EAS[®]-Sm/Zr electromagnetically controllable torque limiting clutch *mayr*

The cyclic, switchable and controllable torque limiting clutch EAS[®]-Sm

- Engagement is guaranteed only at one specific point due to the phased mayr[®]-synchronous geometry of the mayr[®]precision rollers and roller detents.
- The EAS[®]-Sm/Zr control unit takes over the clutch control, regulation and monitoring functions at 96 VDC coil nominal voltage.

Versatile adaptation of cycles and processes for a complete system or single system areas are possible.



Functional principle of the EAS[®]-Sm electromagnetic clutch

The EAS $\ensuremath{\mathbb{S}}$ -Sm disengages when the pre-set limit torque is reached.

- After a defined cycle is left out and after removal of the overload, the clutch re-engages after 360° at the same point as it disengaged.
- The standard cycle corresponds to 360°. Other cycles, for example 180° are also available.

Energised magnetic coil

- As standard with 24V / 96V direct voltage
- Armature disk attracted by the magnetic force
- The level of the magnetic force is determined by the air gap and coil current.
- The air gap is set optimally manufacturer-side.
- The coil current is continuously adjustable, even during operation.

De-energised magnetic coil

• Input and output are disconnected.





The instantly operational, switchable and controllable EAS[®]-Zr control clutch

- Uniform and constant torque transmission due to precision manufacture of the roller detents.
- Prompt readiness for operation of the machine and system after removal of the overload is guaranteed by using the EAS[®]-Zr.
- Switch-on/off with the EAS®-Sm/Zr control unit.
- Applications in all types of automated machines.
- Adaptable to constantly changing overloads and cycle speeds.



Functional principle of the EAS[®]-Zr electromagnetic clutch

- The EAS[®]-Zr disengages when the pre-set limit torque is reached. After removal of the overload, re-engagement is made at the next convenient roller detent.
- The mayr[®] limit switch is responsible for:
 - immediate drive switch-off
 - or further control functions

Application of the EAS[®]-Sm/Zr torque limiting clutches

- in all kinds of automated machines
- with constantly changing overloads
- with changing cycles and speeds
- in packaging machinery
- in filling machinery
- in printing machinery
- · in cleaning machinery
- in materials handling equipment

The EAS[®]-Sm/Zr control clutches in equipment and systems, which are used for

- cycling
- positioning
- controlling
- checking
- A control-technical standard for
 - ... sequences
 - ... processes
 - ... adaptations

Mayr[®] EAS[®]-Sm/Zr electromagnetically controllable torque limiting clutch



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EAS®-Sm/Zr electromagnetically controllable torque limiting clutch *mayr*®



mavr EAS[®]-Sm/Zr – Technical explanations / Limit switch installation

Technical explanations

Operating speeds

The speeds mentioned on pages 12 and 13 are operating speeds which refer to the clutch in engaged condition.

The re-engagement speed of the EAS®-Sm/Zr clutches depends on the corresponding clutch size or on the mass moments of inertia of the flanged drive elements. Re-engagement or connection of the clutch under load conditions should not take place.

Please contact our application engineers regarding your special application.

Torque adjustment

Adjusting and altering the torque can be accomplished by altering the coil voltage.

The torque capacity is proportional to the coil current, independent of the coil temperature. A consistent coil current should therefore be maintained.

Using the EAS®-Sm/Zr control unit enables the torque to be simply and rapidly adjusted and controlled. The consistent current regulator on the control unit guarantees exact and consistent torque. Coil fluctuations do not affect the set torque (within the operational temperature).

Electrical connection

The supply voltage for the magnetic coil depends on the design, 24 VDC or 96 VDC being standard.

For monitoring the coil temperature there is a PTC resistor in the coil (please see Installation and Operational Instructions B.4.9.GB).

The clutch together with the limit switch can be connected via the Sm/Zr control unit. You can find Technical Data and Explanations on the control unit from page 19 onward.

General installation guidelines

The EAS®-Sm/Zr is a permanently energised switchable and controllable torque limiting clutch. In connection with this, it should be mentioned that magnetic fields can encroach on the clutch supports or drive elements, and affect their function.

After actuating the mechanical limit switch, the clutch output should stop immediately, as otherwise the lever mounted on the limit switch will be worn down due to grinding of the armature disk, meaning that the function of the clutch or limit switch can no longer be guaranteed.

To avoid clutch failures in max. torque ranges caused by thermal overload, the ambient temperature for the clutch should not exceed 40 °C.

The permitted ambient temperature increases during operation with low torque.

Securing the clutch onto the shaft

EAS®-Sm and EAS®-Zr clutches are supplied with finish bores and keyways according to DIN 6885.

The clutch is mounted onto the shaft using a suitable device and axially secured using a press cover, set collars or locking rings.

Attaching the friction support

The magnetic element of the clutch must not rotate freely. A support is required to absorb the low friction torque caused by the roller bearing on the static magnetic part (Figs. 7 and 8, page 15). The friction support must not transmit any appreciable forces (distortions) onto the clutch.

Limit Switch Installation

Contactless sensing with limit switch Type 055.009.6 - magnetic field-resistant -

Installation into EAS®-Sm/Zr clutch with cover



Mounting onto the EAS®-Sm/Zr clutch without cover



Incorrect limit switch installation causes faulty

operation, i.e. no monitoring of the overload.

Screw in proximity switch (without connection cable) with disengaged clutch up to contact, and then turn it back again by approx. 1^{1/4} revolutions.

Lock it with a counter nut against loosening.

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EAS®-Sm/Zr – Installation examples



Mechanical sensing with limit switch Type 055.000.5 – light metal housing –



Incorrect limit switch installation causes faulty operation, i.e. no monitoring of the overload. If the clutch is disengaged and the drive is running, the switch lever is worn down due to grinding. In this case, a contactless switch should be used (see "Mounting onto the EAS®-Sm/Zr clutch without cover", page 14).

* The axial dimension 0,5 mm is adjusted with an engaged clutch and can be sensitively adjusted using a hexagon head screw SW7.

Installation Examples





Fig. 8

EAS[®]-Sm clutch combined with a torsionally rigid, flexible all-steel coupling

The EAS[®]-Sm clutch is axially secured onto the motor shaft by a press cover and screw. A set screw secures the torsionally rigid coupling hub onto the gear box shaft. The torsionally rigid, flexible coupling compensates for radial, axial and angular shaft misalignments. When the clutch disengages, the armature disk moves axially and operates the limit switch.

The friction support stops the magnetic part from rotating.

EAS[®]-Sm clutch with cover

The clutch is axially secured to the shaft via a press cover and a screw, screwed into the threaded centre hole in the shaft.

The cover prevents contamination of the air gaps between the magnetic part and the armature disk and the armature disk and the transmission flange.

Free axial movement of the armature disk must be ensured.

The cover serves as a mounting point for the contactless proximity switch (the proximity switch is set in the factory). The friction support absorbs the frictional torque of the roller bearings between the hub and the magnetic part and stops the magnetic part from rotating.

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EAS®-Sp control unit Type 009.000.2

Application

This unit is used to monitor, control and to signal overload on pneumatically controllable overload clutches with switching functions.

Function

The EAS[®]-Sp control unit monitors the switching condition of the clutch and emits a signal when the set torque is exceeded. It controls pneumatic valves which are used to lock or to open the compressed air supply or to switch from engagement pressure 2 to torque pressure 1.

Switching valve	opens or closes the compressed air supply to the clutch; connections V2a / V2b
Pressure valve	switches over between engagement pressure 2

and torque pressure 1; connections V1a / V1b Both connections are resistant against short-circuiting.

Electrical connection

24 VDC/Gnd	+24 VDC input voltage (special design: 2 change-over contacts)	Dimensions (mm)
Í	Installed protection against incorrect polarity! To set up the voltage supply in the EAS®-Sp control unit, the correct connection voltage polarity is necessary.	/]
ON OFF Gnd1 End Gnd 12 V (+)	Start button / (+) connection for PLC control Stop button / (+) connection for PLC control (-) Connection for PLC control Limit switch signal (-) Connection for limit switch Output voltage for	
V1a / V1b V2a / V2b 14 – 11 – 12	ON/OFF contacts and limit switch Pressure valve 24 VDC Switching valve 24 VDC Overload signalling relay, floating change-over contacts,	
	max. contact load 250 VAC / 10 A	

(Ì)

Do not apply any external voltage to the 12 V terminal.



EAS®-Sp control unit Type 009.000.2









EAS®-Sp control unit Type 009.000.2

Installation

The unit is installed using a snap fastener attached to the housing, which can be attached to all DIN EN mounting rails.



Power connections are to be laid interference-free! The control wires (ON – OFF – Gnd1 – End – Gnd2 –12 V) are to be laid separately and at a sufficient distance from the high voltage current or pulsating wires (PE / L1 / N).

Adjustments



Potentiometer 0 – 100% for engagement time t



To avoid disorders or malfunctions, the operational modes are to be observed before making adjustments.

Engagement time t

Adjustments of the engagement time $t_{\!_{\rm K}}$ are to be carried out using the external potentiometer 0-100 %.

Adjustment of the engagement times for the following operational conditions:

1. Single start (manufacturer-side setting)

Coding bridge:	"Engagement time for single start"
(Manufacturer-side setting)	0 - 30 s (for speeds > 2 rpm)
Changing the coding:	0 – 5 min. (for speeds < 2 rpm)

2. Multi-start (by changing the settings)

a. Single start operation (for first impulse-start)		
Coding bridge:	"Engagement time for single start"	
(Manufacturer-side setting)	0 – 30 s	
Changing the coding:	0 – 5 min.	

b. Multi-start operation (second and additional impulses) (Manufacturer-side setting) 0 – 30 s

onanging no ooang. To	10 s	Changing the coding:
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Operational mode 1 (Please observe the settings)

Switch over from engagement pressure 2 to torque pressure 1, if the clutch is engaged and the limit switch is actuated. The remaining engagement time is set to zero.

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Operational mode 2 (Manufacturer-side setting)

Switch over from engagement pressure 2 to torque pressure 1 when the engagement time ${\rm t_k}$ has passed and the clutch remains engaged.



Clutch-ratchetting during the engagement time $t_{\rm k}$ causes disconnection of the clutch and emission of an overload signal.



Multi-start (Please observe the settings)

The multi-start allows repetition of the engagement pressure 2 switch-on during functional operation.

Application possibilities in operational modes 1 or 2 and only with the 2-contact functional control.



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Connection example

Control elements / Control functions

Application	Function
	2 contacts
	Start: close ON contact
On Off Gnd End Gnd 12V	Stop: open OFF contact
• + 24 V	PLC control
• (-)	Start: + 24 VDC
On Off Gnd End Gnd 12V	Stop: 0 VDC
	PLC control 10 – 30 VDC
	1 contact
On Off Gnd End Gnd 12V	Start: close contact Stop: open contact

Limit switch (monitoring)

Application	Function
On Off Gnd End Gnd 2 12 V	1 contact Clutch engaged: Contact closed Clutch disengaged: Contact open
On Off Gind End Gind 2 12 V	PLC control Engaged: + 24 VDC Disengaged: 0 VDC PLC control 10 - 30 VDC
Undamped Damped	PNP NC contact Clutch engaged: Sensor undamped Clutch disengaged: Sensor damped PNP NC contact: 3-wire sensor, 10 – 30 VDC



No overload status signal will be emitted if the limit switch is not installed according to the regulations.

EAS®-Sp control unit Type 009.000.2

Connection example



Technical data

Input voltage	+24 VDC, +/-10 %
Connection pressure valve	+24 VDC / 0,5 A, resistant against short-circuits
Connection switching valve	+24 VDC / 0,5 A, resistant against short-circuits
Current consumption	max. 1 A / 100 % duty cycle
No-load supply power	< 1 W
Protection	IP 20
Operating temperature	0 up to +50 °C
Storage temperature	-20 up to +70 °C
Max. clampable conductor cross section	0,14 - 2,5 mm² / AWG 26-14
Weight	210 g
Overload signalling relay	floating change-over contacts, max. contact load 250 VAC / 10 A
Conformity markings	UL-Standard UL 508 CSA-Standard C22.2 No. 14-M91
Short-circuit-resistant	
coil connections	If a short-circuit occurs, the electronic monitoring registers this and switches off the affected coil voltage between the coil connections V1a and V1b or V2a and V2b.
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The customer is responsible for providing the input voltage-side protection fuse.

Order Number



EAS®-Sm/Zr control unit Type 010.000.2

EAS®-Sm/Zr control unit Type 010.000.2

Application

This unit is used to switch, control, monitor and to indicate overload for adjustable EAS $^{\circ}$ -Sm synchronous clutches and EAS $^{\circ}$ -Zr overload clutches.

Function

The EAS[®]-Sm/Zr control unit works according to the principle of cycled switching controllers with a frequency of 18 kHz. It switches, controls and monitors the clutch and emits a signal when the set torque is exceeded.

Switched with

- floating contacts
- PLC control with 10 30 VDC
- Controlled by
- coil current
- Monitored with
- · floating contacts
- magnetic field-resistant proximity switches up to +100 °C

Temperature monitors

- coil-clutch > +130 °C
- control unit > +80 °C

Electrical connections

PE, L1, N	connection input voltage
Ku1 / Ku2	coil connection for clutch
14 – 11 – 12	contact signalling relay 1 (overload)
24 – 21 – 22	contact signalling relay 2 (excessive temperature)
On	connection "Start" button
Off	connection "Stop" button
Gnd1	(-) connection with PLC control
End	limit switch signal
Gnd2	(-) connection for limit switch
12V	(+) connection for ON-button, OFF-button and limit switch
Gnd3	(-) connection with analogue torque adjustment
Μ	(+) connection with analogue torque adjustment
P1,P2	connection for coil thermistor (or bridge)

Functional sequence





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Dimensions (mm)





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EAS®-Sm/Zr control unit Type 010.000.2

Installation / Connection examples



Do not apply external voltage to the 12 Volt terminal. Ensure **well-conducting connections** between the control unit housing and the metallic screw-on surface.

Use toothed lock washers or spring washers under the fixing screws.

Power connections are to be laid interference-free!

The control wires (ON / OFF / Gnd1 / End / Gnd2 / 12 V / Gnd3 / M / P1 / P2) are to be laid separately and at a sufficient distance from the high-voltage current or pulsating wires (PE / L1 / N / Ku1 / Ku2). Installation should correspond to the **EMC directives!**

Analogue torque adjustment

(observe coding!)



Connection example for thermistor or bridge



Start/Stop (2 contacts)

Start: close ON contact Stop: open OFF contact



Start/Stop (1 contact)

Start:	close ON contact
Stop:	open OFF contact





Limit switch (1 contact)

Clutch engaged: Clutch disengaged: contact closed contact open





Limit switch PNP NC contact

PNP NC contact: 3-wire, magn. field-resistant proximity switch, 10-30 VDC, operating temperature 100 °C.



No overload status signal will be emitted if the limit switch is not installed according to the regulations.

Clutch engaged: Clutch disengaged: sensor undamped sensor damped



EAS®-Sm/Zr control unit Type 010.000.2



Settings

Engagement time t_k (= overexcitation time)

The engagement time t_k is set to the max. time of 5 s (manufacturerside setting). The engagement time is determined by:

Mode 1	The engagement time is stopped, i.e. switched from overexcitation to torque current when the clutch engages, as the limit switch is actuated.
Mode 2	When the set time has passed (independent of the clutch switch condition), overexcitation switches to torque current.

Technical data

Max. clampable

Device fuses

Weight

conductor cross section

Input-side G-microfuse

Coil-side G-microfuse

Overvoltage category

Overvoltage protection

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Input voltage	230 VAC, ±10 %, 50 - 60 Hz
Current consumption	max. 4 A / 100 % ED
No-load power	< 4 Watt
Coil _{Nom} -voltage	96 VDC
Coil _{Nom} -power	max. 256 Watt
Coil _{Nom} -current	<i>Manufacturer-side setting</i> according to the <i>mayr</i> [®] - EAS [®] -Sm/Zr - clutch size
Coil overexcitation	2 x I _{Nom} , current limitation is adapted to the respective coil size.
Torque adjustment	25 % up to 100 % of the coil current (current stabilization)
Engagement time t _k	5 seconds \pm 30 %
Protection	IP 20
Ambient temperature	0 °C up to + 50 °C
Storage temperature	- 20 °C up to + 70 °C

2,5 mm² / AWG 30-12 1,5 kg / 3,31 lb

F1/F2, (4 A MT, 5 x 20 mm) F3. The current is adapted to the *mayr®* - clutch size. Always use the same spare fuse. Two; one for connection to PELV/SELV (control wires), EN 50178 - 04/1998

For installation in <u>overvoltage</u> <u>category III</u>, a suitable overvoltage protection is required between the input voltage and the EAS[®] Sm/Zr control unit.

Control unit temperature monitoring

A fitted temperature switch prevents the control unit from overheating.

Switch-off	The coil voltage is switched off at an operating temperature of > 80 °C.				
New start	$\begin{array}{l} \mbox{Coil}_{\mbox{Norm}}\mbox{-}\mbox{current manufacturer-side setting can} \\ \mbox{only take place after the unit temperature has} \\ \mbox{cooled to below +40 °C.} \end{array}$				
Reset	Switching the input voltage off and on again				

Clutch coil temperature monitoring

The coil temperature monitoring can only be used with a fitted thermistor. The thermistor should be connected to terminals P1/P2.

Advance warning	at > + 130 °C operating temperature The coil voltage is not yet switched off.
Switch-off	at > + 135 °C operating temperature The coil voltage is switched off.
New start	can only take place after the coil temperature has cooled to below + 120 $^{\circ}\text{C}.$
Reset	is energised by clutch "Start".

Short-circuit-resistant coil connection

If a short-circuit occurs between the coil connections Ku1 and Ku2, the coil voltage is switched off. The short-circuit monitoring is reset by switching off the input voltage and removing the short-circuit.



Not protected against earth short-circuits!

Connecting the coil connections Ku1 or Ku against earthed metal components causes earth shortcircuits and therefore to unit failures. It may be necessary to equip the system with an **earth leakage circuit breaker (ELCB)**, to protect against injury or damage. However, this does not protect against control unit failure.

Order Number





Limit switch Type 055.000.5

Limit switch Type 055.000.5 (Mechanical Operation)

Application

This device is used to monitor mechanical movements and end positions. It is a controlling sensor for electronic and mechanical sequences. It also registers axial disengaging movements, e.g. on EAS[®]-clutches.

Function

The pre-tensioned contact is discharged by actuating the switching lever:

Contacts 11 - 14 (21 - 24) open, contacts 11-12 (21 - 22) close.

Design

The microswitch is fitted into a light metal housing and is actuated by a switching lever. Actuation is only possible in one direction. The limit switch is fixed using M4 cap screws via two screw-on mounting links attached diagonally.

Technical data

Contact	1 change-over contact (special design: 2 change-over contacts) 250 VAC / 15 A (with 2 change-over contacts: 10A) 24 VDC / 6 A 60 VDC / 1,5 A 250 VDC / 0,2 A min. 12 VDC / 10 mA					
Switching capacity						
Contact material	AgCdO 90/10					
Switching frequency	max. 200 switching operations/min					
Ambient temperature	-10 °C up to +85 °C					
Protection	IP 54 (special design: IP 65)					
Weight	275 g					
Switching path setting	Using the adjusting screw (SW 7), the zero point can be moved right or left by max. 5 mm.					
Switching path	Advance travel: min. 0,15 up to 0,5 mm Overtravel: max. 10 mm, depending on the zero point setting					
Special Types	Different switching lever lengths as well as a design with 2 change-over contacts are possible on request.					

Installation

See Limit Switch Installation, Fig. 6, page 15.



Dimensions (mm)



Electrical connection



Order Number										
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