

The background of the entire page is a photograph of a renewable energy farm. In the foreground, there are rows of dark blue solar panels tilted towards the sun. In the background, several white wind turbines are visible against a clear blue sky. A large white rectangular area with a green border is overlaid on the right side of the image, containing the title and logo.

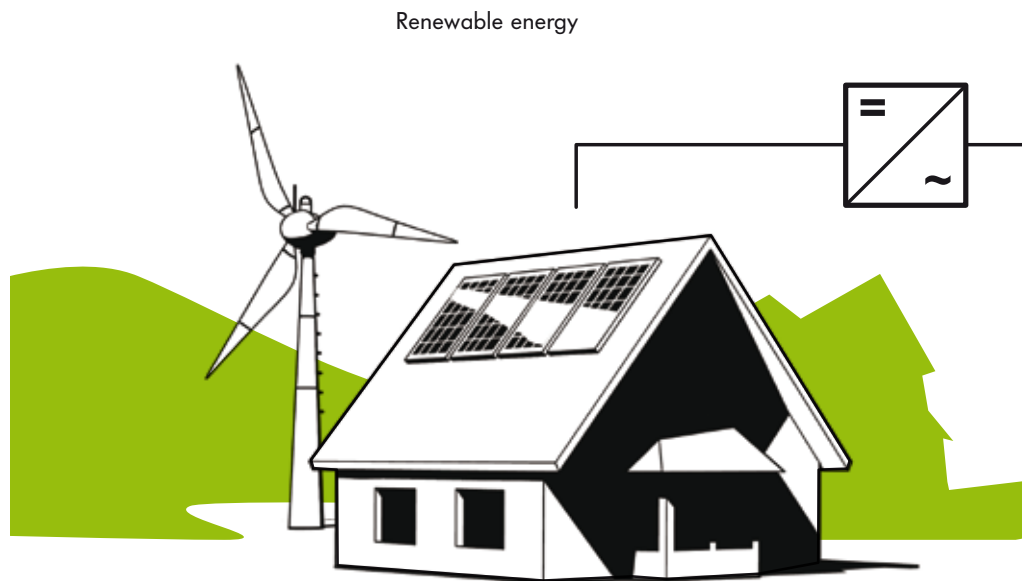
**AUTOMATIC
DISCONNECTION DEVICE
FOR SMALL-SCALE
POWER PLANTS**

wtele
Technik Braucht Kontrolle

CONTROL STATIONS

Information

If mains power is disconnected or suffers an outage, private small-scale power plants need to be disconnected from the grid immediately to prevent injuries and damage to their equipment.



Requirement

The conversion of renewable energy into electrical energy is an important element in stabilizing the world's climate. The principal small and micro-scale power plants used are photovoltaic installations, small-scale wind power generators, block heating and generating plants or small-scale hydroelectric generators.

The operator's energy yields may be used to meet his own needs or – increasingly – profitably fed back into the public low-voltage grid. To ensure the safety of the power grid the transition between private small-scale power plants and the electricity supply company is monitored by an automatic control station.

Large power stations are controlled and monitored directly from the electricity supply company using telecontrol technology, but this is too elaborate for the many private electricity generators and would not be economical.

If the electricity supply company's mains power grid suffers an outage or malfunction, then private small-scale power plants need to be disconnected from the low-voltage grid immediately to prevent power being inadvertently fed into the public grid. This is where TELE products come into play.

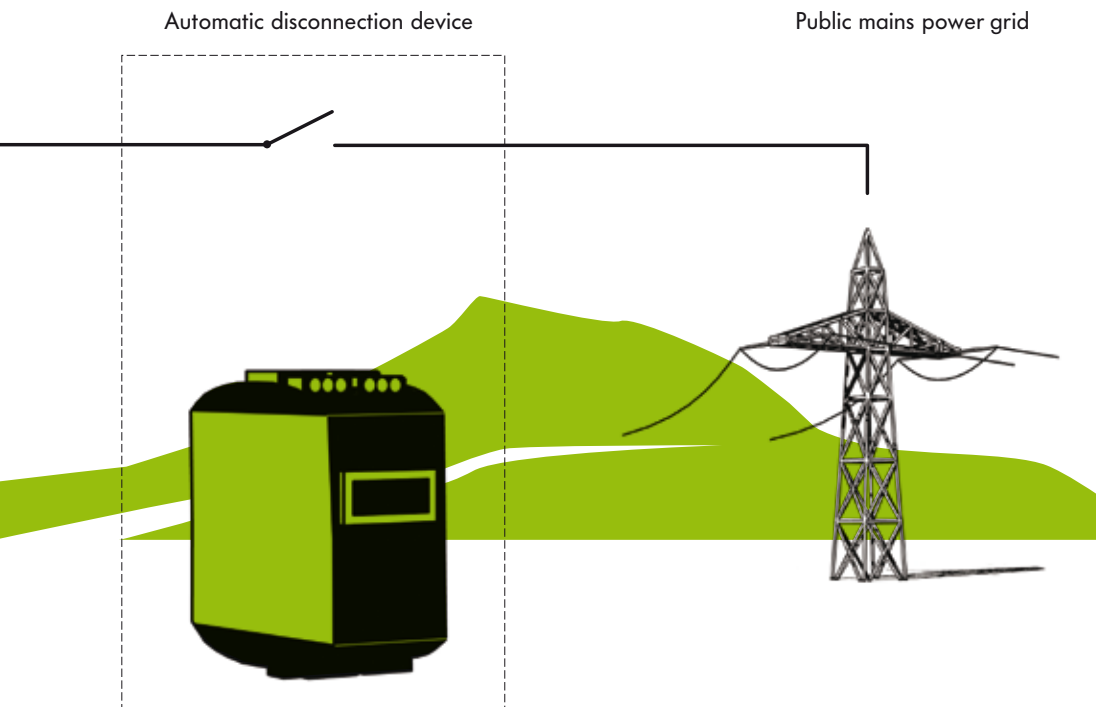
Immediate isolation from the grid is the only way of ensuring that maintenance personnel

are not endangered and that consumers do not suffer injury or damage from excessively fluctuating voltage or frequency.

Monitoring and automatic isolation are handled by an automatic control station. Details of the implementation and testing of such automatic control stations are specified in various national standards¹⁾. TELE offers a wide range of grid monitoring relays and automatic disconnection devices that fulfil these standards as well as the electricity supply companies' requirements.

If the grid operator requires it, the thresholds used can be adjusted to fall within the values prescribed by the standard. Failsafe devices fulfil their monitoring function even in a fault situation, recognizing the problem and making the equipment safe.

¹⁾ You will find more information on page 7.



Function

An automatic disconnection device monitors the energy feedback into the 230/400 V grid.

If mains power is switched off by the electricity supply company, or by a protective device, it is vital for small-scale power plants to be disconnected within a few milliseconds. Monitoring the voltage and frequency and recognizing isolated (off-grid) operation are essential requirements for any automatic disconnection device.

TELE solutions offer the following

- Voltage drop protection
- Over voltage protection
- Monitoring of voltage quality
- Frequency drop protection
- Frequency rise protection
- Detection of off-grid operation
- Failsafe mains grid monitoring
- DC monitoring

PRODUCTS

Specific national standards

TELE's wide range of products offers an optimal solution for any country and any requirement. Apart from special devices for the German market (VDE standards-compliant) there are also specific national solutions for Austria and Italy. The configurable thresholds of the G2PM400VFA02 monitoring relay enable it to be used throughout Europe. These are also available as prewired units in separate housings together with their switching elements.

You will find further information on page 6.



Functionality

- Freely configurable voltage and frequency monitoring
- Detection of off-grid operation



- Freely configurable frequency monitoring for 50/60 Hz power grids



- Voltage and frequency monitoring
- Detection of off-grid operation
- Integrated fail-safety

- Voltage and frequency monitoring

Type	G2PM400VFA02 50Hz EN50438	G2FW400VL20 24-240V	G4PM400VDF02 50Hz OVE	G2FW50HZYFA02-ITALIA
Article no.	2390520	2390900	2394511	2390911
Width	22,5mm	22,5mm	45mm	22,5mm
Thresholds as per	EN 50438		ÖNORM E 8001-4-712	DK5940
Voltage drop protection	up to 75% U_N		80% U_N	80% U_N fixed
Surge voltage protection	up to 125% U_N		115% U_N	120% U_N fixed
Voltage quality monitoring	OFF / 110 – 115% U_N		110 – 115% U_N	
Frequency drop protection	up to 47Hz	(50/60Hz) -10Hz	47Hz	49,7Hz or 49Hz
Frequency rise protection	up to 53Hz	(50/60Hz) +10Hz	51Hz	50,3Hz or 51Hz
Off-grid-operation-protection ¹	■		■	
DC monitoring				
Integrated failsafety ²			■	
Output	2 CO	2 CO	2 CO	2 CO

¹) Off-grid operation protection: In the event of an outage or malfunction in the mains power supply, mains-coupled generators should not be able to continue feeding energy into the grid.

²) Fail-safety: One essential aspect of fail-safety is what is called "no single point of failure" (that is, a single fault at the control station is not allowed to lead to the loss of the safety functions).

³) When combined with the G4JO1ADCF02 VDE, the G2JR1A increases its diagnostic coverage.

Prewired device combination with switching elements in a single housing:

- Voltage and frequency monitoring
- Detection of off-grid operation
- Integrated fail-safety

		Austria	Germany
Max. power output	22kW – Type:	FREISCHALTSTELLE OVE - 22kW	FREISCHALTSTELLE VDE - 22kW
	Article no.	2395010	2395000
Max. power output	45kW – Type:	FREISCHALTSTELLE OVE - 45kW	FREISCHALTSTELLE VDE - 45kW
	Article no.	2395011	2395002



G2FW50HzYFA02



G2PM400VFA02



G4PM400VDFFA02

D

- Voltage and frequency monitoring
- Detection of off-grid operation
- Voltage and frequency monitoring
- Detection of off-grid operation
- Integrated fail-safety
- DC monitoring for transformerless inverters

in addition to: G2FW50HZYFA02		in addition to: G2FW50HZYFA02 or G4PM400VDFFA02 50Hz VDE		
G2FW50HZYFA02	G2PW400VF02	G4PM400VDFFA02 50Hz VDE	G4JO1ADCDF02 VDE	G2JR1A
2390910	2390515	2394510	2394515	2390810
22,5mm	22,5mm	45mm	45mm	22,5mm
VDE V 0126-1-1	VDE V 0126-1-1	VDE V 0126-1-1	VDE V 0126-1-1	
80% U_N fixed	80% U_N fixed	80% U_N		
115% U_N fixed	115% U_N fixed	115% U_N		
110 – 115% U_N		110 – 115% U_N		
47,5Hz fixed		47,5Hz		
50,2Hz fixed		50,2Hz		
	■	■		
			$1A_{DC}$	
		■	■ ³	■ ³
2 CO	2 CO	2 CO	2 CO	

SUPPLE- MENTARY

Information

Failure of the automatic disconnection device can endanger both people and equipment. The VDE V 0126-1-1 standard and the Austrian standard ÖVE/ÖNORM E 8001-4-712 therefore require fail-safety.

Fail-safety

Fail-safety applies to the entire control station and is specified by means of additional requirements. For example, there should be provision for two switches connected in series, each of which must have an independent switching capacity equivalent to the rated current of the generator system.

Another essential safety requirement is “no single point of failure”. A single fault (faulty measurement, logic or switch) may never cause the loss of safety functions. Faults must be recognized and displayed and must lead to the private power generation plant being switched off. To this end, TELE’s G4PM400VDFA02 mains supply monitoring relays not only possess internal monitoring functionality but also monitor the switching elements used.

DC monitoring

If it is possible for a system malfunction to cause DC power to feedback into the low-voltage grid, then VDE V 0126-1-1 stipulates that the system should also monitor its DC circuits. The system operates in such a way that DC can arise only in the case of transformerless inverters, so DC monitoring needs to be implemented only for this type of device.

The TELE relay G4JO1ADCDF02 VDE monitors the DC component of the energy feed. You can optionally use a G2JR1A to increase the unit’s diagnostic coverage, if required.

Fully-cabled device combinations including switching elements

In addition to the necessary monitoring relays TELE also offers turnkey solutions for implementing an automatic disconnection device. For Austria and Germany, TELE supplies prewired disconnection devices with two different power ratings, each housed together with its switching elements. These four types differ only in their current and/or voltage rating and the specific monitoring relays that are used. These prewired units do not provide for DC monitoring, since this is prescribed only for transformerless inverters.

At the site, the inverter side and mains side only need to be wired to the appropriate terminals. All three phases plus the neutral conductor should be connected on the mains side, even if only single-phase energy feedback is to be used. This is necessary because the system uses standards-compliant three-phase voltage monitoring to detect off-grid operation.



Prewired device combination with switching elements

VDE Guidelines

DIN VDE V 0126-1-1: Automatic disconnection device between a generator and the public low-voltage grid: For installations smaller than 30 kVA, the "Richtlinie für Anschluss und Parallelbetrieb von Eigenerzeugungsanlagen am Niederspannungsnetz" [the guideline for the connection and on-grid operation of private power generation plants on the public low voltage grid] published by the German association of electrical economy (VDEW) permits a disconnection device that is accessible at all times to be replaced by an automatic isolation station. The asymmetry of the energy feedback may not exceed 4.6 kVA (for PV installations, 5 kWp). The requirements stipulated by the standards for these disconnection devices are:

- Voltage drop and over voltage protection
- Monitoring of voltage quality
- Frequency monitoring
- Detection of off-grid operation
- DC monitoring (only if the system is capable of generating DC feedback)
- Fault current monitoring (only for installations with no simple separation)

REMARK: Three-phase voltage monitoring is permissible with single-phase energy feedback as a criterion for the detection of off-grid operation. This also applies to the integration of a number of single-phase suppliers that feed into different phase conductors.

ÖVE/ÖNORM Guidelines

ÖVE/ÖNORM E 8001-4-712: Erection of electrical installations with rated voltages up to AC 1000 V and DC 1500 V – Part 4-712 – Annex A: automatic disconnection device

You will find the requirements for disconnection devices in Annex A. For installations larger than 30 kVA, the power grid operator is entitled to insist on an external isolation station that can be accessed at any time, but is not required to do so. If this requirement is waived, then the variant described in Annex A is used. The requirements specified there are very similar to those of the German standard, but they do differ in certain details (thresholds, condition as supplied):

- Voltage drop and over voltage protection
- Monitoring of voltage quality
- Frequency monitoring
- Detection of off-grid operation
- Fault current monitoring (only for installations with no electrical separation)

REMARK: Three-phase voltage monitoring is permissible with single-phase energy feedback as a criterion for the detection of off-grid operation. This also applies to the integration of a number of single-phase suppliers that feed into different phase conductors.

Italy

"Guida per le connessioni alla rete elettrica di Enel Distribuzione Ed 1.1 Dicembre 2009" [guidelines for connections to the mains power grid of Enel Distribuzione, version 1.1 of December 2009] (formerly DK 5940). Section F of the rules for connecting to the low voltage grid of the operator ENEL specifies the required monitoring of the grid. The contents of this are identical to those of the earlier regulation DK 5940, which no longer applies. TELE's grid monitoring relay is approved by ENEL and listed. The regulation stipulates monitoring of voltage and frequency. If the extremely narrow prescribed frequency range (49.7 Hz to 50.3 Hz) causes the system to be disconnected for no good reason, then the range can be extended to 49 Hz to 51 Hz. The time for switching back can also be configured on the TELE monitoring relay for each individual system.

Other countries:

DIN EN 50438: Requirements for the connection of micro-scale generators to the public low voltage grid. This European standard also describes the interface protection (an essential electrical protection function that ensures that whenever the actions of small-scale generators might compromise the function or safety of the distribution grid, they are either disconnected from the grid or their energy feedback is terminated). This function is based on voltage and frequency monitoring. To assist with configuring thresholds, there is a table of standard values as well as a number of local threshold values that apply for various countries. The regulations issued by local electricity supply companies regarding the construction or operation of generators may depart from these standard values. For this reason the G2PM400VFA02.50Hz EN50438 offers configurable thresholds and is delivered as standard with a sealable cover so that the unit can be adjusted to suit a wide range of installations. It is also used in Austria and Germany when the stipulations of local electricity supply companies conflict with the local standard and fail to provide for monitoring of approved inverters.

i Information

In spite of a comprehensive standards landscape, the responsible electricity supply company decides how the grid is to be monitored.



Technik braucht Kontrolle: TELE combines the power of research and development, an Austrian production base and a strong team that readies its products for the market. The company grew to its present size on the strength of its timing relays and automation components, and its development has been shaped by the company's focus on monitoring techniques. We are pioneers and trendsetters, offering intelligent solutions for monitoring installations, buildings and machines and keeping them running. With passion and professional expertise, we at TELE create the very latest monitoring and control technology to the very highest standards of quality and in compliance with international standards for use all over the world.

Founded in 1963 as a family business, TELE now has its headquarters and main production facilities in Vienna, with branches in Germany and the UK and a dense network of more than 60 trading partners throughout the world. Our long-standing relationships with customers from all areas of industry and our innovative solutions for challenging problems have made us a reliable and versatile partner. Our striking green design is an external sign of our inner values – quality and innovation are the basis of our long-term success and our orientation for the future.

TELE • Vorarlberger Allee 38 • 1230 Wien • Österreich
Tel. +43 / 1 / 614 74 - 0 • Fax +43 / 1 / 614 74 - 100
www.tele-online.com