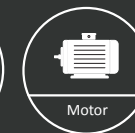
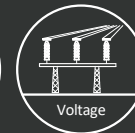




Fast commissioning

FPC 400



Family of multifunctional numerical relays

FPC 400 is a family of current and voltage digital protection relays with easy to use interface meant for variety of solutions in industry and power distribution.

Its robust design enables it to be placed in **demanding industrial environments**.

Setting can be done completely through **user friendly local display unit**. User experience is enhanced through new edition of interface software **MiQen** featuring real-time display of measurements, statuses and event recorder.

Transferring settings between different devices has never been easier thanks to special front panel **USB port**. Same settings are simply transferred from one device to another using USB stick which can also be used to **save fault recordings, counters and update firmware**.

FPC 400 can be **expanded using external module EX408** for up to **8** temperature sensors.

FPC 400 is a member of NEO3000® Substation system and can be integrated to any other new or existing substation or automation.

Feeder, busbar, motor or transformer protection

Supports directional protections

Up to 8 CT/CTs or VT AC inputs

Up to 30 digital inputs and 12 relay outputs

Fault and event recording

Disturbance recording up to 3200 Hz

Multifunctional front USB port

Local and remote control

User-friendly MiQen PC software included

FPC 400

Family of multifunctional numerical relays

Technical characteristics

Device power supply		
Rated voltage	DC or AC/DC	24 V-60 V 100 V-250 V, 50 Hz, 60 Hz
Permissible tolerance		-20 % to +10 %
Power consumption		≤ 10 VA, typical 3 VA (without external modules)
Voltage loss hold up time		100 ms (100 % drop)
Permanent memory type		EEPROM, FLASH
Permanent registers storing time		permanently
Galvanic isolation	AC	3,5 kV, 50 Hz, 1 min
Recommended wire dimensions		1,5 mm ² (min. 0,75 mm ² , max. 2,5 mm ²)
AC current inputs		
Nominal current	I _n	1 A/5 A (defined by software setting)
Nominal frequency		50 Hz/60 Hz
Measuring range	phase inputs sensitive (earth) input	up to 55 I _n up to 2 I _n
Overvoltage category		CAT III 300 V
Consumption		≤ 0,1 VA (I _n), ≤ 0,1 VA (20 I _n)
Thermal overload	Continuous 10 s 1 s	4 I _n (20 A) 15 I _n (75 A) 100 I _n (500 A)
Galvanic isolation	AC	3,5 kV, 50 Hz
Recommended wire dimensions		2,5 mm ² (min. 1,5 mm ² , max. 6 mm ²)
AC voltage inputs		
Nominal voltage	U _n	60 V-500 V (defined by software setting)
Nominal frequency		50 Hz/60 Hz
Measuring range		up to 500 V
Overvoltage category		CAT III 300 V
Input impedance		660 kΩ
Consumption	up to 250 V 250 V-500 V	≤ 0,1 VA ≤ 0,4 VA
Maximum input voltage	Continuous	600 V, 50 Hz-60 Hz
Galvanic isolation	AC	4,35 kV, 50 Hz
Recommended wire dimensions		1,5 mm ² (min. 0,75 mm ² , max. 2,5 mm ²)
Universal digital inputs		
Nominal voltage	DC AC	24 V - 250 V 230 V, 50 Hz-60 Hz
Maximum input voltage	DC AC	275 V 275 V, 50 Hz-60 Hz
Activation voltage	DC AC	> 18 V activation; < 12 V deactivation > 18 V activation; < 10 V deactivation
Galvanic isolation	AC	3,5 kV, 50 Hz
Input current	AC/DC	< 1 mA
Recommended wire dimensions		0,75 mm ² (min. 0,75 mm ² , max. 2,5 mm ²)
High threshold digital inputs		
Nominal voltage	DC AC	110 V - 250 V 230 V, 50 Hz-60 Hz
Maximum input voltage	DC AC	275 V 275 V, 50 Hz-60 Hz
Activation voltage	DC AC	> 83,5 V activation; < 60 V deactivation > 83,5 V activation; < 60 V deactivation
Galvanic isolation	AC	3,5 kV, 50 Hz
Input current	AC/DC	< 1 mA
Recommended wire dimensions		0,75 mm ² (min. 0,75 mm ² , max. 2,5 mm ²)
Digital (relay) outputs		
Switching capacity	AC DC 30 V DC 48 V DC 110 V DC 220 V	8 A, UL: 10 A, 15 A (max. 4 s) 8 A (resistive load) 2 A (resistive load) 0,4 A (resistive load) 0,28 A (resistive load)
Limiting making current breaking capacity		15 A; max. 4 s, duty factor 10 %; max. 2000 VA
Number of switching cycles		electrical 100 k, mechanical 1 M
Maximum switching voltage	AC/DC	250 V, 50 Hz-60 Hz
Maximum number of simultaneously activated relays		8
Power supply burden		max. 0,5 W per activated relay
Protection		dustproof
Galvanic isolation	AC	3,5 kV, 50 Hz
Recommended wire dimensions		1,5 mm ² (min 1,5 mm ² , max 2,5 mm ²)
Communication – RS485		
Connector		rear, screw connector
Cable		120 Ω STP or UTP (twisted pair)
Transfer speed		1200 bit/s-115,200 bit/s
Range		approx. 1200 m (according to EIA-485)
Galvanic isolation	AC	3,5 kV, 50 Hz
Communication – RS232		
Connector		rear, DB9F
Transfer speed		1200 bit/s-115,200 bit/s
Range		approx. 15 m (according to EIA-232)
Galvanic isolation	AC	3,5 kV, 50 Hz
Communication – ETH		
Connector		rear, screw connector
Transfer speed		10/100BASE-T
Range		approx. 100 m (according to EIA-568)
Galvanic isolation	AC	0,5 kV, 50 Hz
Communication – Fiber Optic		
Connector		rear, ST
Cable		multi-mode, 62,5/125 μm, 50/125 μm, 100/140 μm, 200 μm
Wavelength		820 nm
Transfer speed		1200 bit/s-115,200 bit/s
Range		approx. 1700 m
Transmitter optical power		-15 dBm
Receiver sensitivity		-34 dBm
Allowed optical loss		≤ 6,8 dB (62,5/125 μm, 1700 m, -15 dBm/-34 dBm)
Communication – EXT (for extended modules only)		
Connector		rear, RJ45
Galvanic isolation	AC	0,5 kV, 50 Hz
Communication – USB		
Connector		front, type A
Supported type		1.0, 2.0
Supported storage size		≤ 32 GB
Supported file system		FAT32
Transfer rate		≈ 1,2 Mbit/s
Bridgeable distance		< 6 m
Mechanical characteristics		
Dimension (W x H x D) Packaging size		150 x 176 x 125 mm 220 x 180 x 180 mm
Weight With packaging		2080 g 2500 g
Material	Housing	Stainless steel
IP protection level	Front Rear	IP 54 IP 40
Environment		
Degree of pollution	IEC 60255-27	2
Maximum altitude above sea level		2000 m (6561.68 ft)
Operation temperature range		-25 °C to +70 °C
Measuring & protection tolerances		
Current		
Accuracy - measurements	phase inputs sensitive (earth) input	≤ ±0,5 % I _n (0,1 I _n ≤ I ≤ 4 I _n ; 50 Hz; 25 °C) ≤ ±3 % I _m (4 I _n ≤ I ≤ 55 I _n ; 50 Hz; 25 °C) I _{m_min} = 20 mA; 50 Hz; 25 °C ≤ ±0,2 % I _n (0,001 I _n ≤ I ≤ 2 I _n ; 50 Hz; 25 °C) I _{m_min} = 0,5 mA; 50 Hz; 25 °C
Accuracy - protections	phase inputs sensitive (earth) input	≤ ±3 % I _n (0,1 I _n ≤ I ≤ 4 I _n ; 50 Hz; 25 °C) ≤ ±3 % I _m (4 I _n ≤ I ≤ 55 I _n ; 50 Hz; 25 °C) ≤ ±3 % I _n (0,001 I _n ≤ I ≤ 2 I _n ; 50 Hz; 25 °C)
Accuracy - harmonics amplitude		≤ ±3 % I _n (0,01 I _n ≤ I ≤ 0,5 I _n ; 50 Hz; 25 °C)
Temperature stability		≤ ±0,1 % I _n / 10 °C
Voltage		
Accuracy - measurement		≤ ±0,1 % U _n (1 V ≤ U ≤ 250 V; 50 Hz; 25 °C) ≤ ±0,5 % U _m (250 V ≤ U ≤ 600 V; 50 Hz; 25 °C) U _{m_min} = 0,4 V; 50 Hz; 25 °C
Accuracy - protections	phase inputs	≤ ±3 % U _n (1 V ≤ U ≤ 250 V; 50 Hz; 25 °C) ≤ ±3 % U _m (250 V ≤ U ≤ 600 V; 50 Hz; 25 °C)
Accuracy - harmonics amplitude		≤ ±0,5 % U _n (1 V ≤ U ≤ 250 V; 50 Hz; 25 °C)
Temperature stability		≤ ±0,25 % / 10 °C
Frequency		
Accuracy - measurements	Current inputs Voltage inputs Current reference Voltage reference	0,02 Hz (0,1 I _n ≤ I ≤ 4 I _n ; 50 Hz; 25 °C) 0,02 Hz (0,1 U _n ≤ U ≤ 4 U _n ; 50 Hz; 25 °C) 0,02 Hz (20 Hz ≤ f ≤ 80 Hz; I _n ; 25 °C) 0,02 Hz (20 Hz ≤ f ≤ 80 Hz; U _n ; 25 °C)
Accuracy - protections	Phase inputs	0,02 Hz (0,1 U _n ≤ U ≤ 4 U _n ; 50 Hz; 25 °C)
Temperature stability		≤ ±0,005 Hz / 10 °C

FPC 400

Family of multifunctional numerical relays

Type tests

Electromagnetic Compatibility	Standard	Class/Value
Emission		
Conducted Disturbance Emission	IEC 60255-26 CISPR 22 EN 55022 IEC 61000-6-4	A A
Radiated emission (below 1 GHz)	IEC 60255-26 CISPR 11 EN 55022 IEC 61000-6-4	A A
Radiated emission (above 1 GHz)	IEC 60255-26 CISPR 22 EN 55022 IEC 61000-6-4	A A
Immunity		
Electrostatic Discharge	IEC 60255-26 IEC 61000-4-2	Level 4
Radiated immunity	IEC 60255-26 IEC 61000-4-3 ENV 50204 (GSM)	3 3
Fast transient / burst immunity	IEC 60225-26 IEC 61000-4-4	4
Surge immunity	IEC 60255-26 IEC 61000-4-5	3,4
Conducted immunity	IEC 60255-26 IEC 61000-4-6	3
Power frequency magnetic field immunity	IEC 60255-26 IEC 61000-4-8	4
Pulse magnetic field immunity	IEC 61000-4-9	5
Damped oscillatory magnetic field immunity	IEC 61000-4-10	4
Oscillatory transient immunity – Ring wave	IEC 61000-4-12	4
Oscillatory transient immunity – Slow damped oscillatory wave	IEC 60255-26 IEC 61000-4-18 ANSI/IEEE Std C37.90.1	3
Voltage dips	IEC 60255-26 IEC 61000-4-11 IEC 61000-4-29	
Voltage interruptions	IEC 60255-26 IEC 61000-4-11 IEC 61000-4-29	
Ripple	IEC 60255-26 IEC 61000-4-17	

Mechanical durability	Standard	Class/Value
Energized		
Seismic	IEC 60255-27 IEC 60255-21-3 IEC 60068-2-6	Class 1
Sinusoidal vibration response	IEC 60255-27 IEC 60255-21-1 IEC 60068-2-6	Class 1
Shock response	IEC 60255-27 IEC 60255-21-2 IEC 60068-2-27	Class 1
De-energized		
Sinusoidal vibration endurance	IEC 60255-27 IEC 60255-21-1 IEC 60068-2-6	Class 1
Shock withstand	IEC 60255-27 IEC 60255-21-2 IEC 60068-2-27	Class 1
Bump	IEC 60255-27 IEC 60255-21-2 IEC 60068-2-27	Class 1

Environmental Tolerances	Standard	Class/Value
Operation		
Cold operation	IEC 60255-27 IEC 60255-1 IEC 60068-2-1	Ad
Dry heat operation	IEC 60255-27 IEC 60255-1 IEC 60068-2-1	Bd
Damp heat (static)	IEC 60255-27 IEC 60255-1 IEC 60068-2-78	55° C 93% R.H.
Cyclic temperature with humidity (damp heat cyclic)	IEC 60255-27 IEC 60255-1 IEC 60068-2-30	
Relative humidity	IEC 60068-2-30	95%
Absolute humidity	IEC 60068-2-30	
Temperature gradient (change of temperature)	IEC 60068-2-14	-25° C .. 70° C
Storage (must be stored in its original packing)		
Exposure to Cold	IEC 60255-27 IEC 60255-1 IEC 60068-2-1	-25° C
Dry heat storage	IEC 60255-27 IEC 60255-1 IEC 60068-2-2	70° C
Safety		
Electrical		
Insulation resistance	IEC 60255-27	100 MΩ
Impulse voltage	IEC 60255-27	5 kV
Power frequency dielectric withstand	IEC 60255-27	3,5 kV 50 Hz
Enclosure		
Dust/ water ingress	IEC 60255-27 IEC 60529	

Ordering code

FPC400 F3 - 1 H 9 A - A 0

Software type

- Basic Feeder protection F0
- Feeder protection F1
- Feeder protection with AR F3
- Feeder protection with AR and SC F4
- Voltage and frequency protection and SC B3
- Motor protection M4
- Transformer protection T4
- Generator protection G4
- Machine differential protection D7

Housing layout

- Small housing - flush mount 1
- Medium housing - flush mount 2

Auxiliary supply voltage

- High (100V – 250 V AC/DC) H
- Low (24 V - 60 V DC) L

Analog inputs configuration

- 6CT + 1CTs (1A/5A*) + 1VT (150V/300V) with 2 fixed connectors 5
- 3CT + 1CTs (1A/5A*) + 4VT (150V/300V) with 2 fixed connectors 6
- 3CT + 1CTs (1A/5A*) + 4VT (150V/300V) with fixed connector and voltage removable connector 9
- 3CT + 1CTs (1A/5A*) + 1VT (150V/300V) with 2 fixed connectors B

Digital IO options

- 6 Outputs, Power Supply O
- 6 Outputs + (2 Outputs, 10 Universal Inputs) A
- 6 Outputs + (2 Outputs, 10 High threshold Inputs) B
- 6 Outputs + 2x(2 Outputs, 10 Universal Inputs) D
- 6 Outputs + 2x(2 Outputs, 10 High threshold Inputs) E
- 6 Outputs + 3x(2 Outputs, 10 Universal Inputs) H
- 6 Outputs + 3x(2 Outputs, 10 High threshold Inputs) I

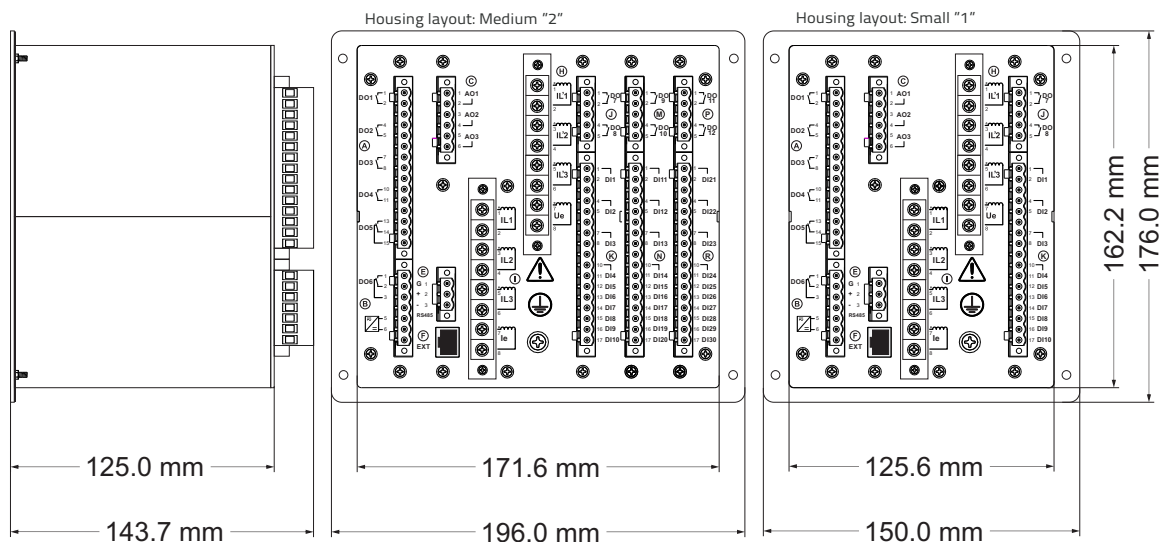
Communication

- None O
- Modbus RTU (2-wire RS485 with 3-pin screw connector) A
- Modbus RTU (RS232 with DB9 Female connector) B
- Modbus RTU (Fiber Optic with ST connector) C
- IEC60870-5-103 (2-wire RS485 with 3-pin screw connector) G
- IEC60870-5-103 (RS232 with DB9 Female connector) H
- IEC60870-5-103 (Fiber Optic with ST connector) I
- Modbus (over) TCP/IP (Ethernet with RJ45 connector) J
- Modbus (over) TCP/IP, IEC60870-5-104 (Ethernet with RJ45 connector) K

Product options

- None O
- 3 Analog outputs 1

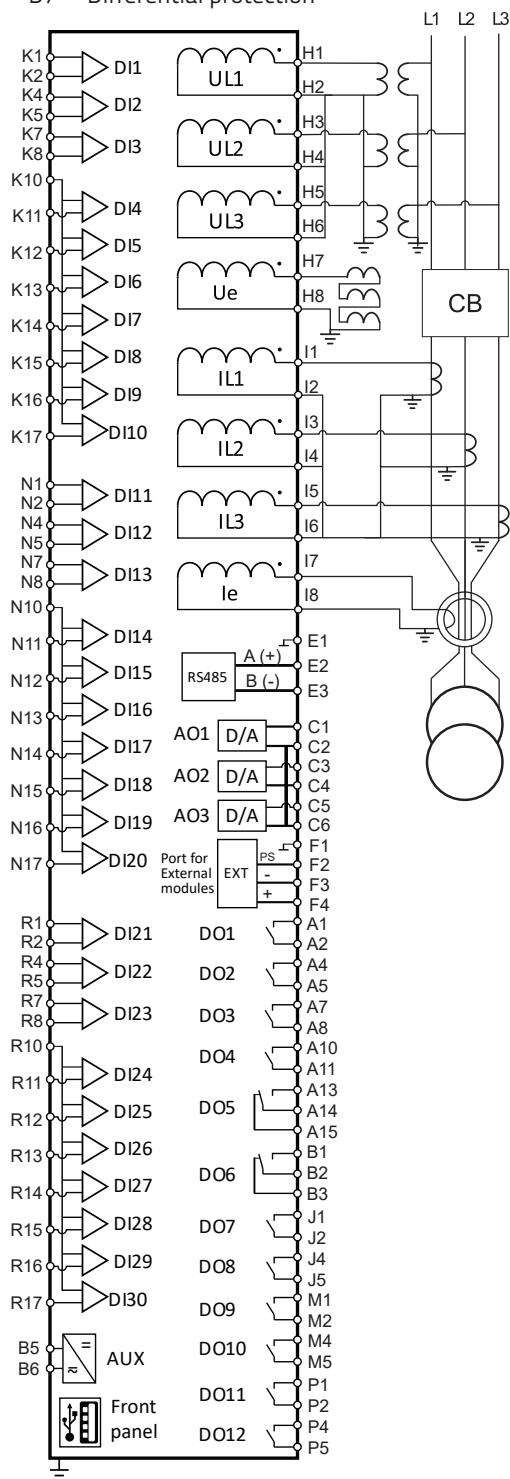
* defined by software setting



FPC 400

Family of multifunctional numerical relays

- F1 - Basic protection
- F3 - Feeder protection
- F4 - Feeder protection with synchro check
- B3 - Busbar protection
- M4 - Motor protection
- T4 - Transformer protection
- G4 - Generator protection
- D7 - Differential protection



Product type comparison	F0	F1	F3	F4	B3	M4	T4	G4	D7
Current protection									
Overcurrent DT/IDMT with inrush restraint and Cold Load Pick-up	50/51	3	3	4	4	4	4	4	4
Directional overcurrent	67	✓	✓	✓	✓	✓	✓	✓	✓
Earth fault overcurrent DT/IDMT with inrush restraint and Cold Load Pick-up	50/51 N/Gs	3	3	4	4	4	4	4	4
Earth fault directional overcurrent, sensitive	67N/G/Ns	✓	✓	✓	✓	✓	✓	✓	✓
Earth fault directional wattmetric/varmetric	32NQ/32NP			✓	✓	✓	✓	✓	✓
Negative sequence/unbalance overcurrent/phase reversal	46/46R		1	2	2	2	2	2	2
Phase undercurrent	37			1	1	1			
Differential relay	87								2
Restricted earth-fault	64REF						2	2	2
Voltage protection									
Phase-to-phase undervoltage	27	2	2	2	2	2	2	2	
Remanent undervoltage	27R					1			1
Positive sequence undervoltage	27D				2	2	2	2	
Negative sequence overvoltage	47			1	1	1	1	1	1
Phase-to-phase overvoltage	59	2	2	2	2	2	2	2	
Overvoltage earth/Residual overvoltage	59N/G	2	2	2	2	2	2	2	2
Overfrequency	81H		2	2	2	2	2	2	
Underfrequency	81L		2	2	2	2	2	2	
Rate of change of frequency (df/dt)	81R				1	1	1	1	1
Power and machine protection									
3 phase thermal overload (feeders, cables, tr. opt.)	49F/T			1	1			1	1
3 phase thermal overload (motors, generators, transformers)	49M/G/T					1	1	1	1
Directional active overpower	32P				1	2	1	2	
Directional active underpower	37P				1	2		2	
Directional reactive power (loss of field)	32Q					1		1	
Temperature monitoring (up to 8 sensors)*	38/49T					✓	✓	✓	✓
Locked rotor, excessive starting time	48/51LR/14					✓			
Starts per hour	66					✓			
Thermostat	26						2	2	2
Buchholz switch	63							2	
External trip		2	2	2	2	2	2	2	2
Automation and diagnostic									
Circuit breaker control and monitoring	94/69	✓	✓	✓	✓	✓	✓	✓	✓
Circuit breaker failure	50BF	✓	✓	✓	✓	✓	✓	✓	✓
Trip circuit supervision (TCS)	74	✓	✓	✓	✓	✓	✓	✓	✓
Auto-reclosure with 5 stages	79			✓	✓				
Synchro Check	25				✓			✓	✓
Lockout Relay	86/94	✓	✓	✓	✓	✓	✓	✓	✓
Machine control, running hours							✓	✓	✓
Programmable logic		✓	✓	✓	✓	✓	✓	✓	✓
Metering									
Phase current, RMS, THD, Harmonics, Residual current 3 _{l0}		✓	✓	✓	✓	✓	✓	✓	✓
Earth current sensitive		✓	✓	✓	✓	✓	✓	✓	✓
Ph. & PPV voltages, RMS, THD, Harmonics		✓	✓	✓	✓	✓	✓	✓	✓
Frequency		✓	✓	✓	✓	✓	✓	✓	✓
Power		✓	✓	✓	✓	✓	✓	✓	✓
Communication									
IEC61850 MMS	Ethernet								Optional
IEC 60870-5-101	Serial								Optional
IEC 60870-5-103	Serial	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60870-5-104	Ethernet	✓	✓	✓	✓	✓	✓	✓	✓
DNP3	Eth., Serial								Optional
Modbus RTU	Serial	✓	✓	✓	✓	✓	✓	✓	✓
Modbus TCP/IP	Ethernet	✓	✓	✓	✓	✓	✓	✓	✓
mA/10V Analog output	mA, V								Optional (3 when product option "1" in ordering)
External modules									
EX 408 (8 x PT100, 2 or 3 wires, powered from FPC)									Optional
Accessories									
Surface mount kit									Optional

✓ included, 1...4 number of functions, (3) Optional.
* With optional external temperature module EX 408.

Published by Iskra, d. d. • Version 5.0, December 2018



Iskra, d. d. Power Division
Stegne 21
SI-1000 Ljubljana, Slovenia

Phone: +386 (0) 1 50 04 282
eMail: sales.energy@iskra.eu
www.iskra.eu