Electronic motor-starter combination used with SmartWire-DT

Powering Business Worldwide

Contents

1 Electronic motor-starter combination in the application

The electronic recording of data from a motor-protective circuit-breaker via SmartWire-DT offers new possibilities in terms of motor protection, monitoring as well as the logging of motor data.

The following information is immediately available to the system operator:

- Is the right trip block plugged in?
- Is the tripping current correctly set?
- Is the motor currently being run in the normal or overload range?
- Does the motor reach an overload range so that a warning has to be issued or regulated?
- Is the motor load for a period higher than planned so that regular maintenance has to be done earlier?
- What was the triggering cause?
- Has the end of a process step been reached (e.g. does the motor load allow conclusions to be drawn about the sponge mixture consistency)?

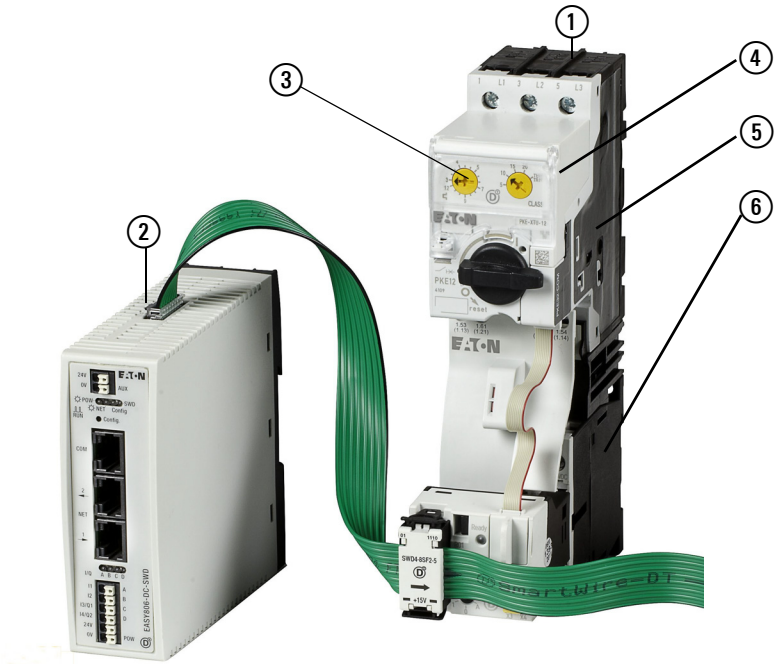


Figure 1: Control relay EASY806-DC-SWD with motor-starter combination over SmartWire-DT

① Motor-starter combination
② EASY806-DC-SWD
③ Dial for tripping current
④ PKE-XTUA-4 trip block
⑤ PKE12 motor-protective circuit-breaker
⑥ DILM7 contactor

These application notes describe the user program "PKE_MotorCurrentMeasurement.e60". After installing easySoft-Pro V6.90, you can find the user program in the folder C:\Programme\Gemeinsame Dateien\Eaton\easySoftSamples\easy800.

Please refer to the "Motor-protective circuit-breaker PKE12 and PKE32" and "SmartWire-DT Units" manuals for further information on motor circuit breakers and the SmartWire-DT. Please consult the Manual "Control Relay easy800 " for the EASY806-DC-SWD startup.

1.1 Job definition for the user program

The actual current of the motor-starter combination should be shown in milliamperes in the Display & Buttons indicator of the easySoft-Pro. The motor-starter combination delivers the following data via SmartWire-DT as the basis for calculation:

- I_r: the tripping current set by the operator on the PKE trip block
- I-REL: phase current measured on the PKE trip block as a percentage value of I_r

The imported 4-bit value of the tripping current I_r refers to the tripping current in milliamperes in the associated table. Since the table values depend on the type of trip block, the type must be known.

Table 1: Set I_r current value of the overload release

Field		&Value	PKE-XTUA-1.2 I_r [A]	PKE-XTUA-4 I_r [A]	PKE-XTUA-12 I_r [A]	PKE-XTUA-32 I_r [A]
	I_r	0x0	0.30	1.00	3.00	8.00
		0x1	0.33	1.10	3.30	8.80
Values		0x2	0.36	1.20	3.60	9.70
for		0x3	0.40	1.30	4.00	10.50
MX31		0x4	0.43	1.42	4.30	11.50
		0x5	0.47	1.55	4.70	12.50
		0x6	0.50	1.70	5.00	13.50
		0x7	0.56	1.90	5.60	15.00
		0x8	0.63	2.10	6.30	17.00
		0x9	0.70	2.40	7.00	19.00
Values		0xA	0.77	2.60	7.70	20.50
for		0xB	0.83	2.80	8.30	22.00
MX32		0xC	0.90	3.00	9.00	24.00
		0xD	1.00	3.30	10.00	27.00
		0xE	1.10	3.70	11.00	29.00
		0xF	1.20	4.00	12.00	32.00

MX31 and MX32 are multiplexer modules that are used in the function block diagram. The table values of the selected trip block are set up on the module inputs.

The actual current I_{actual} can be calculated according to following formula:

$$I_{actual}\,[mA] = \frac{\text{I-REL\%} \cdot I_r[mA]}{100\ \%}$$

I_r and I-REL are explained in detail in the "SmartWire-DT Units" manual under "PKE-SWD-32 cyclical data".

Below you can see how to determine the actual motor current in milliamperes from I_r and I-REL using easySoft-Pro V6.90.

1.2 Prerequisites

To start the user program, you need an EASY806-DC-SWD controller with a connected SWD line and at least one connected PKE12 module with a plugged in PKE-XTUA-4 trip block. The SWD line is configured and the EASY806-DC-SWD has the target configuration. The easySoft-Pro V6.90 software is installed and executed.

If you open the user program in easySoft-Pro, establish communication with the controller afterwards. It is possible that the target and the project configuration are not matching since the SWD line has more than only one PKE 12. In this case, adjust the project configuration in the SWD view of the user program. You can also copy the missing SWD components from the imported SWD line into the SWD view of the project.

Make sure that the user program has the following settings in easySoft-Pro V6.90:

- The data profile Profil2 is selected in the device settings for the PKE-SWD-32.
- The value inputs I-REL and I_r are stored in the marker bytes MB65 and MB66, which are assigned operands of the PKE-SWD-32.
  Otherwise, re-assign the value inputs by double-clicking on the Operand assignment box.
- The type of the trip block is known. The adjustable current values of the overload release are present on the inputs of the MX31 and MX32 multiplexer (refer to → Section "Table 1: Set Ir current value of the overload release", page 5).
- The MW66 marker word is used as an auxiliary marker and is no longer available for other purposes.

If you use an EASY802-DC-SWD as controller instead of an EASY806-DC-SWD, you must replace the device in the project view (please refer to the easySoft-Pro online help "Replace Device in Project").

Load the user program into the controller and proceed to the RUN operating mode. Switch on the "Display & buttons" indicator. The actual motor current is shown in mA in the D032 display.

1.3 Functional description of user program

The set tripping current I_r is imported as bit field and assigned to the MB66 marker byte. Since the operator can set a total of 16 different values for the tripping current on the trip block, the current values from the Table (Table 1, page 5) are stored in two multiplexers. Multiplexer MX31 contains the first 8 adjustable current values and MX32 the last 8. One CP32 comparator compares the input value of the imported tripping current with the value 7. If I_r is less than or equal to 7, multiplexer MX31 becomes active. If I_r is greater than 7, multiplexer MX32 becomes active. Before MX32 can become active, the bit value of I_r for the multiplexer must be translated to the value range 0 to 7. The AR01 arithmetic module is used for this purpose. It subtracts the value 8 from I_r and then forwards the result to MX32.

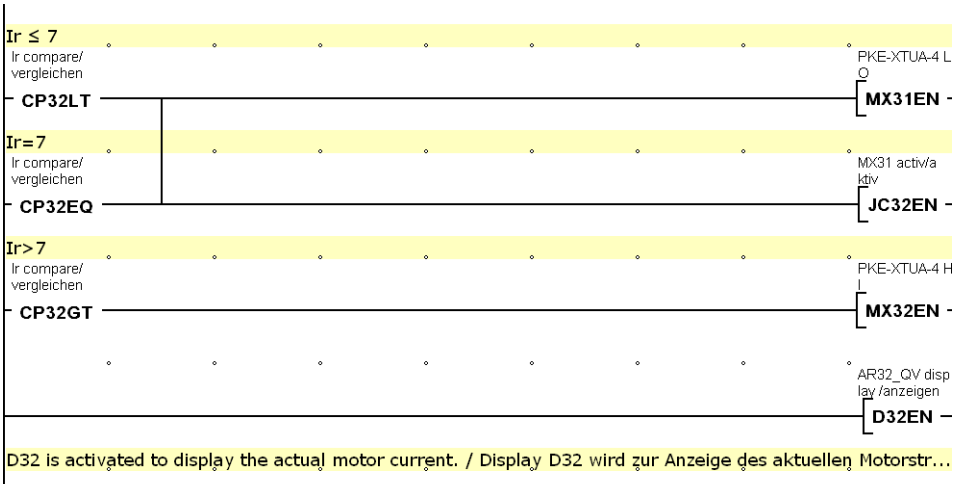
The values from the table for the set current values of the overload release are stored in both multiplexers (Table 1, page 5). Using I_r on the multiplexer you can determine which input (I1 to I8) is put through to QV. The result is depicted in the MW66 marker word and corresponds to the set tripping current in milliamperes.

The percentage value of the actual current I-REL is imported and assigned to the MB65 marker byte. I-REL is multiplied by I_r in the AR31 arithmetic module. The result is divided by 100 in the AR32 the arithmetic module and shown in the D32 display.

1.4 Circuit Diagram

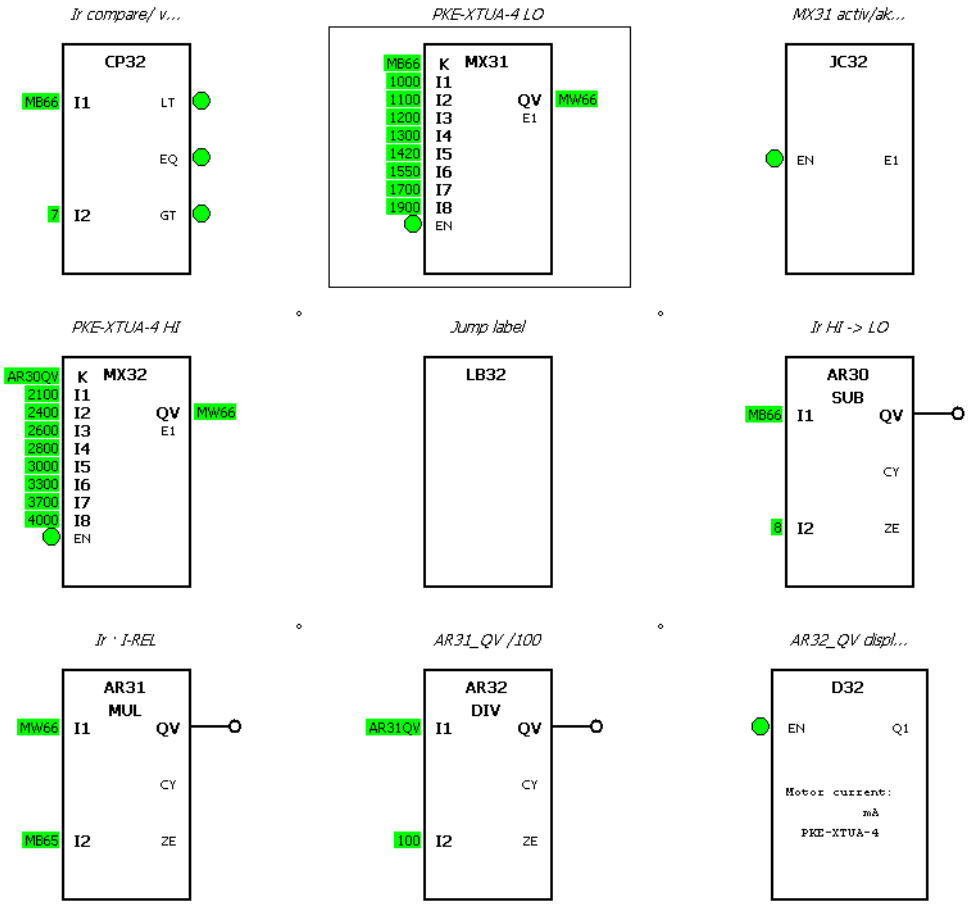
If I_r is less than or equal to 7, multiplexer MX31 is activated. You are then brought to the LB32 jump label upon activation of the JC32EN jump and the D32 display is now activated.

If I_r is greater than 7, multiplexer MX32 is activated. The D32 display is then activated.



1.5 Function block diagram

Before the value is outputted on the D32 display, various calculations that are invisible in the circuit diagram are still executed in the function block diagram. The MW66 auxiliary marker of multiplexer MX31 or MX32 is multiplied with the MB065 marker byte in the AR31 arithmetic module. The calculation result is applied to the input of the AR32 arithmetic module and divided by 100. The result corresponds to the actual current in milliamperes and is then shown on the D32 display.



1.6 Operand list / cross-reference list

Oper...	R...	Point of use	Comment
AR030QV	R	(MX32, K)	Ir HI -> LO
AR031QV	R	(AR32, I1)	Ir · I-REL
AR032QV	R	(D32, [2])	AR31_QV /100
CP032EQ	R	(003, A)	Ir compare/ vergleichen
CP032GT	R	(004, A)	Ir compare/ vergleichen
CP032LT	R	(002, A)	Ir compare/ vergleichen
D032EN	W	(005, I)	AR32_QV display /anzeigen
I017	W	(SWD 01, C)	
I018	W	(SWD 01, STAT)	
JC032EN	W	(003, I)	MX31 activ/aktiv
MB065	W	(SWD 01, I_REL)	I-REL in % von Ir
MB065	R	(AR31, I2)	I-REL in % von Ir
MB066	W	(SWD 01, Ir)	Ir indicated with a 4 bit field
MB066	R	(CP32, I1), (MX31, K), (AR30, I1)	Ir indicated with a 4 bit field
MB068	W	(SWD 01, TRIPR)	
MB070	W	(SWD 01, TH)	
MW066	W	(MX31, QV), (MX32, QV)	Ir PKE-XTUA-4 in mA
MW066	R	(AR31, I1)	Ir PKE-XTUA-4 in mA
MX031EN	W	(002, I)	PKE-XTUA-4 LO
MX032EN	W	(004, I)	PKE-XTUA-4 HI
Q017	R	(SWD 01, Q0)	

1.7 View

If you use another one trip block, you can easily modify the sample program by changing the input values of the multiplexer accordingly Table 1, page 5.

You can also expand the sample program so that you can import the type of trip block. To do this, you must choose profile 4 as data profile. Depending on the type of trip block, the corresponding pair of multiplexers containing the respective values for the tripping current to be set is then selected.