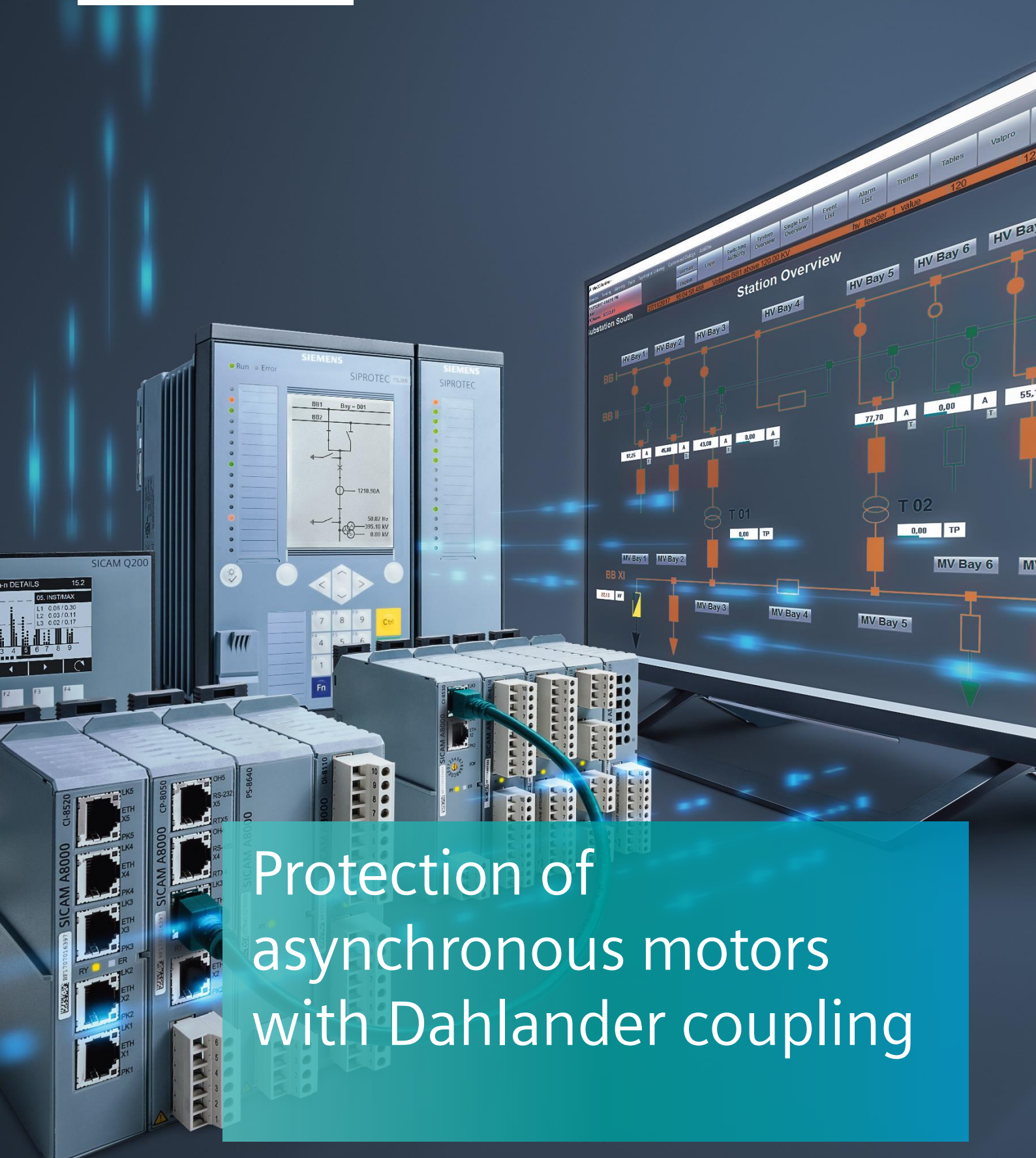


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Protection of asynchronous motors with Dahlander coupling

SIPROTEC 5 Application

Protection of asynchronous motors with Dahlander coupling

SIPROTEC 5 Application

SIPROTEC 7SK85 Protection of asynchronous motors with Dahlander coupling

APN-075, Edition 1

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1 SIPROTEC 7SK85 Protection of asynchronous motors with Dahlander coupling

1.1 Introduction

These motors are pole changing motors (Dahlander coupling). Motor starts with 8 pair of poles with nominal speed 747 RPM and nominal power is 500kW. When motor achieve nominal speed (747 RPM) stator is recoupling to have four pair of poles, nominal speed 1491 RPM and nominal power is 2000kW.

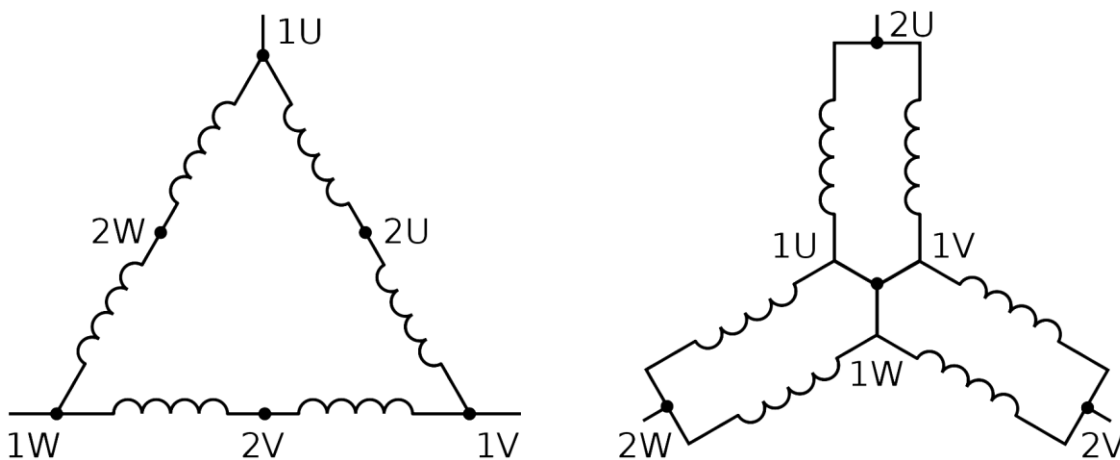


Figure 1: schematic diagram of Dahlander coupling

This application describes how to use one device for protection of Dahlander motors within SIPROTEC 5 devices.

1.2 Definitions

Circuit breakers

There are three CB's. For our application two CB's are in focus, one is for small speed, second is for big speed. The third one is for star point and it is not relevant for protection functions

Measuring points

Each of the current (voltage) measuring points are three phase measurement type. The single-phase measurements are for earth fault cable protection (VI1ph).

Function groups

Each of the motor speed needs to have separate protection functions. In this case we are protecting "practically" two motors with one device.

For this purpose, we choose one SIPROTEC 7SK85 with two extension modules IO207 and IO202 (SIPROTEC 5 motor protection device):

SIPROTEC 5 Application

Protection of asynchronous motors with Dahlander coupling

Device: 7SK85 Motor Protection

Product code

Short: P1H71725

Long: 7SK85-DAAA-AA0-0AAAA0-AH0111-33111B-BAA000-000AC0-CB2BA1-CG0CB2



Firmware:	Current version
Housing width:	2/3 x 19"
Housing type:	Flush mounting
Binary inputs:	35
Binary outputs:	23 Relays (11 Standard, 12 Fast, 0 High-Speed, 0 Power)
Current transformers:	6 for protection, 2 for measurement and sensitive ground-current detection
Voltage transformers:	8
Measuring-transducer inputs:	0 (20 mA or 10 V, fast) 0 (20 mA, standard)
CPU:	CP300
Modules in 19" row 1:	IO202 , PS201 , IO207 , IO202
Modules in 19" row 2:	
LEDs/Push-buttons:	48 LEDs
Operation Panel:	Integrated
Key switch:	Without
Display type:	Large display
Front Design:	Standard
Power Supply:	DC 60 V-250 V, AC 100 V-230 V

Communication/Plug-in modules:

Communications encryption:	Normal
Integrated Ethernet port J:	for DIGSI 5
Plug-in module position E:	ETH-BB-2FO: 2x optical Ethernet 100 Mbit/s, 1300 nm, duplex LC connector, 2 km over 50/125 um or 62.5/125 um multimode optical fiber Communication Protocols: applicable for DIGSI 5, IEC 61850-8-1 MMS and GOOSE, IEC 60870-5-104, DNP3 TCP, Modbus TCP, Synchrophasor (IEEE C37.118 - IP), Profinet IO, SUP, DHCP, SNTP, SNMP, etc. Redundancy protocols: Line Mode, RSTP, HSR, PRP
Plug-in module position F:	Port is available but not assembled

1.3 Device Configuration

Assign the necessary Measuring Points.

		Base module				Expansion module 4			
		1A				4A			
		1A1-1A2	1A3-1A4	1A5-1A6	1A7-1A8	4A1-4A2	4A3-4A4	4A5-4A6	4A7-4A8
Measuring point	Connection type	IP 1A1	IP 1A2	IP 1A3	IM 1A4	IP 4A1	IP 4A2	IP 4A3	IM 4A4
(All)	(All)	(All)	(All)	(All)	(All)	(All)	(All)	(All)	(All)
I-3ph 1 small speed	3-phase, 2 primary CT	I A	I B	I C		I A	I B	I C	
I-3ph 2 big speed	3-phase, 2 primary CT								
I-1ph 1 earth fault					Ix				
Add new									

Figure 2: Assignment of measuring points

Assign the necessary Function group

Measuring point	Motor small speed				Motor big speed			
	V 3ph	I 3ph	V	I 3ph	V 3ph	I 3ph	V	I 3ph
(All)	(All)	(All)	(All)	(All)	(All)	(All)	(All)	(All)
I-3ph 1 small speed[ID 1]		X		X				
I-3ph 2 big speed[ID 3]						X		X
I-1ph 1 earth fault[ID 2]								
V-3ph 1[ID 4]	X		X		X			
V-1ph 1 earth fault[ID 5]								

Protection group	CB small speed	CB big speed
(All)	(All)	(All)
Motor small speed	X	
Motor big speed		X
V1 1ph 1	X	X

- Motor small speed
 - General
 - Th.rep.li.rotor
 - Motor monitor
 - 48 Start.time sup.1
 - 49 Th.overl.-A 1
 - 46 I2 1
 - 50/51 OC-3ph-B1
 - Circuit-breaker interaction
- Motor big speed
 - General
 - Th.rep.li.rotor
 - Motor monitor
 - 48 Start.time sup.1
 - 49 Th.overl.-A 1
 - 46 I2 1
 - 50/51 OC-3ph-B1
 - Circuit-breaker interaction

Figure 3: Assignment of function groups

1.4 Conclusion

With motor protection SIPROTEC 7SK85, a modular SIP5 device, is perfect to provide all necessary protection functionally and solution for “Dahlander coupling” and all asynchronous motors. In this case, we protected two separate motors, but with SIP5 it can be up to 5 motors.

References:

- [1] https://en.wikipedia.org/wiki/Dahlander_pole_changing_motor
- [2] Siemens PTD EA · Optimum Motor Protection with SIPROTEC Protection Relays
- [3] SIPROTEC 5, Motor Protection, Manual, C53000-G5040-C024-7, Edition 05.2018

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