AFDD
Arc Fault Detection Device

WIRING DIAGRAMS USING AFDDs

v.1.0

ecolight Resident

CAUTION

Remember:

- **electricity can kill** – unlike most other hazards you cannot see, feel, hear or smell electricity so there is no advance warning of danger;
- electrical work should only be undertaken by those who are trained and competent to do so.

All work should be thoroughly planned so it can be done safely and so the completed installation or equipment is safe.

Terms and definitions: Things you need to know...

- **Arc Fault Detection Device (AFDD):**
  An AFDD is a device designed to protect against electrical fires caused by arc faults. Arc faults occur when there is an unintentional discharge of electrical current due to:
  - Damaged or deteriorated wiring
  - Loose electrical connections
  - Other electrical faults

- These arc faults can generate high temperatures, leading to fire hazards. AFDDs are specifically designed to detect and respond to arc faults by interrupting the flow of current, thereby preventing potential electrical fires.

- An **MCB** is a Miniature Circuit Breaker designed to protect an electric circuit from overload or short circuit. MCB can be reset quickly and does not demand more maintenance costs. MCB works on a bi-metal respective principle that protects against overload current and solenoid short circuit current.

- An **RCD**, or residual current device, is a safety mechanism that monitors for any unintended current flowing

- A **Residual Current Circuit Breaker with Overcurrent Protection (RCBO)** is a crucial component in electrical systems. They provide both residual current protection and overcurrent protection.

- A **Three phase Voltage Monitoring Relay (VMR)**, or phase monitor, is a common type of monitoring relay in the protection of high voltage and high current electrical systems. It monitors the voltage of the three phases and trips if any of them is outside of a predetermined range. This prevents damage to equipment. If you're looking to use a 3-phase voltage monitoring relay, here's what you need to know about its application and installation.

- A **Phase Failure Relay (PFR)** is a type of control and monitoring relay designed to detect problems typically with a three-phase supply but some can be used for single phase applications. The conditions which are monitored are Complete Phase Loss, Under Voltage, Over Voltage, Phase Sequence, Phase Asymmetry and Neutral Loss. Phase Failure Relays can also be known as Line Monitoring Relays, Supply Monitoring Relays, Phase Protection Relays or 3 Phase Voltage Monitoring Relays. Phase Failure Relays can be used on three phase supplies with or without Neutral.

What is AFDD and how does it work?

This class of equipment is the subject of IEC 62606-2016 (General requirements for arc fault detection devices).
Miniature Circuit Breakers (MCBs) and residual current device (RCDs) do not, in most cases, protect the circuit from arcing faults that can lead to fire, especially when a series arc fault occurs.
The AFDD is a fire protection device and is installed in the switchboards together with the MCB and the RCD and does not replace them.

IMPORTANT!

In all variants of connection of the AFDD to branched circuits, it is necessary to provide such a scheme of installation of protective devices in group switchboards (storey, flat, separate room, etc.), in which the AFDD is protected against short-circuit by a MCB or fuse (clause 5.5.5.5 of IEC 62606-2016). The rated current of the AFDD (sole version) must not be less than the rated current of the MCB or fuse to which the branched circuit(s) protected by the AFDD are connected. If a combined circuit-breaker combining AFDD and MCB is used, the rated current of this device should be selected in accordance with the requirements of IEC 60364-4-43:2023.

If an MCB with a rated current of more than 63 A is installed at the site input, such circuits must be divided into branched circuits with their own protective device with a rated current not exceeding 63 A.

In three-phase circuits, it is recommended that phase control relays are installed after single-phase AFDDs to avoid failure of 3-phase loads.

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How AFDD is connected with different types of protection devices

In all variants of connection of the AFDD to final/branched circuits, it is necessary to provide such a scheme of installation of protective devices in group switchboards (storey, flat, separate room, etc.), in which the AFDD is protected against short-circuit by a MCB or fuse (clause 5.5.5.5 of IEC 62606-2016).

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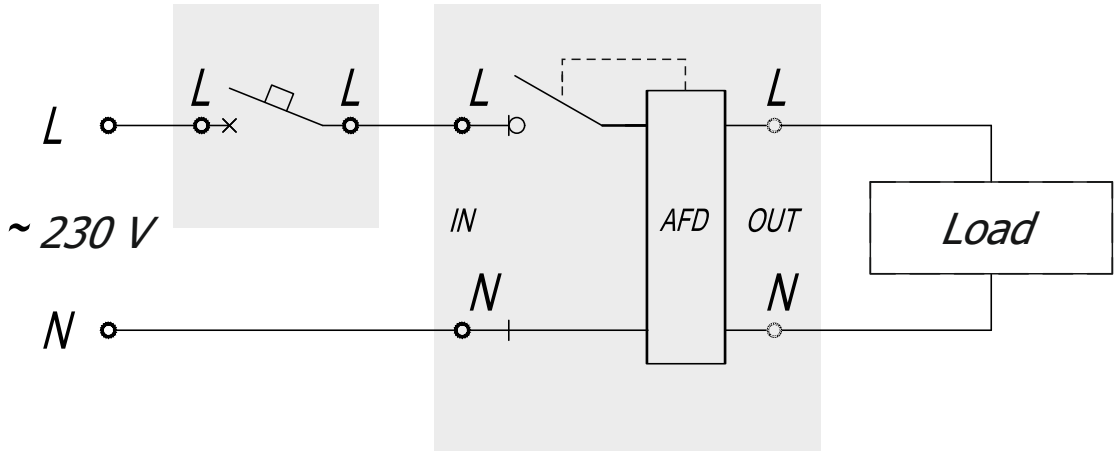
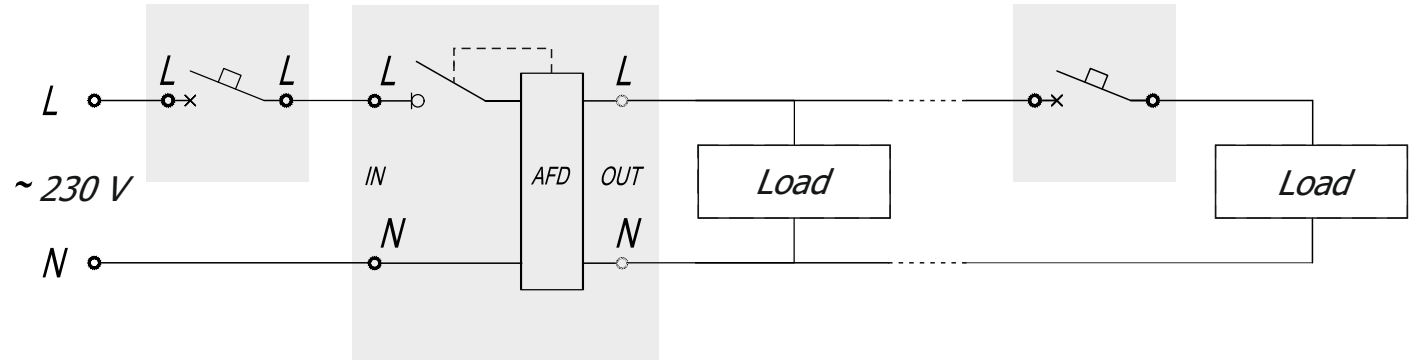
Connecting AFDDs with different types of protection devices

Single-pole AFDD and single-pole MCB

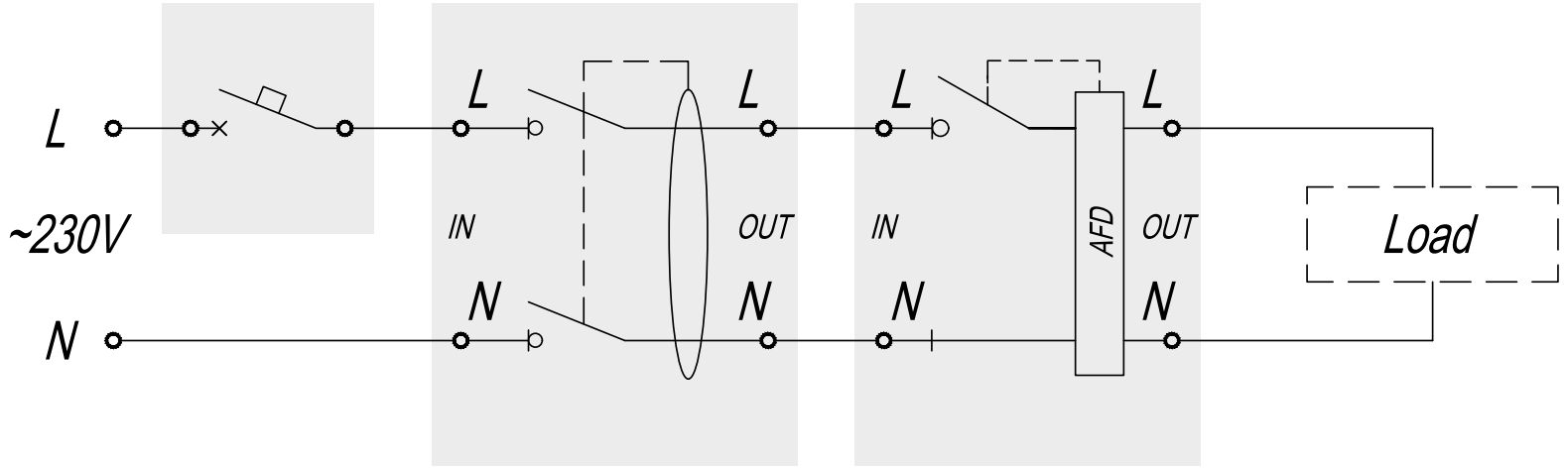


*The AFDD TUMOV (rated current 63 A) can protect a number of branched circuits in a property of up to 150 m2. A single AFDD is sufficient for the branched circuits supplying the electrical installations in this area, if the electrical supply is provided from a single external supply network.
The protection test is performed using the hardware Test Unit included in the kit.

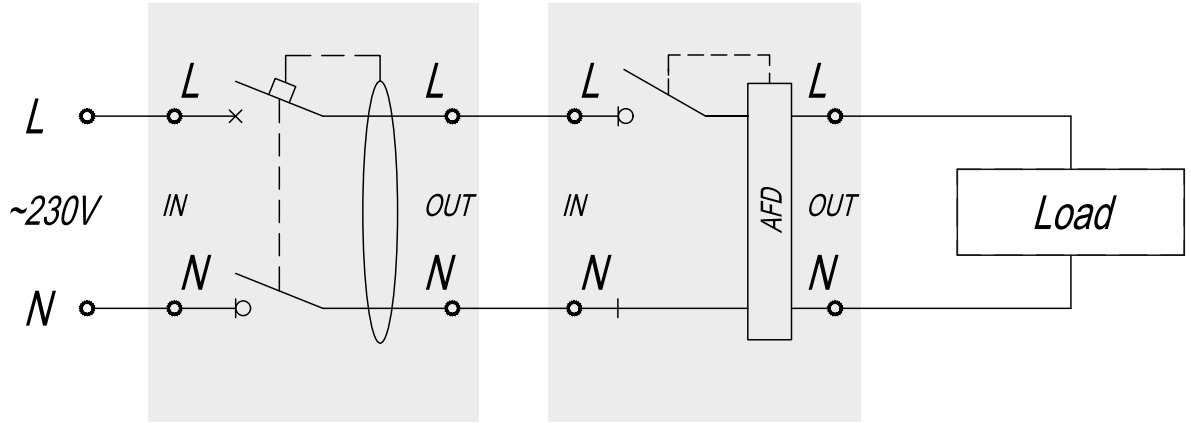


Connecting AFDDs with different types of protection devices

Single-pole AFDD, single-pole MCB and double-pole RCD

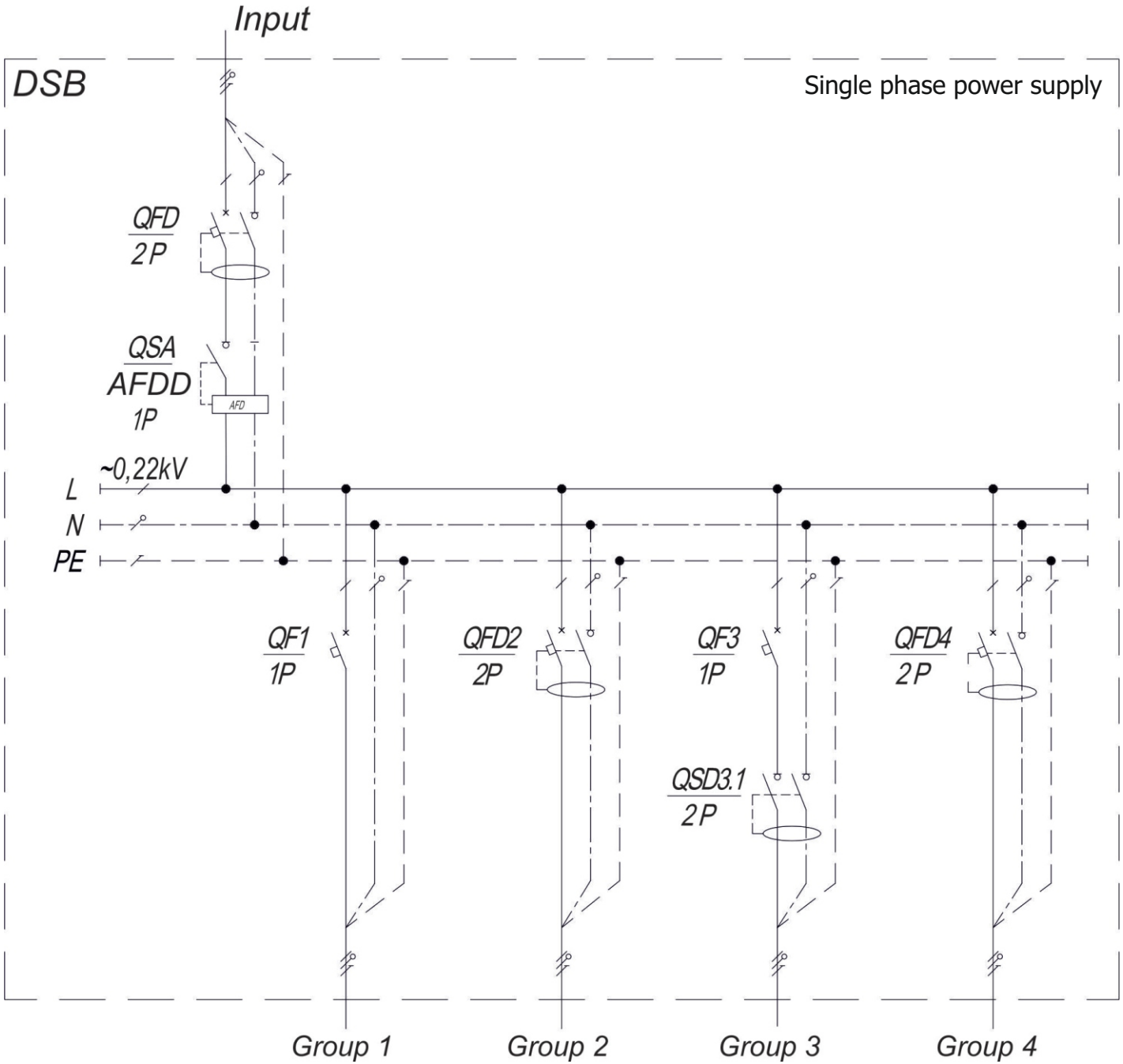


Single-pole AFDD and double-pole RCBO

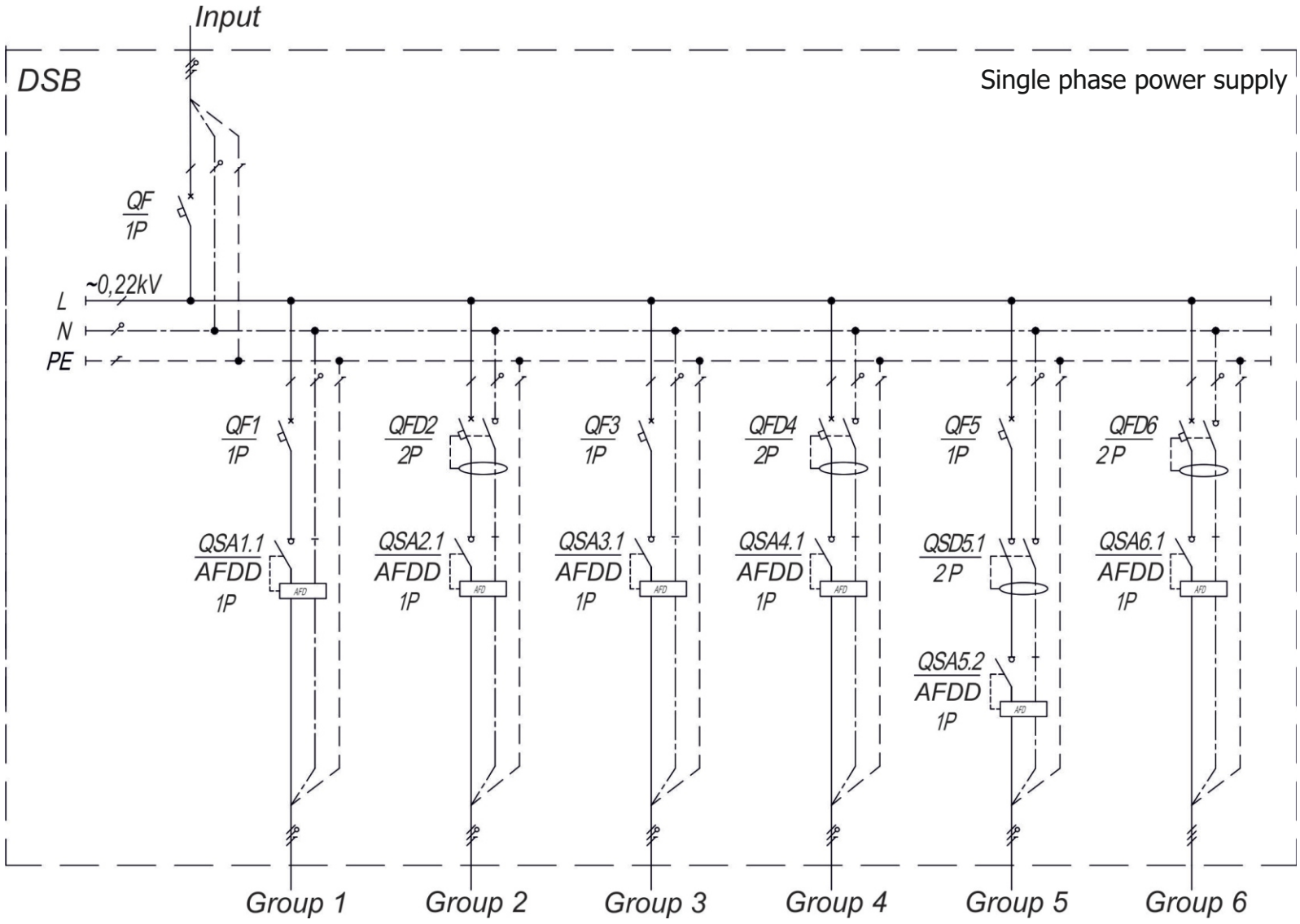


Note:
Load refers to the electrical circuits of a domestic consumer based on the various uses of electrical energy. Such circuits may contain various electrical equipment and devices, the composition of which, as well as the configuration of the circuit, is determined by the electrical engineer.

AFDD in the electrical installation of residential and public buildings (circuit variant)



AFDD in each final / branch circuit of residential and public buildings (circuit variant)



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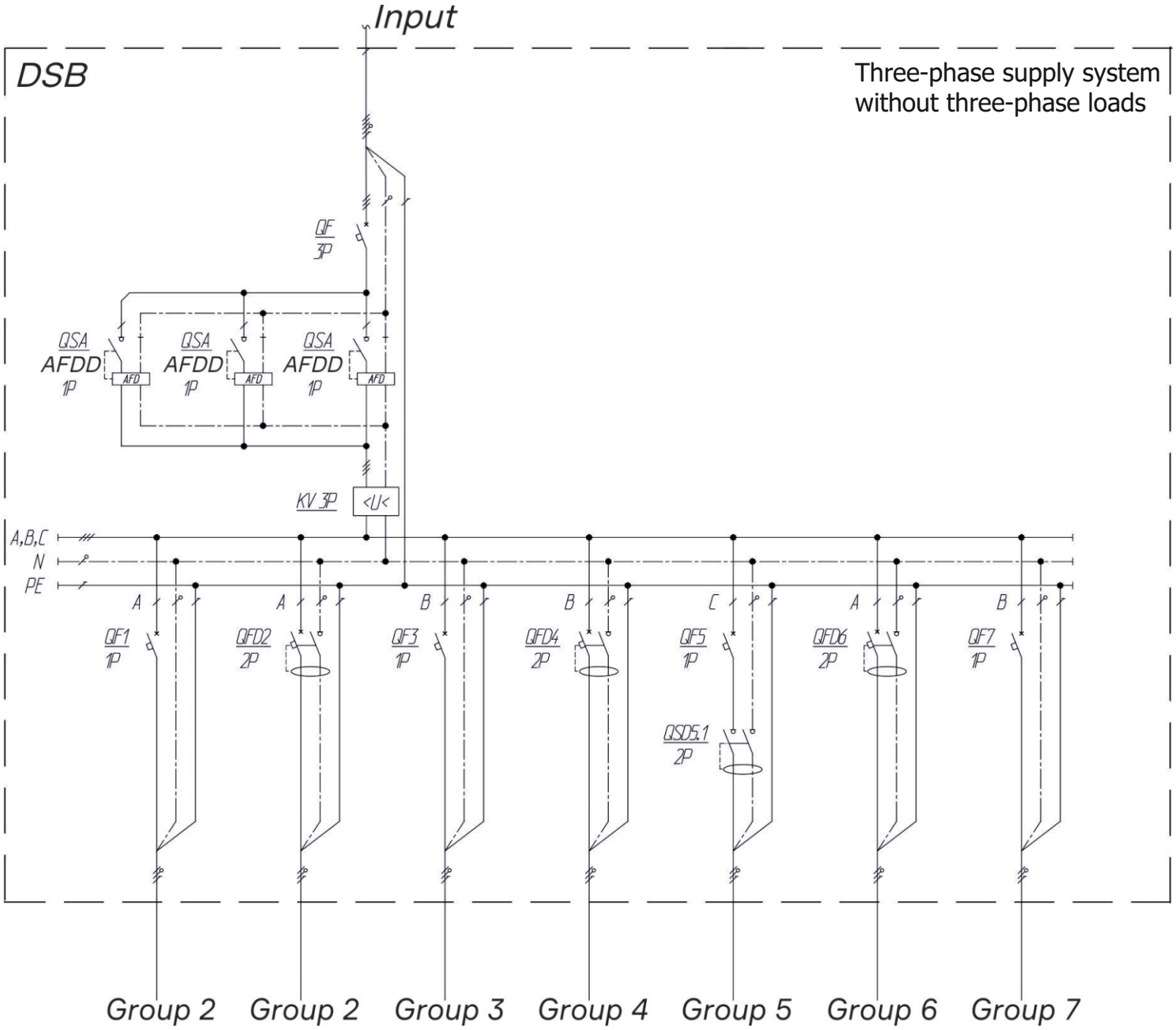

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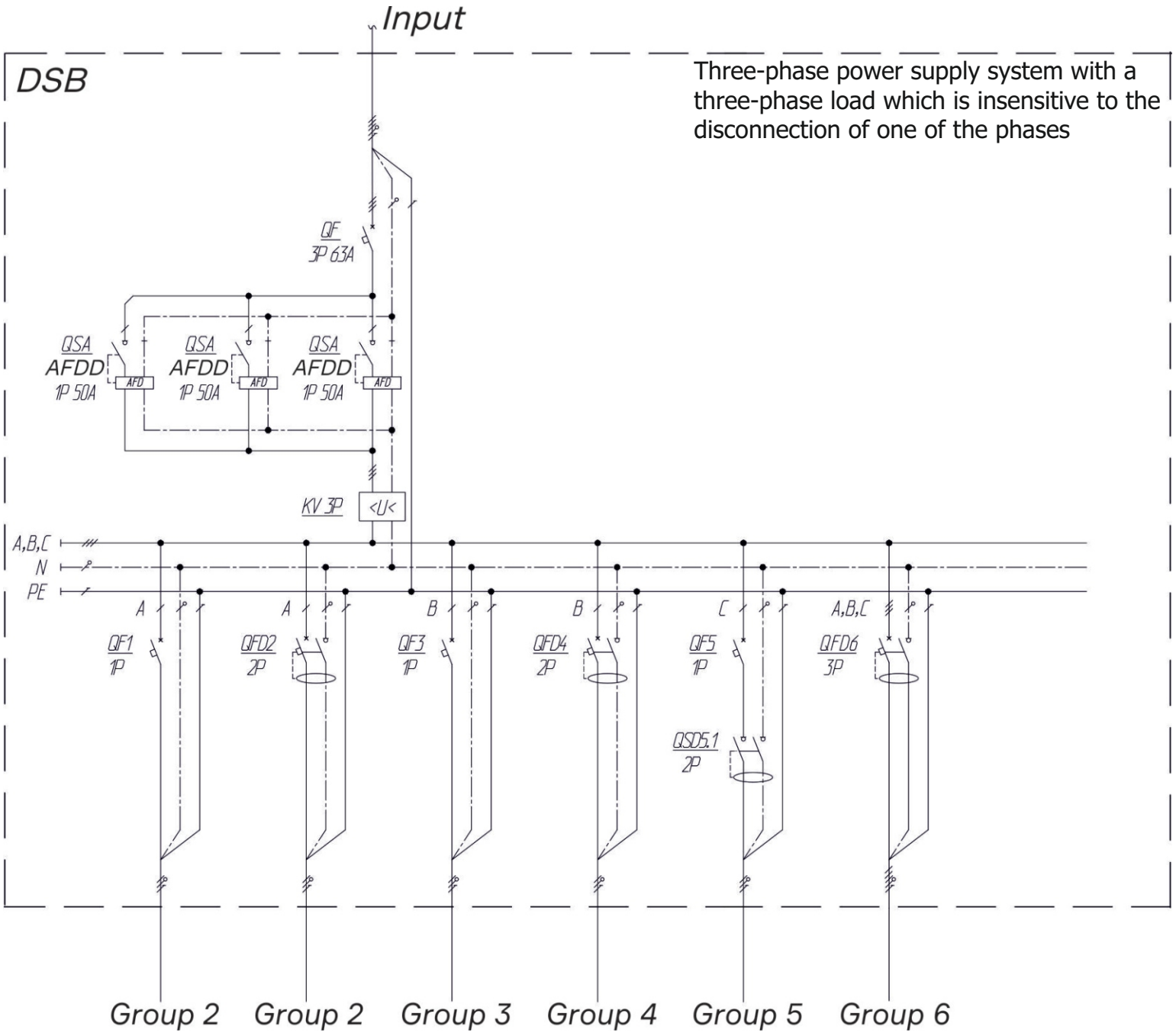

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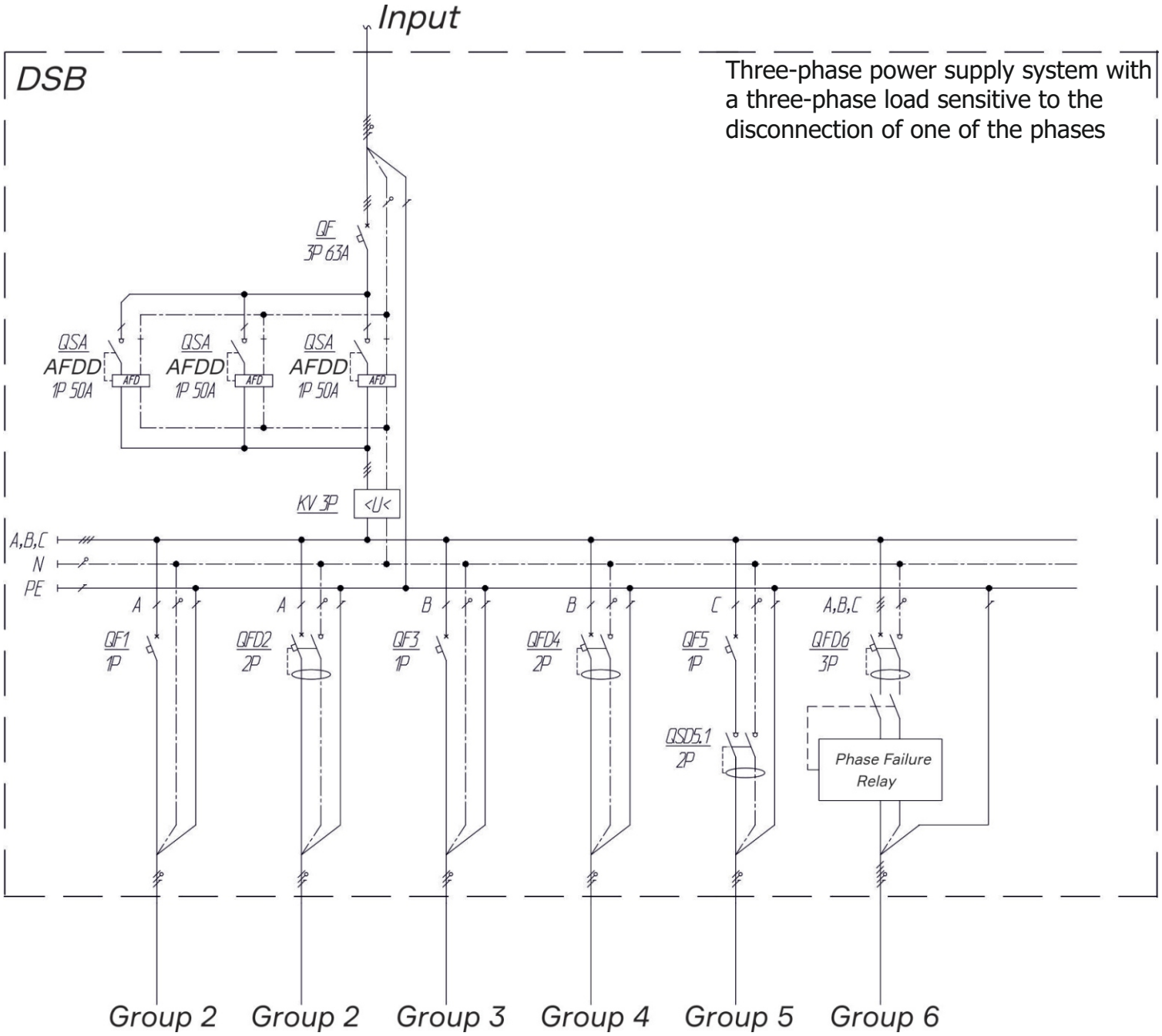

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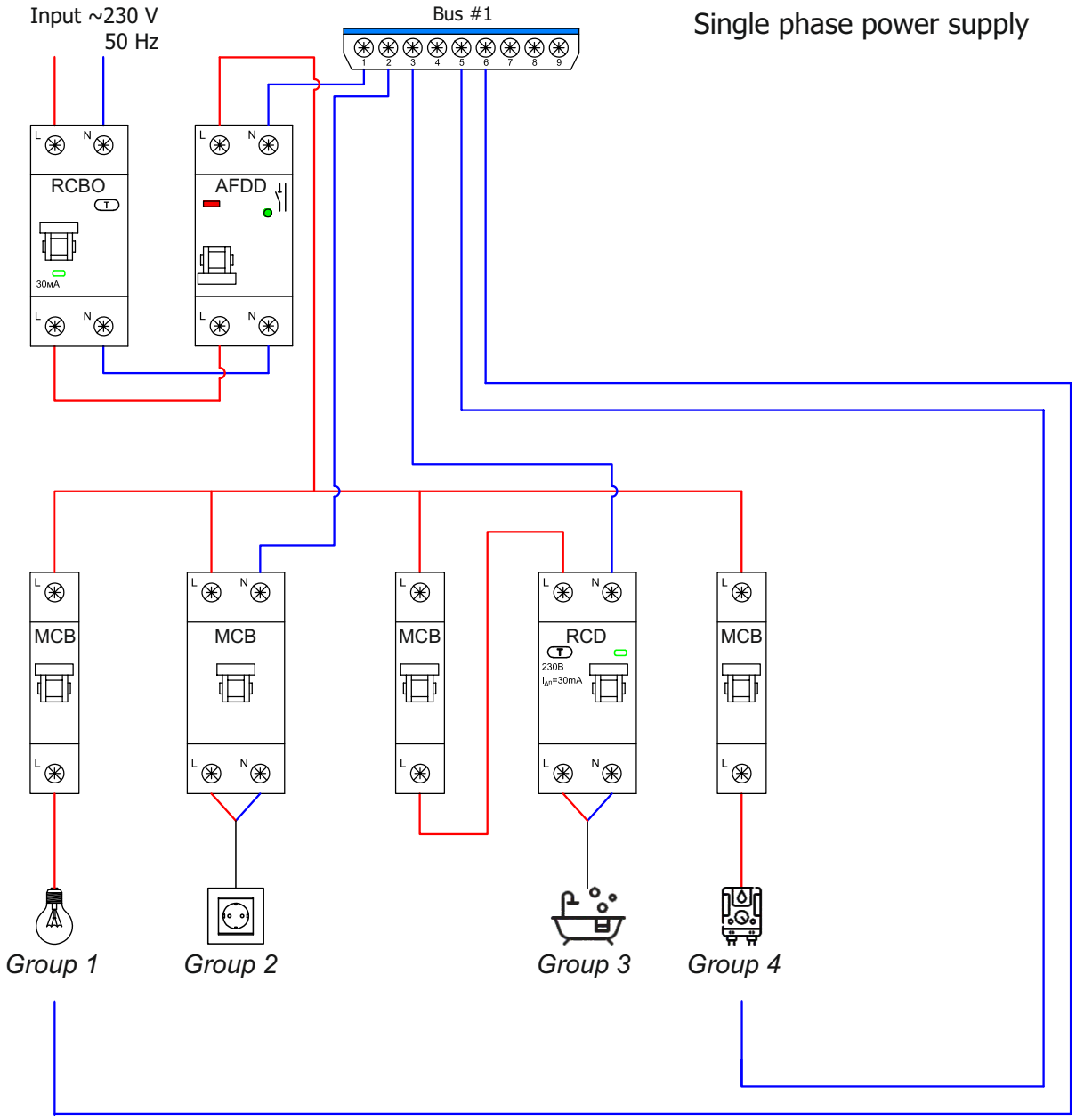

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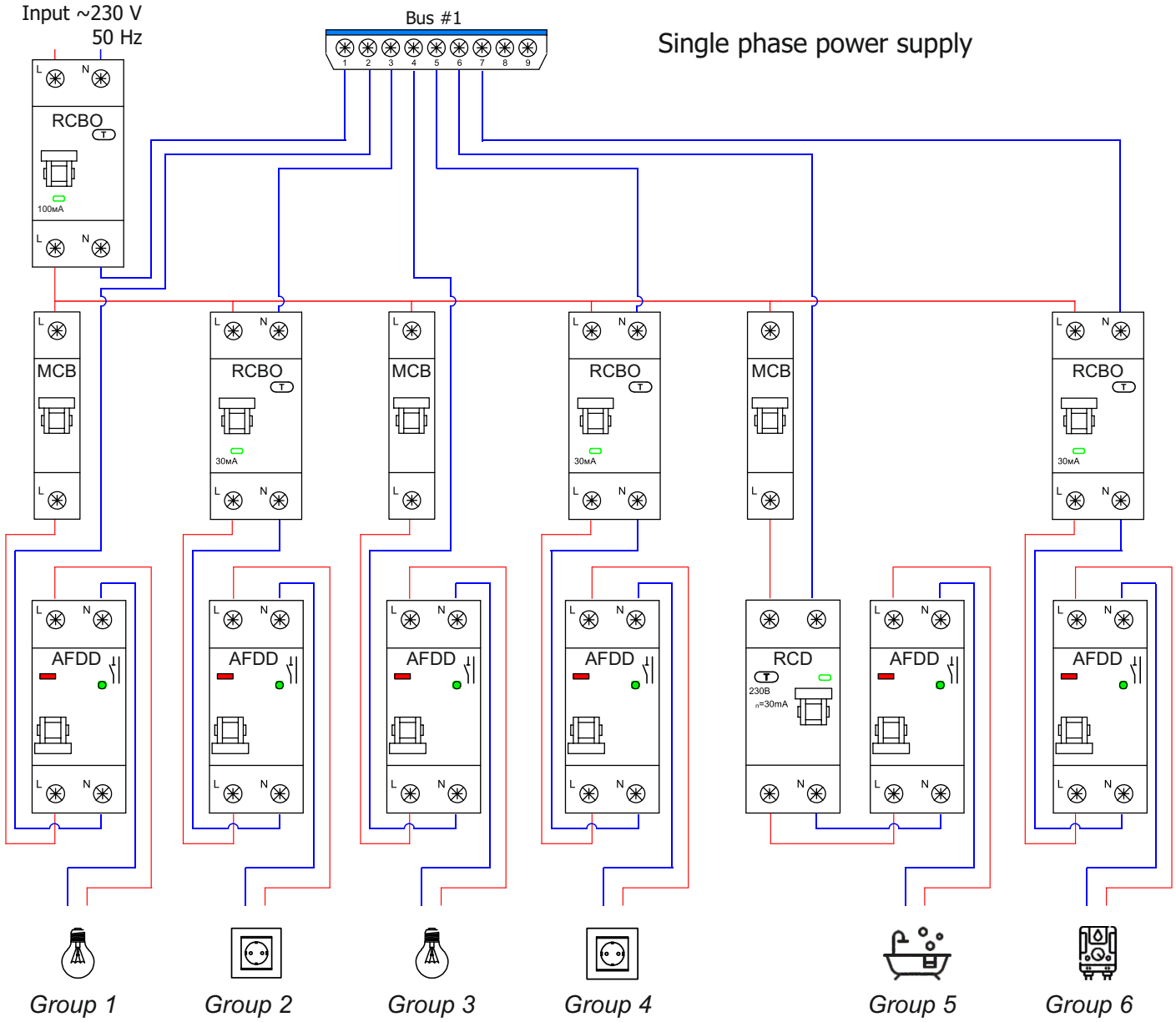

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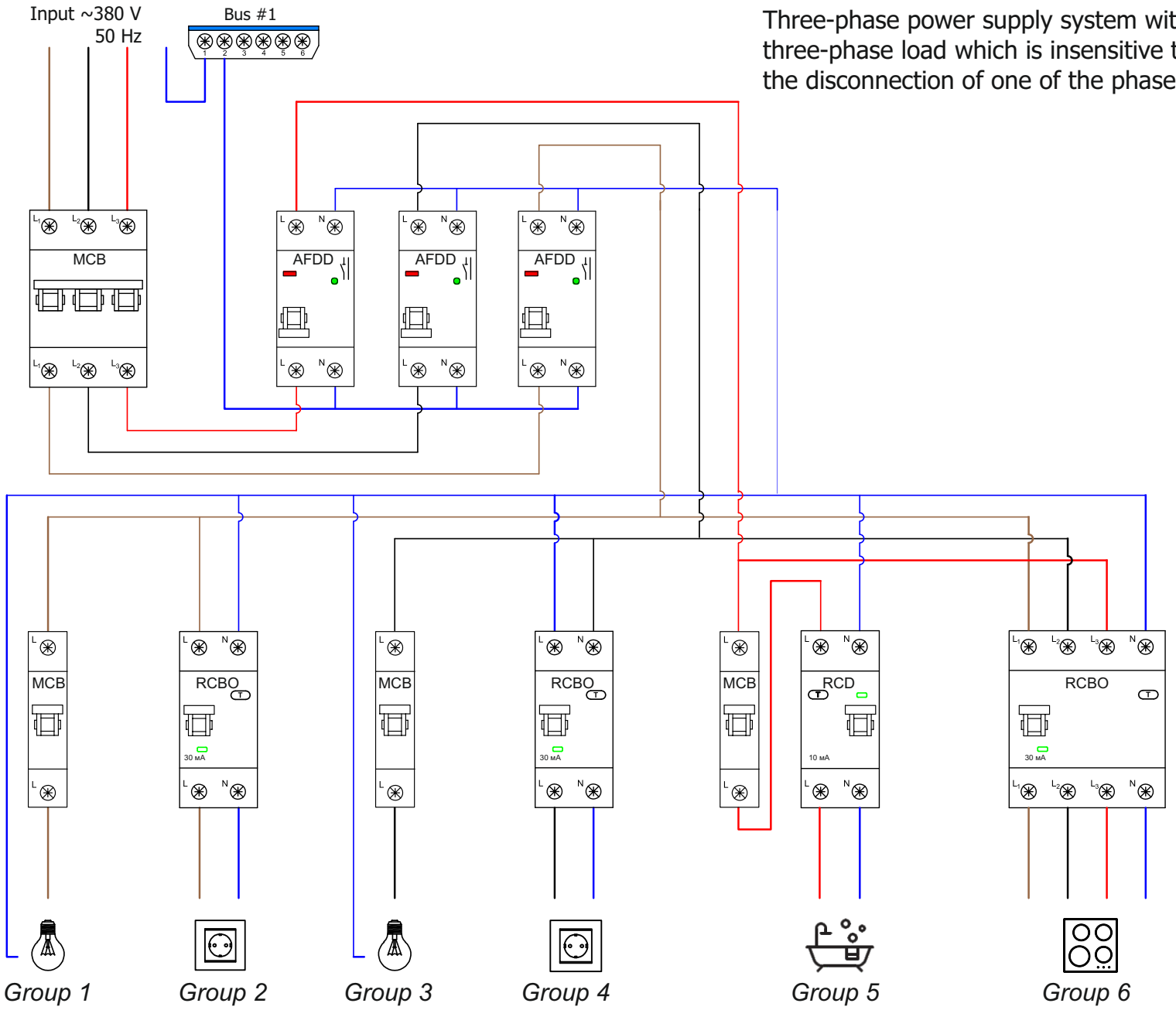
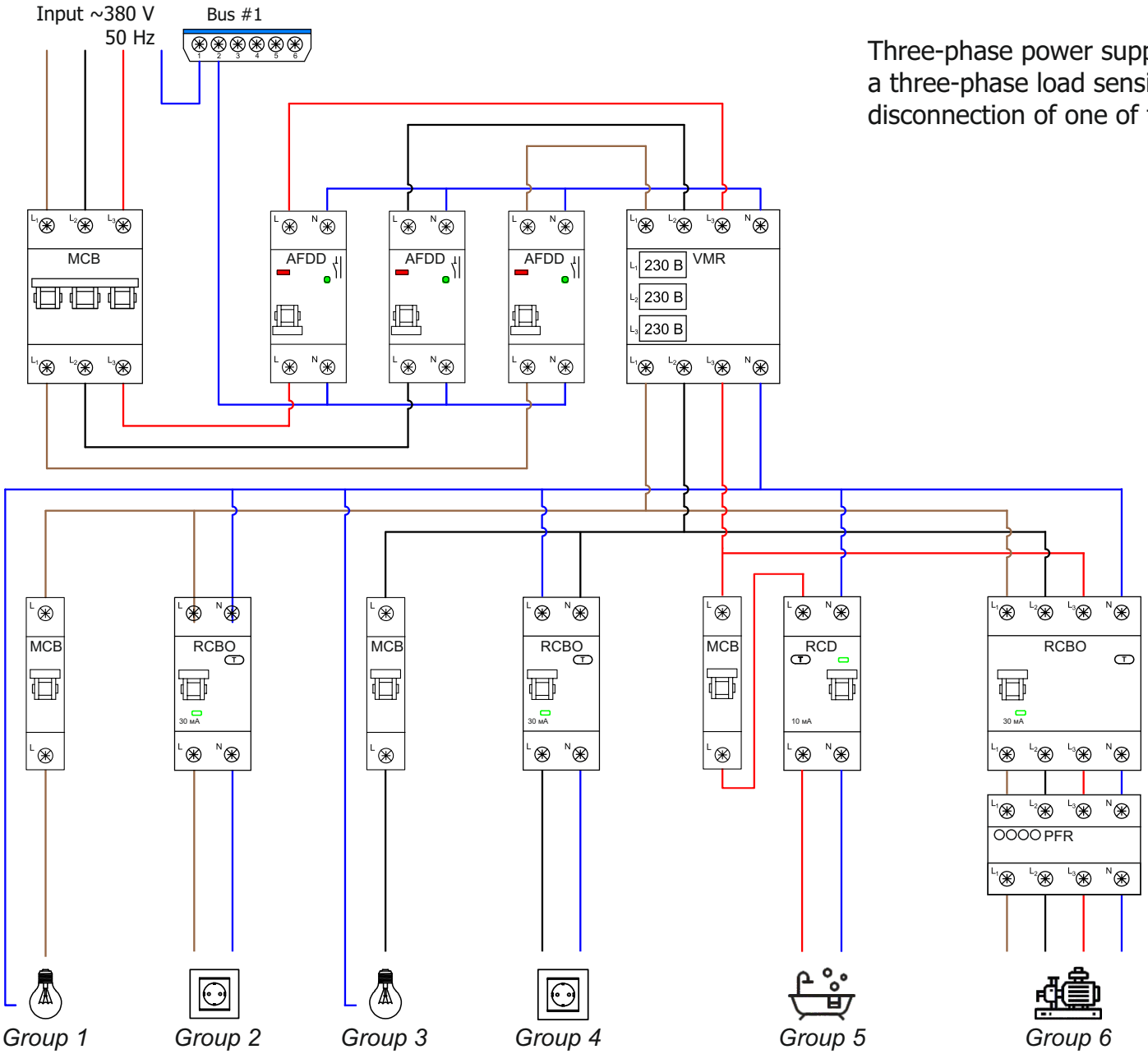


Three-phase power supply system with a three-phase load which is insensitive to the disconnection of one of the phases

AFDD in the electrical installation of residential and public buildings (circuit variant)



Three-phase power supply system with a three-phase load sensitive to the disconnection of one of the phases

AFDD TUMOV features

Feature		Unit.	Required value	
Performance characteristics				
Maximum trip time for low arc currents, arc current	2.5 A	ms	up to 1000	Note: The arc energy during arcing with the carbonized path is in the range of 2,5 times the arc energy provided by the arc generator (clause 9.9.2.7 IEC 62606 –2016)
	5,0 A	ms	up to 500	
	10,0 A	ms	up to 250	
	16,0 A	ms	up to 150	
	32.0 A to 63.0 A	ms	up to 120	
Overvoltage shutdown time, at	275 V	s	≈ 3.3	Note: The tripping time values comply with IEC 63052:2019
	300 V	s	≈ 1.1	
	350 V	s	≈ 0.3	
	400 V	s	≈ 0.08	
Operating voltage range		V	115 to 270	
Other characteristics				
Operating mode			permanent continuous	
Mounting type			DIN-rail 35 mm (IEC/EN 60715:2017)	
Operating position			arbitrary position	
Rated voltage		V	230	
Method of measuring the effective mains voltage			True RMS	
Rated current (depending on model)		A	16, 25, 32, 40, 50, 63	
Rated operating frequency		Hz	50	
Breaking capacity		A	500 or ten times the rated operating current (whichever is greater))	
Conditional short circuit current		A	6000	
Maximum withstand voltage		V	440	
Degree of enclosure protection (comply with IEC 60529:2013)			at least IP40	
Degree of live contacts protection (comply with IEC 60529:2013)			at least IP 20	
Parameters of the built -in varistor protection: A) Voltage limit at 100 A pulse current		V	max 1200	
B) Maximum absorption energy (single pulse 2 ms)		J	175	
C) Maximum absorption current, single pulse 8/20 μs		A	8000	
D) Pulse protection trip time		ns	under 25	
Number of poles			single-pole AFDD with two current paths (one pole and non -switched neutral)	
Minimum aring current		A	2,5	
Power loss		W	up to 0.7	
Ambient air temperature		°C	-25 ÷ +40	
Storage temperature		°C	-40 ÷ +70	
Relative humidity at +25°C		%	98	
Wire size to be connected		mm^2	0,5 ÷ 25 (20 – 4 AWG)	
Torque applied to the contact clamp screws		N·m	2.5	
Frequency of internal self-monitoring		h	12 at most	
Overall dimensions (H × W × H)		mm	85.6 × 35.6 × 77	
Weight		g	up to 150.0	
Service life, at least		year	10	

Test Unit features

Feature	Unit.	Required value
Rated/minimum operating/maximum operating supply voltage	V	230/180/275
Simulated arc current (comply with IEC 62606-2016)	A	2.5
Operating temperature range	°C	–25...+40
Storage temperature	°C	–40...+70
Overall dimensions (H × W × H)	mm	71 × 31 × 12

AFDD
Arc Fault Detection Device

Prevent a fire
Save a life
Protect property

In order to prevent fires in electrical circuits and appliances, we are happy to share our experience and expertise in the use of AFDD:

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