



Operating instructions
Electronic circuit breakers, IO-Link
for the 24 V DC secondary circuit

GB

DF21xx
DF22xx
DF25xx

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1 Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at www.ifm.com.

1.1 Symbols used

- ✓ Requirement
- Instructions
- ▷ Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference
-  Important note
Non-compliance may result in malfunction or interference.
-  Information
Supplementary note

2 Safety instructions

- The unit described is a subcomponent for integration into a system.
 - The system architect is responsible for the safety of the system.
 - The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Intended use).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.
- Replace damaged units, otherwise the technical data and safety will be impaired.
- The devices are intended for use with a 24 V DC safety extra-low voltage.
- A wrong connection to voltage which is higher and/or not safely isolated may lead to damage or conditions which are dangerous to life.
- Use the supply module only with the matching circuit protection modules.
- Do not mount the devices and do not actuate the contact levers while live.
- After triggering a circuit protection module and before power on again, remove the cause of triggering (short circuit or overload).
- Check the devices for damage prior to installation. Defective devices must not be used.
- Supply the devices with energy only after they have been properly installed.

3 Intended use

Electronic overcurrent protection for primary switched-mode 24V DC power supplies. A supply module must be combined with at least one circuit protection module and, optionally, complemented by supply/feedback/potential modules.

4 Function

The circuit protection modules are available with either fixed or adjustable currents and are equipped with a fail-safe element (integrated fuse).

		DF210x	DF2208	DF2210	DF2212	DF2214	DF2216	DF2220	DF2520	DF2524
Supply module		•		—						
Circuit protection module		—		•						
Interface			IO-Link							
Max. number of circuit protection modules per supply module		—	16		8					
Electrical data										
Input voltage	[V]		18...30 DC (SELV/PELV)							
Nominal voltage	[V]		24 DC							
NEC Class 2		—	—	—	•	•	—	—	—	•
Input current (= max. total current)	[A]	40		—						
Number of channels		—	1		2					
Nominal current I _N	[A]		8	10	2	4	6	1...10	1...10	1...4
Fail-safe I _N	[A]		8	10	2	4	6.3	16	16	4
Mechanical data										
Installation			rail TH35 (to EN 60715)							
Device width	[mm]		12.5							
Ambient temperature	[°C]		-25...60							
Storage temperature	[°C]		-40...70							
Protection rating → Installation			IP 30 (installation area) IP 20 (operating area)							
Electrical connection										
Type			push-in terminals, contact lever/strip							
	• = applicable									

4.1 Temperature factor / continuous current rating

The time-current characteristic curve depends on the ambient temperature. To determine the max. permitted load current multiply the nominal device current by the temperature factor taking into consideration the series connection.

Ambient temperature [°C]	0	10	23	40	50	60
Temperature factor	1	1	1	0.95	0.90	0.85

With series installation the nominal device current can be max. 80% or has to be oversized accordingly. With increased temperature the load current warning limit "warning limit typ. $0.8 \times I_N$ " is reduced by the temperature factor.

4.2 Fail-safe element

The load circuits are additionally protected by the circuit protection modules that are equipped with a fail-safe element (integrated fuse). The fail-safe element is adapted to the nominal current I_N of the respective circuit protection module and the respective wire cross-sections.

4.3 IO-Link



The load current warning threshold can be configured via the IO-Link interface to provide a visual warning and a warning via IO-Link with a capacity utilisation between 50 and 100 %.



The IO-Link devices can also be used as stand-alone devices without IO-Link master.

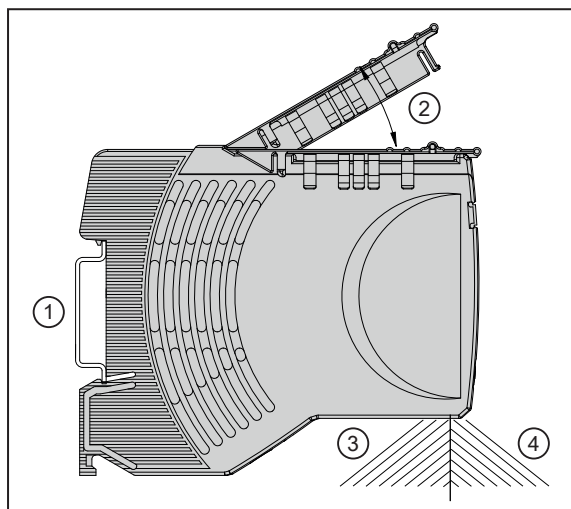
Extended functions of the DF2101 supply module via IO-Link:

- Min. / max. value generation of the measured current and voltage values for each channel over any period of time
- Averaging of the measured current and voltage values for each channel over any period of time
- Permanent switching on of individual channels in order to ignore the cyclic data exchange (e.g. to guarantee the voltage supply of important devices). The safety function remains active.

You will find the IODDs necessary for the configuration of an IO-Link device and detailed information about parameter setting tools, process data structure, diagnostic information and parameter addresses at www.ifm.com/gb/io-link.

5 Installation

► Mount the devices on a 35 mm rail.



- 1: Rail
- 2: Contact lever
- 3: Installation area
- 4: Operating area

Fig. 1: Example circuit protection module DF22xx

6 Electrical connection

- Dimension cables according to input and output current.
- Insert wires directly into the terminals as shown on the device label.

Art. no.	Terminals	Potential	Cross-section [mm²]	Stripping length [mm]
DF21xx	24 V DC	supply	0.5...10	18
	0 V		0.14...2.5	8...10
	L+, C/Q, L-	IO-Link	0.25...0.5	6
DF22xx	O1 or O1/O2	current outputs	0.14...2.5	8...10



To disconnect press the orange pusher using a suitable tool.

To open the push-in terminals IO-Link use a 2 mm wide micro screwdriver.

6.1 Supply, feedback and potential modules

In combination with GND potential modules (DF311x) the GND supply modules (DF310x) are used to reduce wiring.

In order to avoid that subsequent modules are disconnected from the voltage supply when opening a contact lever, a feedback module (DF3210) can be used to ensure that the respective modules are still supplied with power.

A LOAD potential module (DF320x) is used to extend +24 V DC circuit protection outputs to other connections.

7 Operating and display elements

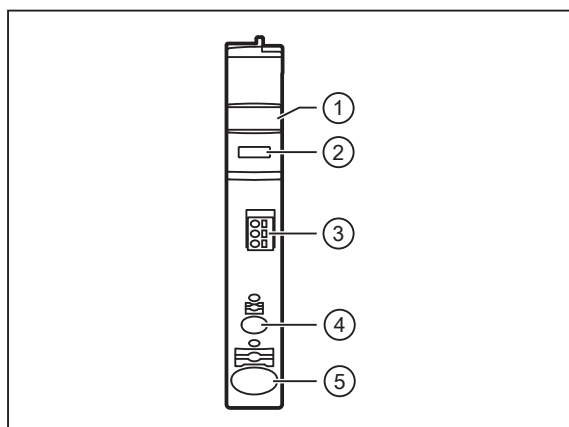


Fig. 2: Example DF21xx supply module

- 1: Panel for labelling
- 2: Status LED
- 3: Push-in terminals IO-Link
- 4: Push-in terminal 0 V
- 5: Push-in terminal 24 V DC

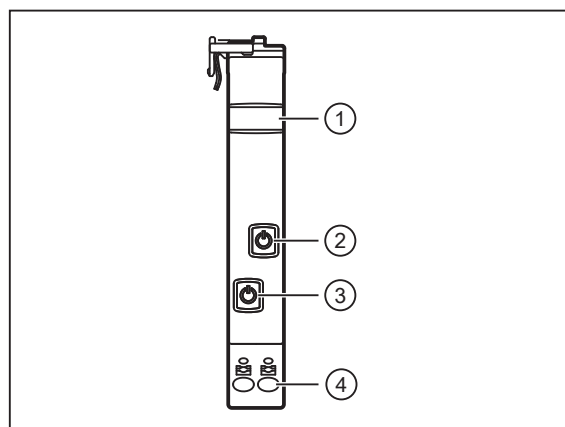


Fig. 3: Example DFx2xx circuit protection module

- 1: Panel for labelling
- 2: ON/OFF/reset button and status LED (channel 2)
- 3: ON/OFF/reset button and status LED (channel 1)
- 4: Push-in terminals outputs 1/2

7.1 DF21xx supply modules

The different operating states of the circuit protection modules are indicated by the status LED.

Status LED		Operating status	IO-Link communication
—	off	Missing operating voltage	no
green	on	Correct operation (→ 10)	yes
	flashing	Independent operation (→ 10)	no
orange	on	Uncritical error (→ 10)	yes
	flashing		no
red	on	Critical error (→ 11)	no
	flashing	System start (→ 11)	no

Tab. 1: Status LED DF21xx supply modules

7.1.1 Correct operation

No fault occurred and there is connection to the IO-Link master.

7.1.2 Independent operation

No connection to the IO-Link master. If there is no connection to the IO-Link master when the operating voltage has been applied, the supply module transfers the parameter data to the connected circuit protection modules. The behaviour of the connected circuit protection modules is controlled via the configuration of the supply module. Either the status of the circuit protection modules is kept (FREEZE) or the circuit protection modules are switched off (UNFREEZE). If there is again connection to the IO-Link master and no fault occurred, the device goes to the "correct operation" mode.

7.1.3 Uncritical error

No valid configuration data is available. The connected circuit protection modules remain switched off. Cyclic data exchange is not possible, acyclic data exchange is conditionally possible. After the device has received the valid configuration and parameter data, it quits this operating mode.

7.1.4 Critical error

During initialisation an error is found or a critical error occurs. Communication with the IO-Link master is not possible. The connected circuit protection modules are and remain switched off.

- Reboot the device.

7.1.5 System start

The supply module is initialised when the operating voltage is applied. During this time communication with the IO-Link master is not possible.

7.2 DF22xx circuit protection modules

The different operating states of the circuit protection modules are indicated by the status LED.

Status LED		Operating status	Status of load output
—	off	Missing operating voltage, error in initialisation or channel switched off via button	off
green	on	Channel switched on via button or IO-Link, no error	on
green/orange	flashing	Load current limit reached	on
orange	on	Overload or short circuit until disconnection	on
		Channel switched on via button and switched off via IO-Link	off
red	on	Triggering via short circuit or overload	off
		Undervoltage in ON status with automatic switching on again	

Tab. 2: Status LED DF22xx circuit protection modules

7.3 Interrogation of module to confirm the set nominal current

Only for circuit protection modules with adjustable nominal current.

- Press the ON/OFF/reset button of the requested channel between 2 and 5 seconds.
- ▷ The status LED of the selected channel flashes red once.
- ▷ The status LED flashes orange to display the set nominal current. The LED flashes red once to confirm completion of the cycle. The LED flashes orange, once or multiple times, in accordance with nominal current setting in amperes (orange flashing once = 1 A; orange flashing twice = 2 A; etc.).
- ▷ The set nominal current is displayed five times. After 5 cycles the display changes to the current operating status.
- To interrupt/stop the interrogation cycle, and return to normal status indication mode, press the ON/OFF/reset button of the requested channel at any time.

7.4 Setting of the nominal current

Only for circuit protection modules with adjustable nominal current.

- Set the nominal current via IO-Link using a corresponding parameter setting software.

8 Maintenance, repair and disposal

The operation of the unit is maintenance-free.

Only the manufacturer is allowed to repair the unit.

- ▶ After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.

Cleaning the unit:

- ▶ Disconnect the unit from the voltage supply.
- ▶ Clean the unit from dirt using a soft, chemically untreated and dry micro-fibre cloth.