DMV-OP

NUMERICAL MOTOR PROTECTION

Field of application

The ***OmegaProt*** compact devices belong to the smallest, numerical type device family produced by PROTECTA Co. Ltd. Due to the compact design the place requirement is small, so they can be applied in narrow locations as well. The application is more economic than the complex products of other types, if the protection requirement allows usage of few inputs and outputs. Because of the small size, the hardware configuration has considerable limitations as compared to the modular ***EuroProt*** devices.

This information sheet describes the individual characteristics of a specific application: the factory configuration ***DMV-OP*** complex motor protection. The general description of the members of the ***OmegaProt*** type complex protection family can be found in document "***OmegaProt*** complex protection, hardware and software description and user's manual" (further "*OmegaProt manual*").

Main features

The ***main tasks of*** motor protection:

- ***Short circuit protection*** to make fast trip when phase-to-phase or three phase fault occurs on motor stator winding, at motor terminals or on the feeder cable,
- ***Earth fault protection*** to trip when phase-to-ground fault occurs on motor stator winding, at motor terminals or on the feeder cable,
- ***Overloading protection*** works as a thermal replica function i.e. it determines the motor overheating by taking motor current and motor thermal characteristic data into account, and gives first alarm only, then it trips the motor on dangerous overheating. The protection calculates the motor overheating [$\Theta(t)$] or cooling according to the equations as follows:

$$\Theta(t) = \Theta_0 + [\ \Theta_n \left(\frac{I_k}{I_{nm}}\right)^2 - \Theta_0\ ] \cdot [\ 1 - e^{-\frac{t}{T_m}}\ ], \qquad \Theta(t) = \Theta_0 \cdot [\ e^{-\frac{t}{T_h}}\ ],$$

where

I_{nm}	"motor rated current",
Θ_n	temperature rising at "motor rated current" $\mathbf{I_{nm}}$,
$\Theta(t)$	inner temperature rising of motor after t time period,
Θ_0	previous overheating of motor,
T_m	warming and cooling time constant of motor on rotating condition,
T_h	cooling time constant of motor on standing condition.

- ***Restart blocking the overheated motor*** prevents damagaes, if the motor is overheated due to a former load state, until the motor cools down below a predefined temperature.
- ***Asymmetry protection*** protects a motor against abnormal overheating of stator and rotor due to a phase loss, or any asymmetry caused by faulty operation of the higher voltage network.
- ***Loss of load protection*** which is necessary at some drives (e.g. if the motor drives a pump) and trips the motor if a sudden load loss is dangerous due to technological reasons.
- ***Protection of a motor with heavy starting condition*** makes possible that the preset overheating value of a motor of long running-up time and starting with heavy load is higher then that on normal operation. It allows safe overheating protection during normal operation.
- ***Stalled rotor protection*** protects the motor against severe damage caused by prolonged starting mode of operation.

Each protection functions listed above can be disabled or enabled**.**

Design

The DMV-ΩP motor protection is built into a closed dustproof steel case. The case can be mounted to a standard **Ω** rail, the width in the rail is 120 mm. 16 terminals are placed on the front plate of case, through them the external connection can be made. The optical fibre cable connections are located on the upper part of the front plate.

Setting and supervising of the motor protection

Setting and checking of protection, reading operating information, events and signals, setting of the software matrix, and handling of signals (messages) is possible with external PC or other external computer. Protecta Co. Ltd. delivers the operating software (Protect for Windows) together with the DMV-OP motor protection.

Technical Data

General technical specification see in **OmegaProt system information sheet**
Type tests see in **OmegaProt system information sheet**
Design and sizes see in **OmegaProt system information sheet**

Setting ranges:	
Motor rated current, I_n in per cent of the main C.T. rated current, In / I_{CT}	30 to 120 %, step 2 %
No load operation minimum threshold current (fixed)	I_{IDLE} / I_n = 15 %
Phase fault O.C. relay starting current, I> / I_{CT} time delay setting, t (I>)	50 to 1500 %, step 10 % 0 to 60000 ms, step 10 ms
Earth fault O.C. relay starting current, 3Io> / I_{CT} time delay setting, t($3I_o$>)	10 to 100 %, step 2 % 0 to 60000 ms, step 10 ms
Motor rated temperature rising related to the ambient temperature when the motor load is the In rated current	Θn = 10 to 100°C, step 1°C
Overheating alarm signal setting value in per cent of the motor rated temperature rising	Θp / Θn=60 to 160 %, step 1 %
Thermal overloading (overheating) trip setting value in per cent of the motor rated temperature rising	Θt / Θn=80 to 180 %, step 1 %
Temperature rising limit to block the restart command in per cent of the motor rated temperature rising	Θb / Θn=60 to 160 %, 1 %
Time constant for rotating motor temperature rising and cooling	T_R = 2 to 200 min., step 1 min.
Standing motor cooling time constant in per cent of the time constant for rotating motor	T_C / T_R (Tcool / Trise) = 100 to 400 %, step 100 %
Negative sequent current weighting	$4I^2$
Asymmetry protection starting value, fixed	I_2 / I_n = 15 %
Asymmetry protection, time delay at I_2/I_{nm}=15 % lower limit of time delaying	t_{as} = 10...80 s, step 2 s $t_{as\ min}$=50...500ms,step: 50 ms
Loss of load protection starting current in per cent of the motor rated current	I_t < / In = 30 to 60 %, step 5 %
Loss of load protection time delay	t(I_t) = 1 to 10 s, step 1 s
Starting period setting value	t_{st} = 5 to 100 s, step 5 s
Fault during starting period, setting current	I_{st} / I_{CT}=200 to 1200 %, 10 %
At heavy starting setting, the heating current during the starting period,	I^2 / 2, fixed
Stalled rotor protection at the end of the starting period	2xI_n, (if t > t_{st})

Current relays, resetting ratio	95 %, fixed

Size

Widht	Height	Depth
120 mm	90 mm	80 mm

Ordering information

- Type of protection [DMV-OP]
- Rated C.T. current [1 A, 5 A]
- Rated zero sequence C.T. current [main C.T., toroidal type C.T.]
- The D.C. (logical) bus-bar differential protection contact is NC or NO type?