2/B	1100	GR6/B

¹ Duty class EN 50328:2003 / IEC 62590:2010

Standard dimensions of panel height: 2 265 mm; frame depth: 1 350 mm for TracFeed® TDx, 1 200 mm for TracFeed® TDx-L
IP at side: IP30; IP at top / bottom: IP00, cable connection from below





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