



DYNAMAG - DYM-050

Dynamic linear solenoid for electrical short-stroke applications in mechanical engineering.

Made in Switzerland 



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1 General information

Original operating instructions (in accordance with MRL 1.7.4.1 a)

1.1 Dokumentversion

2024-04/V0.1 – Operating instructions DYM-050 DE (replaces previous versions)

1.2 Herstellerinformationen

Isliker Magnete AG
Im Bilg 7
CH-8450 Andelfingen
Schweiz
Tel +41 52 305 25 25
www.islikermagnete.ch
info@islikermagnete.ch

We recommend reading the entire operating instructions before commissioning. Installation and commissioning may only be carried out by qualified personnel in accordance with these operating instructions.

1.3 Device assignment

These instructions apply to the following devices:

Type	DYM-050
Product series	DYNAMAG
Function	Dynamic linear solenoid for electrical short-stroke applications in mechanical engineering

1.4 Scope of delivery

Only the linear solenoid is included in the scope of delivery, all accessories must be purchased separately.

1.5 Product development

Thank you for your confidence in our product. The idea for it was born at an industry association event in a major Swiss city through a chance encounter between two technology enthusiasts. After a short coordination phase, the two companies decided to work together. We started with the realisation of the DYNAMAG and developed it to series production readiness for explicit use in mechanical engineering and as an addition to the existing product range. The DYNAMAG is a joint product innovation by:



und



2 Safety information

2.1 Local safety regulations

Before using the DYNAMAG, ensure that the local safety regulations are met. Take all necessary safety precautions to ensure proper operation during and after the period of use. If necessary, you can also add additional external protective functions or structures to the product. Restrict access to hazardous areas appropriately.

2.2 Accident risk

Do not remove any parts and do not attempt to open the device, for example by loosening screws or other components.

2.3 Modification

No modifications may be made to the DYNAMAG. Modifications may cause the product to malfunction and invalidate any warranty claims.

2.4 Qualified personnel

Installation, commissioning, maintenance and removal may only be carried out by qualified personnel. The personnel must be familiar with the installation of mechatronic drives.

2.5 Intended use

The DYNAMAG is partly completed machinery within the meaning of the Machinery Directive (Directive 2006/42/EC) and is intended for incorporation into complete machinery. It may only be put into operation once it has been established that the machine into which this partly completed machinery is to be incorporated complies with the provisions of Directive 2006/42/EC.

The dynamic linear solenoid DYNAMAG is an electromechanical drive for linear movements of payloads or is generally used for short-stroke applications in mechanical engineering.

It can be used in a wide variety of applications, which is why the responsibility for the specific application is transferred to the user. The application or performance limits as well as the ambient or boundary conditions can be found in chapter 6 „Technical data“.

The risks associated with improper use lie solely with the user. No liability is accepted for damage caused by improper use.

2.6 Foreseeable misuse

The DYNAMAG may not be used for the transport or movement of people or animals. For example, the product must not be used to lift suspended loads if a person could be injured in the event of a direct failure.

3 Safety instructions

3.1 General hazards

The DYNAMAG is built according to the current state of the art and is safe to operate. However, the machine may present hazards if it is not used by trained or at least instructed personnel, or if it is used improperly or for purposes other than those for which it is intended.

3.2 Warnings, notes

Warnings, notes and residual risks are labelled with symbols in these operating instructions. Always follow the instructions to avoid accidents, personal injury and damage to property. The labelling on the product must be observed!

DANGER	
	...indicates a hazardous situation which, if not avoided, could result in death or serious injury.
Warning	
	...indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
Caution	
	...indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
Important	
	...indicates a potentially harmful situation which can lead to material damage if not avoided.
Note	
	...points out useful tips and work recommendations, which have no influence on the safety and health of personnel.

3.3 Product-specific warnings and notes

Warning	
	Before assembly, installation and maintenance of units: Switch off the power supply, check that there is no voltage and secure against being switched on again.
Caution	
	Depending on the operating conditions (number of cycles, load, etc.), increased surface temperatures may occur on the product in the area of the coils. Touching the product during operation can lead to slight burns. Do not touch the product during operation. When carrying out repairs and maintenance, ensure that the product has cooled down before starting work. If the temperature exceeds 60°C and the contact time exceeds 1s, take protective measures to prevent contact. Ensure that no temperature-sensitive parts or objects are in contact with or attached to the product.
Hinweis	
	The noise pattern does not necessarily indicate the service life of the DYNAMAG. Different noise patterns may occur depending on production and use.

4 Transport, handling, storage

Only remove the DYNAMAG as an individual part from the packaging. It should be handled by the housing and not by the protruding push rod. The weight specified in section 6 „Technical data“ must be observed.

The application of torques and lateral loads to the shaft must generally be avoided. When installing in the application, a counterforce must be used where necessary.

Important	
	The DYNAMAG must not be held solely by the push rod, as this can lead to damage. The push rod must be secured during transport and kept free of load.

Note	
	We accept no liability for any damage caused by improper transport or storage. The resulting costs are to be borne by third parties.

5 Functional description

The dynamic linear solenoid DYNAMAG is an electromechanical drive for electrical short-stroke applications in mechanical engineering. The enclosed solenoid housing contains the following components: two coils that represent the electrical drive, a push rod that ensures the mechanical power transmission and the sensors for end position detection. The integrated electronics with connector plug are also used to control the solenoid system.

Electrical control is carried out using simple digital signals via the 8-pin M-12 round connector. The desired function is achieved using the digital inputs (DI), which trigger the lifting movement and can be used for force control.

The end positions are displayed via digital outputs (DO) and the two green LEDs. If the DYNAMAG is ready for operation, this is also signalled via a digital output (DO). Non-compliant states, such as undervoltage or overvoltage, are detected and indicated by flashing LEDs.

Note	
	For the DYNAMAG to function correctly as described, it must be ensured that the push rod can move freely in the longitudinal direction up to the two end positions. The internal stop of the magnet housing is the end position. If this is not observed, malfunctions may occur.

5.1 Structure

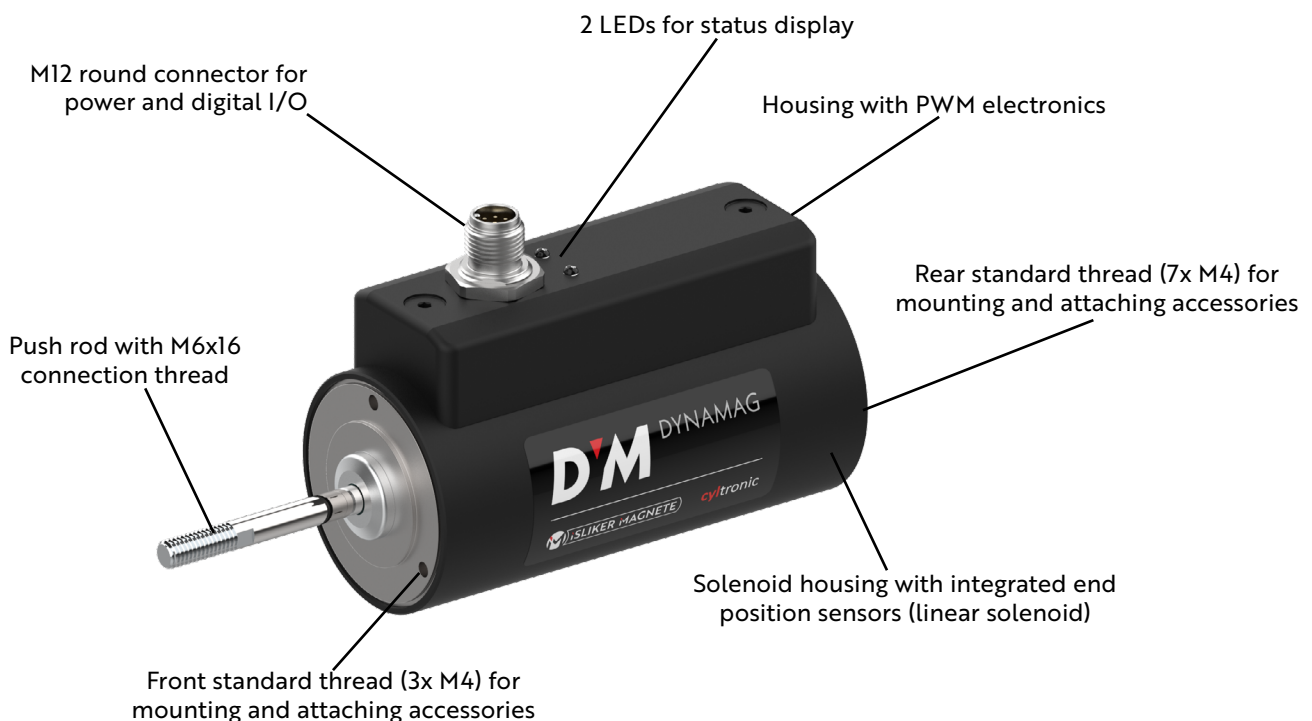


Figure 1: Structure of DYM-050

5.2 Dimensions

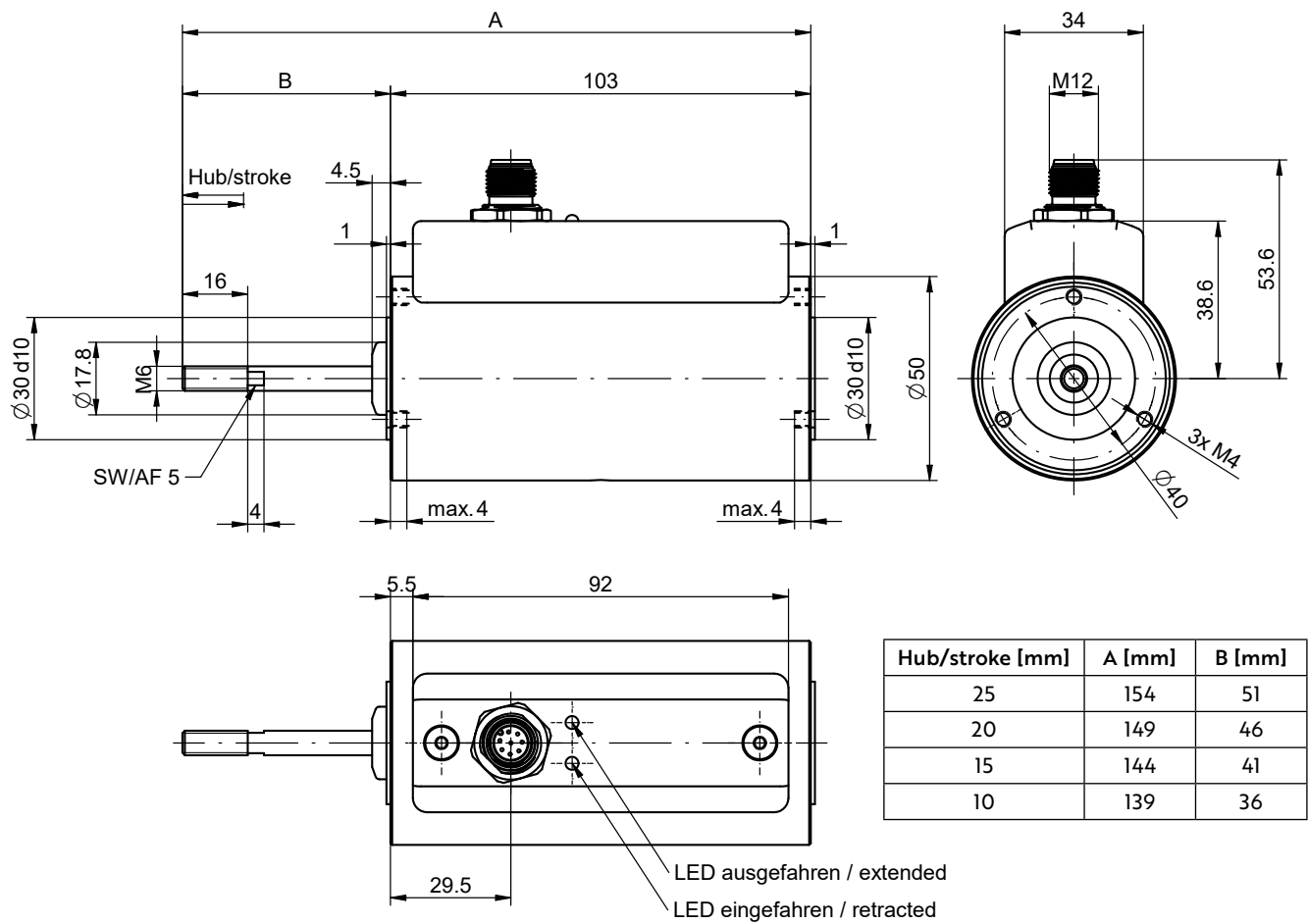


Figure 2: Dimensions DYM-050

5.3 Pin assignment

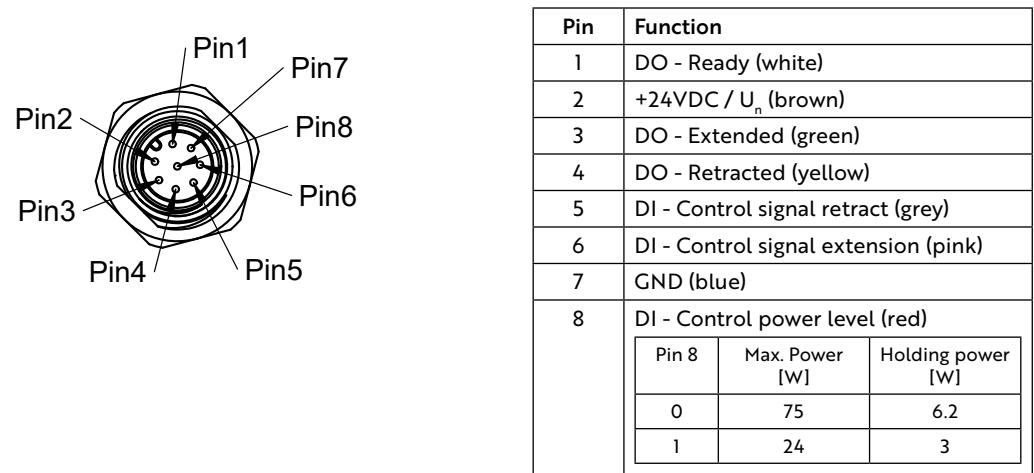


Figure 3: Pin assignment M12 round plug

6 Technical data

Specifications

Operation		Return operation			
Rated voltage [VDC]		24			
Voltage range [VDC]		20.4 ... 27.6 (24 ± 15%)			
Stroke [mm]		25	20	15	10
Nominal force [N] (selectable)	Pin 8 = 0	20	25	40	45
	Pin 8 = 1	10	12.5	20	22.5
Holding force [N] (selectable)		30 (Pin 8 = 0) / 15 (Pin 8 = 1)		40 (Pin 8 = 0) / 20 (Pin 8 = 1)	
Max. power consumption [W]		75 (Pin 8 = 0) / 24 (Pin 8 = 1)			
Max. current consumption [A] (short term)		3.125 (Pin 8 = 0) / 1.0 (Pin 8 = 1)			
Holding power consumption [W]		6.2 (Pin 8 = 0) / 3.0 (Pin 8 = 1)			
Holding current [A]		0.270 (Pin 8 = 0) / 0.125 (Pin 8 = 1)			
Min. operating time [ms] (without load)		35	32	25	23
Working cycles [1/min] (up to)		55 (Pin 8 = 0) / 175 (Pin 8 = 1)		60 (Pin 8 = 0) / 200 (Pin 8 = 1)	
Lifetime [Mio] (Working cycles without load)		40			
Class of insulation		B (130°C) / DIN VDE 0580			
Test voltage / Surge category		EN 60664-1 / III			
Degree of protection		IP65 / IEC 60529			
Electrical termination		M12 metric connector EN61076-2-101 A-code, 8 poles, male			
Surface treatment		black varnished			
Moving mass [kg]		0.145	0.155	0.145	0.155
Total weight [kg]		1.150	1.160	1.175	1.185
Storage temperature [°C]		-20 ... +60			
Ambient temperature [°C]		0 ... +40			
Relative humidity [%]		0 ... 90			
Torsion protection		no external torque allowed			
Maintenance		free of maintenance			
CE marking		DIN VDE 0580 IEC61000-6 (EMC) 2011/65/EU (RoHS II + III)			

Signals control

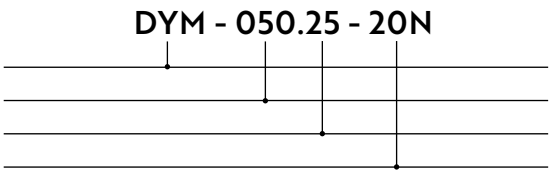
Status and end position display	2	LED
Operating range signal input	[VDC]	24 ± 20%
Max. current digital signal outputs	[mA]	40 / output
Number of digital signal inputs (DI)	3	extend, retract, power level
Number of digital signal outputs (DO)	3	extended, retracted, ready
Features signal inputs		not galvanically isolated
Max. cable length	[m]	30 (in- and outputs)
Switching logic outputs (DO)		push-pull
Switching logic inputs (DI)		positive switching

Materials

Housing / Plunger	Steel
Axis	Stainless steel
Bearing	Thermoplastic
Cover, Coil former	PA66 25% GF
Coil winding	Copper winding wire
Stranded leads	UL3266
Seals	NBR
Printed circuit boards (PCB)	FR4
Disposal	Dispose of PCB separately, recycle metals

6.1 Configuration key

Type DYM: DYNAMAG
Diameter [mm]
Stroke [mm]
Nominal force [N]



Attention

The following configurations are available:
Stroke 25mm with nominal force 20N
Stroke 20mm with nominal force 25N
Stroke 15mm with nominal force 40N
Stroke 10mm with nominal force 45N
Accessories can be ordered separately
(for details see datasheet accessories)

6.2 Tightening and holding forces

The digital input Pin8 (DI - power level) can be used to select between two different force values in pull-in and hold mode. If this input is not used (Pin8 = 0), 100% of the pull-in force is used. If Pin8 = 1, this is 50%, at approx. 1/3 of the maximum power. In holding mode, the holding force can be reduced to 50% at any time via pin8. The holding power absorbed is adjusted accordingly.

The following tables show the forces for both lifting directions and for both power levels.

Hinweis	
	Pin8 can be used to influence the value of the tightening and holding forces and thus the electrical power consumed. The current consumption relevant for the design of the power supply can be found in the data sheet.

a) Table of forces DYM-050.25-20N (article no.: 133.00001)

Signal	Stroke direction [mm]	Pin8	Stroke force [N]	Holding force [N]
DI-Push (Pin6 = 1)	0 ... 25	0	20	30 (at 25mm)
DI-Pull (Pin5 = 1)	25 ... 0	0	20	30 (at 0mm)
DI-Push (Pin6 = 1)	0 ... 25	1	10	15 (at 25mm)
DI-Pull (Pin5 = 1)	25 ... 0	1	10	15 (at 0mm)

b) Table of forces DYM-050.20-25N (article no.: 133.00002)

Signal	Stroke direction [mm]	Pin8	Stroke force [N]	Holding force [N]
DI-Push (Pin6 = 1)	0 ... 20	0	25	30 (at 20mm)
DI-Pull (Pin5 = 1)	20 ... 0	0	25	30 (at 0mm)
DI-Push (Pin6 = 1)	0 ... 20	1	12.5	15 (at 20mm)
DI-Pull (Pin5 = 1)	20 ... 0	1	12.5	15 (at 0mm)

c) Table of DYM-050.15-40N (article no.: 133.00003)

Signal	Stroke direction [mm]	Pin8	Stroke force [N]	Holding force [N]
DI-Push (Pin6 = 1)	0 ... 15	0	40	40 (at 15mm)
DI-Pull (Pin5 = 1)	15 ... 0	0	40	40 (at 0mm)
DI-Push (Pin6 = 1)	0 ... 15	1	20	20 (at 15mm)
DI-Pull (Pin5 = 1)	15 ... 0	1	20	20 (at 0mm)

d) Table of DYM-050.10-45N (article no.: 133.00004)

Signal	Stroke direction [mm]	Pin8	Stroke force [N]	Holding force [N]
DI-Push (Pin6 = 1)	0 ... 10	0	45	40 (at 10mm)
DI-Pull (Pin5 = 1)	10 ... 0	0	45	40 (at 0mm)
DI-Push (Pin6 = 1)	0 ... 10	1	22.5	20 (at 10mm)
DI-Pull (Pin5 = 1)	10 ... 0	1	22.5	20 (at 0mm)

Note



The attraction and holding forces were determined at nominal voltage and with a horizontal magnet without load. Horizontal means that the weight of the moving mass is not included in the force values.

Moderate heating occurs when the DYNAMAG is in operation. This influences the available lifting force and is taken into account in the specified force values.

If the linear solenoid is operated at its limits, as described in chapter 8.6, additional heating is to be expected, which has a negative effect on the force values.

7 Installation and assembly

7.1 Installation, tightening torque

The simplest method of mounting is via the mounting threads on the front. A flange or swivel bearing adapter are also available as options.

Important	
	The linear solenoid must be mounted without tension or distortion. Lateral forces on the housing and the push rod significantly reduce the service life of the device and must be avoided.

Important	
	The push rod is mechanically secured against rotation and must not be loaded with a torque. When mounting accessories on the push rod, always use the corresponding lock nut or spanner size for tightening or counter-locking.

7.2 Electrical connection

The DYNAMAG is intended for operation with an AC-DC converter.
Connect the connection cable according to the operating mode (see chapter 8).
Depending on the mode, the digital inputs (DI) - Pin5 / 6 / 8 are wired to the 24V power supply.

DANGER	
	The electrical cables may only be connected by qualified personnel.

Important	
	The power supply must not exceed 24VDC including tolerance, otherwise there is a risk of damage to the device.

Important	
	The specified cable length must not be exceeded, otherwise the EMC standardisation (CE marking) is no longer fulfilled.

7.3 Commissioning

When commissioning for the first time, ensure that the push rod is load-free and can move freely between the end positions.

→ Carry out a function check in accordance with chapter 7.4.

When installed, the connected device can be controlled directly. As no position detection is integrated, neither a teach-in run nor a reference run must be performed.

Important	
	To ensure error-free start-up, the „DI - Pull“ (pin 5) and „DI - Push“ (pin 6) inputs must not be applied simultaneously. (see chapter 8) Otherwise, the device will go into error mode and remain there as long as both signals are activated.

Note	
	To ensure safe commissioning, it is recommended that this is carried out for the first time in the non -installed state, without activating the digital inputs (DI) - Pin5, Pin6 and Pin8 (powerless).

7.4 Function check

During the function check, only the nominal voltage must be applied between pin7 (0V) and pin2 (+24VDC). The electronics start up, no movement is executed. Manually move the push rod to the end positions, the respective LED display lights up green. The DYNAMAG is now ready for operation.

When installed, the respective end position can be queried via the digital outputs (DI) Pin3 and Pin4. If the device behaves as expected and described, it can be assumed that the device fulfils its function and can be properly installed in the intended application.

Caution	
	Installation, electrical connection, commissioning and functional checks must only be carried out by specialised personnel, as otherwise damage to property or injuries cannot be ruled out.

8 Operation

8.1 Displays and connection cables

The DYNAMAG is supplied with voltage (power) via two pins on the 8-pin M12 connector. It is controlled using digital inputs (DI). The digital outputs (DO) can be used to read out the end positions reached and the operating status. During operation (DO - Ready = 1), the green LEDs indicate that the respective end positions have been reached and flash if the device is not ready for operation (DO - Ready = 0).

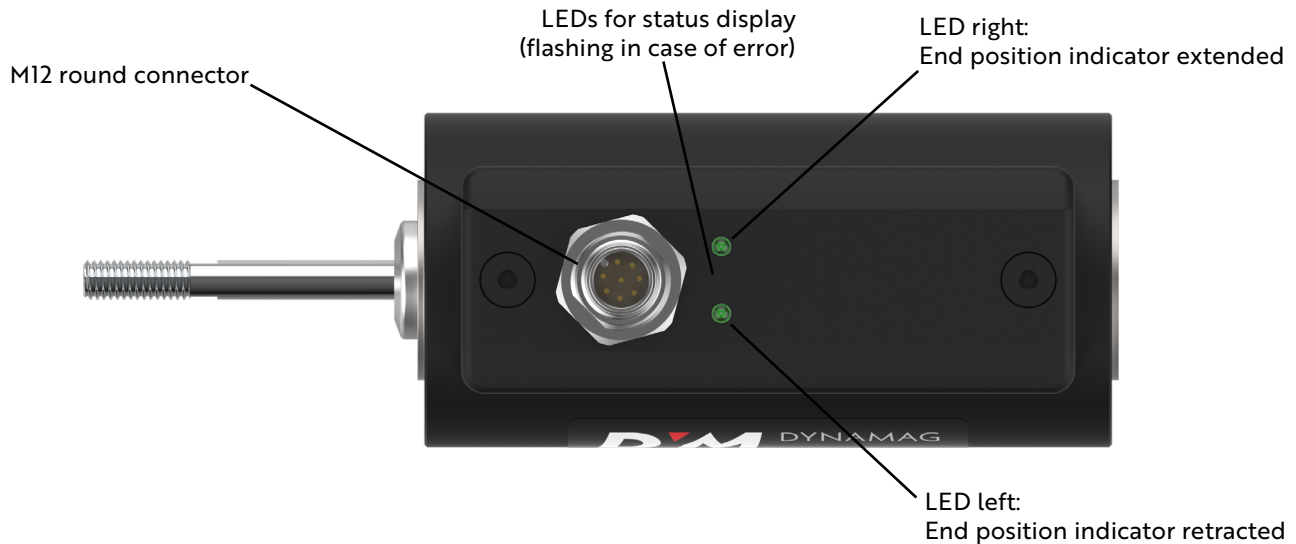
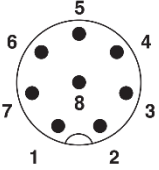
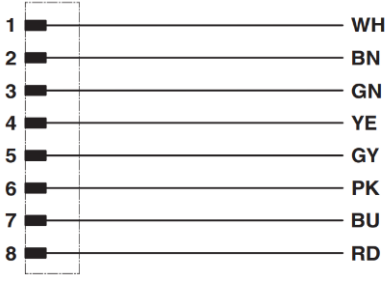


Figure 4: Displays and plugs for connection cables

Round connector M12x1, 8-pin	Pin	Colour	Function
A-coded according to EN 61076-2-101 (shielded cables recommended)	1	WH	DO - Ready
 	2	BN	+24VDC - Power supply
	3	GN	DO - is extended
	4	YE	DO - is retracted
	5	GY	DI - Pull
	6	PK	DI - Push
	7	BU	0V - GND
	8	RD	DI - Power level

The following connection cables are recommended:

- A-coded, 8-pin, socket, shielded, 90° angled, sample length 3m
- T4161420008-004 Manufacturer: TE Connectivity
- SAC-8P-3,0-PUR_M12FR_SH Manufacturer: Phoenix Contact

8.2 2-signal control (bidirectional)

The DYNAMAG can be operated in two modes. In bidirectional mode, the stroke movement is triggered with 2 signals each at digital input (DI) pin 5 or pin 6. The start position of the push rod (end position) is not fixed.

Signal	Pin6	Pin5	Pin8	Remark
DI-Push	1	0	0	Moves out and goes into holding mode, 100% nominal and holding force
DI-Pull	0	1	0	Retracts and goes into holding mode, 100% nominal and holding force
powerless	0	0	x	No movement, push rod can be moved by hand
undefined (only when starting up)	1	1	x	If both are active when the voltage is applied, the device goes into error mode → LEDs flash
DI-Push (50% force)	1	0	1	Reduces the nominal and holding force by 50% when pushing
DI-Pull (50% force)	0	1	1	Reduces the nominal and holding force by 50% when pulling

8.3 1-signal control (monostable)

In monostable operation, the lifting movement is triggered with a signal at either digital input (DI) pin 5 or pin 6. The other input is permanently set to „1“. The push rod has a defined start position and returns to the specified end position after the movement command is switched off.

Signal	Pin6	Pin5	Pin8	Kommentar
DI-Push	0 / 1 (switched)	1 (fix)	0	Moves out and goes into holding mode, 100% nominal and holding force
DI-Pull	1 (fix)	0 / 1 (switched)	0	Retracts and goes into holding mode, 100% nominal and holding force
powerless	0	0	x	No movement, push rod can be moved by hand
undefined (only when starting up)	1	1	x	If both are active when the voltage is applied, the device goes into error mode → LEDs flash
DI-Push (50% force)	0 / 1 (switched)	1 (fix)	1	Reduces the nominal and holding force by 50% when pushing
DI-Pull (50% force)	1 (fix)	0 / 1 (switched)	1	Reduces the nominal and holding force by 50% when pulling

8.4 End position detection

The DYNAMAG is equipped with integrated end position sensors. The end positions are indicated, optically via the LEDs and electrically via two digital outputs (DO), pin3 = extended and pin4 = retracted. The end position is detected at the end positions plus 1mm $\pm$ 0.5mm (incl. hysteresis).

8.5 Heating

The DYNAMAG has the property of heating up during operation, depending on the application, the number of switching cycles, the control power and the ambient conditions. The coil materials used in the linear solenoid are designed in accordance with insulation class B (130°C). The circuit boards (PWM electronics and sensors) are designed for a maximum temperature of 100°C. Care must therefore be taken during use to ensure that the device cannot heat up excessively!

Caution	
	Excessive heating can lead to material damage in the system or to injuries. Keep combustible material away from the appliance.

The boundary conditions as described in chapter 6 „Technical data“ apply.

8.6 Design of the maximum possible duty cycles

Pin8 can be used to influence the characteristic curve of the DYNAMAG, i.e. the lifting force and therefore the power consumption. This function is used to optimise the use of only the energy actually required for operation in the application.

By default, pin8 = 0, which corresponds to 100% pulling force and a power consumption of 75W in pulling mode and 6.2W in holding mode.

If Pin8 = 1, this means a reduction of the magnetic forces by 50%, corresponding to a reduced power consumption of 24W in pull-in mode and 3W in hold mode.

Note	
	To avoid excessive heating, it is recommended that the load is designed for a maximum of 75% of the nominal force and that the duty cycles are selected accordingly so that the maximum permissible number is not exceeded (see tables below).

Important	
	If the DYNAMAG is operated at the maximum possible duty cycles, a housing temperature of up to 58°C and a reduction in force of up to 20% can be expected.

a) Table for the design of the maximum duty cycles with $\text{pin8} = 0$ (100% force):

Type	Stroke [mm]	Stroke time without load [ms]	Maximum number of work cycles under load [1/min]			
			Load in % of the nominal force			
			0%	25%	50%	75%
DYM-050-25-20N	25	35	55	43	37	33
DYM-050-20-25N	20	32	55	43	37	33
DYM-050-15-40N	15	25	60	46	40	34
DYM-050-10-45N	10	23	60	46	40	34

b) Table for the design of the maximum duty cycles with $\text{pin8} = 1$ (50% force):

Type	Stroke [mm]	Stroke time without load [ms]	Maximum number of work cycles under load [1/min]			
			Load in % of the nominal force			
			0%	25%	50%	75%
DYM-050-25-20N	25	45	175	145	130	120
DYM-050-20-25N	20	44	175	145	130	120
DYM-050-15-40N	15	33	200	160	140	120
DYM-050-10-45N	10	32	200	160	140	120

8.7 Lifetime

The DYNAMAG is designed for a long lifetime. This is specified in working cycles (1 working cycle = one lifting movement in both directions). The lifetime specifications apply to horizontal operation and without lateral forces on the push rod. Loading by lateral forces significantly reduces the lifetime.

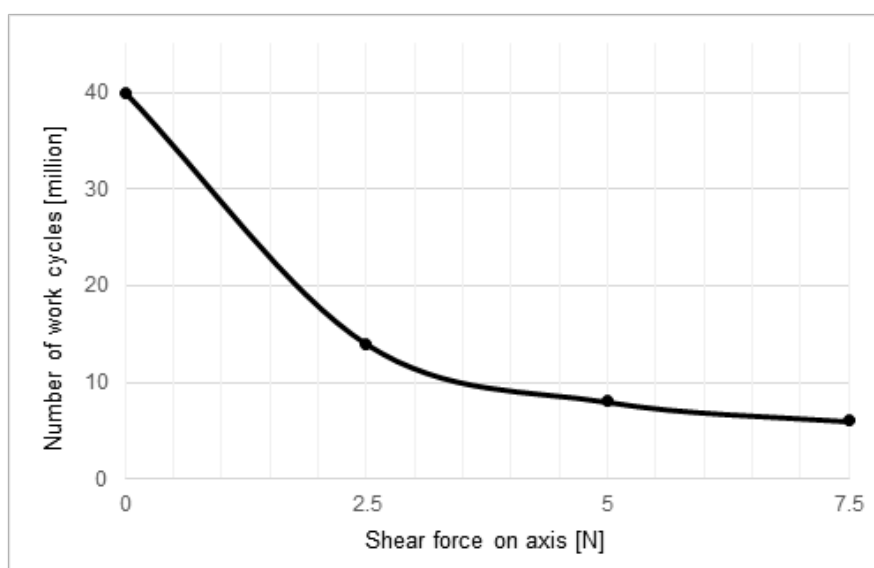


Figure 5: Lifetime with lateral forces

9 Maintenance and care

9.1 Maintenance

The DYNAMAG is maintenance-free. However, it is recommended to clean the outside of the appliance periodically if it becomes dirty.

9.2 Cleaning

Important	
	The product may only be cleaned when stationary. Direct exposure to strong jets of water must be avoided and can lead to damage. Submerging the product is not permitted. The product must be in a dry state before being used again after cleaning.

10 Removal and repair

In the event of damage or a defect, the entire unit must be returned to Isliker Magnete AG. Repairs may only be carried out by Isliker Magnete AG and trained personnel.

11 Disposal

Dispose of the device properly in accordance with the applicable legal regulations or return it to Isliker Magnete AG.

12 Troubleshooting

Important	
	Do not attempt to open the appliance or remove individual parts. Improper disassembly can lead to damage. Any warranty is void in the event of improper manipulation.

12.1 Malfunctions

Malfunction	Possible cause	Remedy / Measure
Strong running noises / push rod play too large	Worn bearing	Please contact Isliker Magnete or your dealer.
Push rod cannot be pushed in or out	Push rod mechanically jammed / control electronics defective	Check application for lateral forces / Check for free movement in the application Contact Isliker Magnete or your dealer.
The end positions are not displayed	Push rod mechanically jammed or damaged / control electronics defective / sensors defective	Please contact Isliker Magnete or your dealer.
Stroke time too slow	Load connection mechanically jammed or damaged Incorrect control (pin 8)	Check application for lateral forces / Check for free movement in the application Check control of pin8
Temperature unacceptably high, possibly damaged / no more movement	Coils possibly damaged / push rod mechanically jammed / control electronics defective	Check design (cycle numbers) / check load and free movement In the event of damage, contact Isliker Magnete or your dealer.
Push rod does not move, despite correct control	The power supply is too low or too high / when starting up, pins 5 and 6 are connected simultaneously (LEDs flash)	Checking the supply voltage / adjusting the starting conditions

12.2 Error codes

Flashing pattern	Error	Possible cause	Remedy / Measure
Both LEDs flash synchronously 4 times per second	Power supply is outside the permissible range	Overvoltage or undervoltage	Checking the supply voltage / ensuring a stable power supply
Both LEDs flash synchronously 2x per second	Undefined state on start-up	Digital inputs (DI) pin 5 and 6 are connected at the same time	When starting up, ensure that either none or only one input is active

13 Appendix

13.1 Declaration of incorporation

Declaration



EMC - Declaration

Description and identification of the partly completed machinery

Designation / Function: **Dynamic linear solenoid for electric stroke applications**

Type: **DYM-050**

Trade Name: **DYNAMAG**

Declaration

We hereby declare that the above-mentioned product complies with the relevant provisions of the following appliance standards:

- IEC 61000 Electromagnetic compatibility (EMC)

Additionally we declare that the following individual tests have been carried out by a certified EMC test laboratory in accordance with IEC 61000-6 and that these have been documented in a test report:

- IEC 61000-6-3 Compatibility to radiated emissions (1'000 ... 6'000MHz)
- IEC 61000-6-3 Compatibility to radiated emissions (30 ... 1'000MHz)
- IEC 61000-6-3 Compatibility to conducted emissions disturbance voltage (0.15 ... 30MHz)
- IEC 61000-4-2 Electrostatic discharge
- IEC 61000-4-3 Immunity to radiated field immunity (1 - 6GHz)
- IEC 61000-4-3 Immunity to radiated field immunity (80 - 1'000MHz)
- IEC 61000-4-4 Immunity to electrical fast transient (Burst)
- IEC 61000-4-6 Immunity to conducted disturbances

The manufacturer resp. the authorised person undertakes to transmit, in response to a reasoned request by the national authorities, the detailed test report by e-mail. This shall be without prejudice to the intellectual property rights.

Manufacturer:
ISLIKER MAGNETE AG
Im Bilg 7
CH-8450 Andelfingen

Authorised person:
Peter Mühle
Head of Engineering

Andelfingen, January 25th, 2024

1/1



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Isliker Magnete AG
Im Bilg 7
CH - 8450 Andelfingen
Switzerland
phone +41 52 305 25 25
www.islikermagnete.ch
info@islikermagnete.ch



Cyltronic AG
Technoparkstrasse 2
CH - 8406 Winterthur
Switzerland
phone +41 52 551 23 10
www.cyltronic.ch
info@cyltronic.ch

