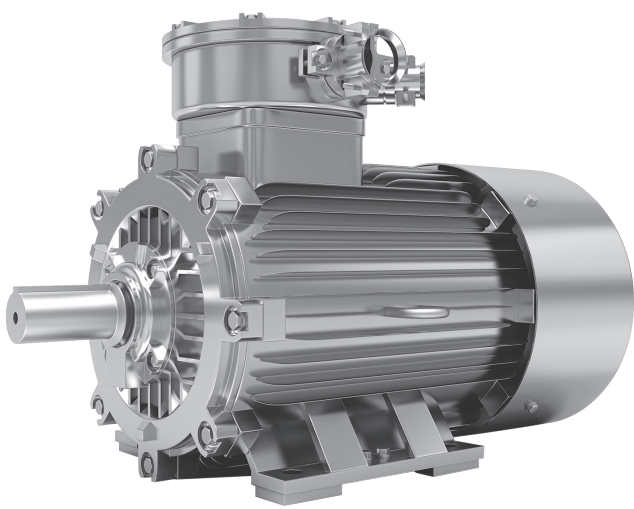




FLAME-PROOF SERIES
Mounting & Maintenance Instructions



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1. GENERAL INFORMATION

1.1. INTRODUCTION

The purpose of this Manuel, important issues to follow accordingly including storage, operation and maintenance Proex motors used in explosive atmospheres. We therefore recommend that you read it carefully, Complete with User Manual and all specialized documents (data sheet, general arrangement drawing, connection diagrams, curves, etc.) before delivery with the engine. prior to or during the performance of any installation service drives the electric motor.

Once these Proex motors are designed explosive atm spheres, all safety information those described in point 1.2 below shall be complied with carefully

1.2. SAFETY INFORMATION

ATTENTION

When any Proex motor is used out of the industrial area, it is the enduser´s responsibility to provide all safety and protection information while installing the motor.



Authorized personnel are those who are duly authorized to perform any service on the engine because of their training, experience, knowledge of the standards and the required service conditions. They must also know how to perform first aid procedures.

DANGER

Electrostatic discharge is a potential source of ignition. It can be used on the motor for maintenance or cleaning. dangerous electrostatic charges may be generated when carrying out some work. There is a risk of explosion in an explosive atmosphere.

This can cause death, serious injury or property damage. Situations that could lead to such undesirable events must be avoided.



Disassembling the motor will cause it to lose its Ex-Proof feature. Only (for electrical connection) Remove the terminal box cover. Do not remove the front and rear covers. For situations requiring this kind of operation contact the manufacturer.

Electric motors are exposed to live parts, rotating parts that may pose a hazard and hot surfaces. Fatal consequences if necessary precautions are not taken and the motor is not properly operated or maintained, serious injuries and property damage may occur.

2. GUIDE TO MOTOR CHOICE

First step is the classification of hazardous places in zones. The end user shall classify the hazardous areas under his own responsibility. Directive 1999/92/EC provides information regarding 'Classification of places where explosive atmosphere may occur.

The corresponding standards of reference are EN 60079-10 for gas and EN 61241-10 for dust.

Here below we give you a synthetic step by step guide to the choice of the motors. We will highlight all the characteristics of our motors.

Zone Classification (presence of explosive atmosphere)		Electrical apparatus ATEX marking					(5) GAS Temperature class (6) DUST Surface temperature
		(1) Group	(2) Category	(3) Type of protection	(4) Gas group Dust group	IP Degree	
GAS	0	II	1G	Electrical apparatus not allowed			
	1	II	2G	Ex eb 'increased safety'	IIA, IIB, IIC	-	T1=450°C T2=300°C T3=200°C T4=135°C T5=100°C T6=85°C
				Ex db 'flameproof enclosure'			
2	II	3G	Ex ec 'non sparking'	IIA, IIB, IIC	IP54	T1=450°C T2=300°C T3=200°C T4=135°C T5=100°C T6=85°C	
DUST	20	II	1D	Electrical apparatus not allowed			
	21	II	2D	Ex tb 'protection by enclosure t'	IIIC, IIB, IIIA	IP6X	
	22	II	3D	Ex tc 'protection by enclosure t'	IIIB, IIIA	IP5X	T125°C
GAS group	IIc	Hydrogen, Acetylene, carbon disulfide					
	IIb	Diethyl ether, Ethylene etc.					
	IIa	Propane, Butane, pentane, natural gas etc.					
DUST group	IIIC	Conductive dust					
	IIIB	Non-conductive dust					
	IIIA	Combustible fibers					

1. Group II: comprises equipment intended for use in other places likely to become endangered by explosive atmospheres (surface plants different from mines).

2. Group II is sub-divided into 3 categories:

Category 1: very high level of protection

Category 2: high level of protection

Category 3: normal level of protection

G explosive atmosphere consisting of a mixture with air and flammable substances in the form of gas, vapour or mist

D explosive atmosphere in the form of a cloud of combustible dust in air

3. The following types of protection:

Ex eb Increased safety (GAS)

Ex ec Non-sparking (GAS)

Ex tb, Ex tc protection by enclosure 'tD' (DUST)

GAS - MAIN INFLAMMABLE SUBSTANCES

Inflammable substance	Group of GAS	temperature of ignition	Temp. Class	Inflammable substance	Group of GAS	temperature of ignition	Temp. Class
2-Methylpentane	IIA	300	T2	Ethyl formate	IIA	440	T2
Amyl acetate	IIA	360	T2	Methyl formate	IIA	450	T1
Butyl-n acetate	IIA	425	T2	Natural gas	IIA	482	T1
Ethyl acetate	IIA	426	T2	Isobutane	IIA	460	T1
Isobutyl acetate	IIA	420	T2	Isoheptane	IIA	220	T3
Methyl acetate	IIA	502	T1	Isohexane	IIA	264	T3
Propil acetate	IIA	430	T2	Isooctane	IIA	410	T2
Vinyl acetate	IIA	425	T2	Isoprene	IIA	220	T3
Acetone	IIA	465	T1	Methane	IIA	537	T1
Methanol	IIA	464	T1	Methylcyclopentane	IIA	258	T3
Brome thane	IIA	511	T1	Methylamine	IIA	430	T2
Butane	IIA	287	T3	Methylmetacrylate	IIA	430	T2
Butane - 1	IIA	384	T2	Paraldehyde	IIA	239	T3
Butane - 2	IIA	325	T2	Pentane	IIA	258	T3
Cycloexano	IIA	259	T3	Pyridine	IIA	483	T1
Cycloexanol	IIA	300	T2	Propane	IIA	470	T1
Cyclohexanone	IIA	419	T2	Propylamine	IIA	318	T2
Cyclohexene	IIA	244	T3	Propylbenzene	IIA	450	T1
Cyclopropane	IIA	498	T1	Propylene	IIA	455	T1
Cymene (p)	IIA	436	T2	Styrene	IIA	490	T1
Chloro-benzene	IIA	637	T1	Toluene	IIA	480	T1
Acetyl chloride	IIA	390	T2	m-Xylene	IIA	522	T1
Allyl chloride	IIA	390	T2	o-Xylene	IIA	464	T1
Chlorbutane	IIA	240	T3	p-Xilene	IIA	528	T1
Chloroethane	IIA	495	T1	1,2 Butadiene	IIB	430	T2
Vinyl chloride	IIA	472	T1	1,3 Butadiene	IIB	430	T2
Dichlorobenzene	IIA	648	T1	Dioxane	IIB	245	T3
Dichloroethylene 1,1	IIA	570	T1	Diethyl ether	IIB	160	T4
Dichloroethylene 1,2	IIA	441	T2	Ethyl vinyl ether	IIB	200	T3
Diethylamine	IIA	312	T2	Methyl vinyl ether	IIB	350	T2
Dimethylamine	IIA	400	T2	Acrylate ethyl	IIB	350	T2
Dimethylaniline	IIA	371	T2	Ethylene	IIB	425	T2
Dimethylbutane 2,3	IIA	405	T2	LPG	IIB	365	T2
Dimethylpentane 2,3	IIA	330	T2	Sulphurated Hydrogen	IIB	260	T3
Heptane	IIA	215	T3	Methylacrylate	IIB	415	T2
Hexane	IIA	233	T3	Carbon monoxide	IIB	605	T1
Heptane	IIA	515	T1	Ethylene oxide	IIB	435	T2
Ethylacetacetate	IIA	350	T2	Propylene oxide	IIB	430	T2
Ethylamine	IIA	385	T2	Acetylene	IIC	305	T2
Ethylmercaptane	IIA	295	T3	Hydrogen	IIC	500	T1
Butyl formate	IIA	320	T2	Carbon disulfide	IIC	95	T6

DUST - MAIN INFLAMMABLE SUBSTANCES

	Substance	Medium largeness particles (mm)	LEL (g/m3)	Cloud ignition temperature Tci (°C)	Layer 5mm thick ignition temperature TI (°C)
Metals, alloys	Aluminium	10	60	560	430
	Bronze	18	750	390	260
	Iron	12	500	580	>450
	Graphite	7	30	600	680
	Lamp-black (carbon black)	13	15	620	435
	Sulphur	20	30	280	260
	Paper		100	620	370
	Cellulose (93% sweet wood, 6% hard wood)	14	15	420	335
	wood flour	60		470	305
	Wood (50% pear tree and 50% kernel)	35	100	500	340
Wood, products of wood, fibres	Wood (beech)	61		490	310
	Wood (pear tree)	27	100	500	320
	Sawdust of wood	65		470	290
	Cork	42	30	470	300
	Cacao	3	125	460-540	245
	Coffee	10	25	360	450
	Cereals (mixed powders)	37	125	510	300
	Wheat flour	56-125	60	480	>450
	Soy flour	20	200	620	280
	Gelatine	65	60	560	>450
Agricultural products	Wheat	100	470	220	
	Dry milk	165	60	460	330
	Milk sugar	22	60-125	450	>450
	Rye			415-470	325
	Buttermilk	400		450	420
	Tobacco		60	485	290
	Black tea	76	125	510	300
	Sugar	32	30	360	>450
	Powdered sugar	17	60	350	>450

2.1 THERMAL PROTECTION

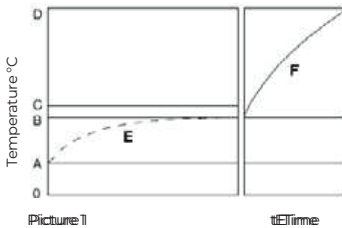
1. When intended for use with a current-dependent device to protect against exceeding the limiting temperature, the starting current ratio I_A/I_N and the time t_E shall be determined and marked (t_E shall not be less than 5sec while I_A/I_N shall not exceed 10). So to prevent from exceeding the limit temperature the protection devices must trip within the time t_E .

2. When intended for use with winding temperature sensors associated with protective devices to protect against the occurrence of nonpermissible temperatures, the starting current ratio I_A/I_N shall be determined and marked. Time t_E is not required to be determined and marked.

Increased safety design, Ex eb

The design of this motor type prevents the occurrence of sparks, arcs or hot spots in service (including starting and locked rotor situation), that could reach the self-ignition temperature of the surrounding, potentially explosive atmosphere, in all inner and outer parts of the machine. This is ensured by applying constructional or dimensional provisions that mainly concern:

- specified minimum values for creepage distances and clearances
- use of tracking-proof isolating materials
- suppression of sharp angles where static electrical loads could build-up
- ensuring electrical and mechanical assemblies are tightly secured
- minimum backlash values between stationary and rotating parts (e.g., air gap, ventilation, etc.)
- temperature
- rise limits, taking into account locked rotor and normal operation under the most adverse thermal conditions (in case of the worst voltage conditions).



- O = temp. 0°C
- A = Max. ambient temp.
- B = Temp. at rated load and worst voltage conditions
- C = Max temp. as permitted by the insulation class
- D = Max limit temp.
- E = Temperature-rise curve of motor at rated output and at worst voltage conditions
- F = Temp. rise curve under stalled rotor conditions
- t_E = stalled rotor time

Non-sparking design, Ex eb and Ex ec

This type of protection is allowed to be used in the hazardous area corresponding to zone 2. This design is also known as 'Non-sparking' type as the motor must be designed in such a way that no sparks can occur in normal operation, used within the ratings specified by the manufacturer, which excludes thermal requirements due to starting or accidental stalling.

Protection by enclosures "t"

This protection prevents any explosion transmission of dust because: the IP protection avoid to the dust to go inside the moto, the maximum surface temperature outside the motor must not exceed the limit temperature, no sparks must occur outside the motor enclosure.

3. MAIN FEATURES

All the motors are asynchronous with squirrel cage rotor, wound stator, closed and externally ventilated in comply with EN 60034-6 (IC 4T1).

Supply voltage 230/400 V \pm 5% /Y (56 - 112), 400/690 V \pm 5% /Y (132 - 160) and frequency 50 Hz \pm 2% (EN 60034-1).

The power ratings and the dimensions of the motors comply with EN 50347 and IEC 60072-1, the mounting arrangements B3, B5, B14 comply with EN 60034-7.

All the geometrical dimensions are unified following the tables UNEL 13113-7I; 13117-7I; 13118- 7; IEC 60072-1.

The IP degrees of protection of the motors comply with EN 60034-5. It depends on the type of protection as follow:

Ex eb IP55 (they have to be at least IP54 as requested by the standard EN 60079-7)

· Ex ec IP55 (they have to be at least IP54 as requested by the standard EN 60079-15)

· Ex tc IIIB IP55 for non-conductive dust (the standard EN 60241-1 states that it have to be at least IP5X)

· Ex tb IIIC IP65 (or IP66) for conductive dust (the standard EN 60241-1 states that it have to be at least IP6X)

Insulation class - All the motors have an insulation class F in compliance with EN 60034-1.

The bearings - are high-quality single raw deep grooves ball bearings, preloaded by a wave spring.

Duty - The motors are normally built for S1 duty, otherwise S3 duty can be done on request after performing the heating tests.

Windings - Made using enamelled copper wires are insulated by two layers (insulation class H). They are painted with another layer of varnish and after this placed in an oven so to dry it. The maximum ambient temperature is 40 °C. It is also possible to tropicalize the windings using special additional varnish with high hygroscopic characteristics so to be used in places with an humidity >60% (see options)

Rotors - Die-cast aluminium squirrel cage aluminium alloy slots.

The shafts - of the motors and the keys-shaft comply IEC 60072-1. Special shaft are made on request (see options).

Frame - (in compliance with IEC 60072-1) Die-cast aluminium with high mechanical strength, with a good thermal conductivity and light weight. The feet can be mounted on the motor frame in 3 different positions, in the bottom or on right and left side.

Terminal box - The terminal box in case of motor B3, is normally on the top of the motor. As the feet can mounted also on the sides of the frame it is possible to have the terminal box on both the sides of the motor too.

Flanges and shields - (in compliance with IEC 60072-1) Die-cast aluminium, with dimensions as per standard IEC 60072-1, or with special shapes on request (see options).

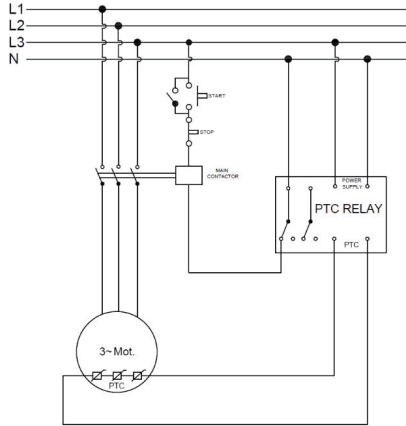
Ventilation - (in compliance with EN 60034-6) Self-ventilated motors IC 4T1. Depending on the type of protection the fan can be in plastic (Ex eb, Ex ec, Ex tc) or in aluminium (Ex tb).

Fan cover - Zinc-plated steel sheet.

Noise - (in compliance with EN 60034-9)

3.1 THERMISTORS (PTC Positive Temperature Coefficient)

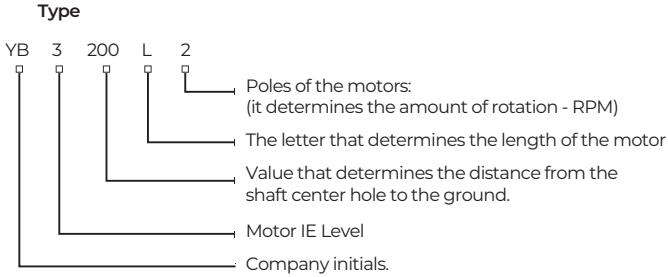
They are fitted inside the windings in number of 3 with a series connection to be connected to an appropriate tripping device that cut off the motors supply in case the winding reach the thermal probe limit temperature. On request will be available protectors with different temperature setting.



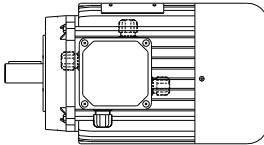
Thermistors Connection



4. MOTOR CODE STRING



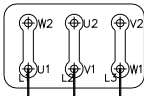
4.1 TERMINAL BOX AND CONNECTIONS



Motor size	Cable glands	
	Main	Aux
63	M20	M20
71	M32	M20
80	M32	M20
90	M32	M20
100	M32	M20
112	M32	M20
132	M32	M20
160	M40	M20
180	M40	M20
200	M50	M20
225	M50	M20
250	M63	M20
280	M63	M20
315	M75	M20
355	M75	M20

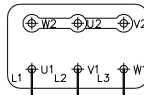
4.2 MOTOR 3-PHASE CONNECTION AND MIN. SECTION OF THE POWER CABLE

Delta connection



Lower Voltage

Star connection

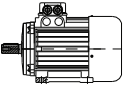





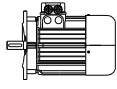


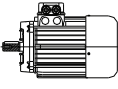


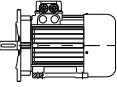


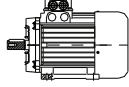




Higher Voltage

7.5	4x4 mm ²
11	4x6 mm ²
15	4x6 mm ²
18.5	4x 10mm ²
22	4x 10 mm ²
30	4x 16mm ²
37	3x25+16
45	3x35 + 16
55	3 x 50 + 25
75	3 x 70 + 35
90	3 x 95 + 50
110	3x120/70
132	3x185/95
160	2 (3 x 95 / 50)
185	2 (3 x 95 / 50)
200	2(3x120/70)
250	3 (3 x 95 / 50)
315	3(3x120/70)
355	3(3x150/70)

5. MECHANICAL CHARACTERISTICS

MOUNTING ARRANGEMENTS

Foot mounted					
					
IM 1001 (IM B3)	IM 1051 (IM B6)	IM 1061 (IM B7)	IM 1071 (IM B8)	M 1011 (IM V5)	IM 1031 (IM V6)
Flange mounted					
					
IM 3001 (IM B5)	IM 3011 (IM V1)	IM 3031 (IM V3)	IM 3601 (IM B14)	IM 3611 (IM V18)	IM 3631 (IM V19)
Foot-flange mounted					
					
IM 2001 (IM B35)	IM 2011 (IM V15)	IM 2031 (IM V36)	IM 2101 (IM B34)	IM 2111 (IM V58)	IM 2131 (IM V69)

MOUNTING

- **Foot mount** motors should be mounted to a rigid base to prevent excessive vibration. Shims may be used if the foundation is uneven and should be placed adjacent to and between the motor mounting bolts.

Warning: Improper alignment may void the motor warranty.

- **Flange mount** motors should be properly seated and aligned.
- **Belt drive** motors should have the pulley mounted on the mid-point of the motor shaft with the hub facing to the shaft end.
- **Direct drive** motors should have the coupling properly aligned as excessive angular displacement can result in premature failure of the shaft or bearings.

STORAGE

Motors should be stored under the following provisions:

- Store in a clean and dry location,
- Vibration can cause bearing damage to static motors, store in a vibration free location,
- Shaft locking clamps (if fitted) should be removed and the shaft turned by at least one full rotation, every 3 months. Replace shaft lock after rotation.
- Energise anti-condensation heaters (if fitted) if the environment is damp or wet.

51. BEARING TYPES

Frame	Pole	DE	NDE
71	2 ~ 8	6202-2RZ	6202-2RZ
80	2 ~ 8	6204-2RZ	6204-2RZ
90	2 ~ 8	6205-2RZ	6205-2RZ
100	2 ~ 8	6206-2RZ	6206-2RZ
112	2 ~ 8	6206-2RZ	6206-2RZ
132	2 ~ 8	6208-2RZ	6208-2RZ
160	2	6209/V2	6209/V2
	4 ~ 8	6309/V2	6209/V2
180	2	6211/V2	6211/V2
	4 ~ 8	6311/V2	6211/V2
200	2	6212/V2	6212/V2
	4 ~ 8	6312/V2	6212/V2
225	2	6312/V2	6312/V2
	4 ~ 8	6313/V2	6312/V2
250	2	6313/V2	6313/V2
	4 ~ 8	6314/V2	6313/V2
280	2	6314/C3	6314/C3
	4 ~ 8	6317/C3	6314/C3
315	2	6316/V2	6316/V2
	4 ~ 10	NU319/C3	6319/C3
355	2	6319/Z2	6319/Z2
	4 ~ 10	NU322	6322/Z2

5.2 LUBRICATION

Please use polyurea based grease such as Mobil Polyrex EM and keep the grease clean. Mixing of dissimilar greases is not recommended and may result in premature bearing failure.

- Lubrication is recommended when the motor is warm and the shaft is stationary.
- Remove all dirt and wipe the outside of the grease fills and drains.
- Clean the grease fitting (or area around grease hole, if equipped with slotted grease screws). If the motor has a purge plug, remove it. Motors can be regreased while stopped (at less than 80°C) or while running.
- When applicable, locate the grease inlet at the top of the bearing hub. If the motor is not equipped with grease fitting, clean the area and replace the 1/8-inch (3,175 mm) pipe plug with grease fitting.
- Remove grease drain plug located opposite the grease inlet.
- Apply grease gun to fitting (or grease hole). Too much grease or injecting grease too quickly can cause premature bearing failure. Slowly apply the recommended amount of grease, taking a few minutes or so to apply.
- Operate the motor for 20 minutes and reinstall the purge plug if previously removed.
- Install grease drain plug located opposite the grease inlet.

5.3 RADIAL AND AXIAL FORCES ON THE SHAFT

The table below details the maximum radial and axial loads permissible with the standard bearing arrangement.

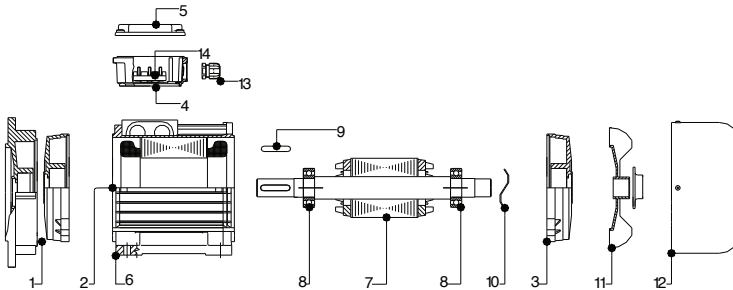
The values are calculated based on horizontal foot mount motors with a bearing life L10 of 40,000 hours.

Frame size	Permissible Radial Load (N)				Permissible Axial Load (N)			
	2 Pole	4 Pole	6 Pole	8 Pole	2 Pole	4 Pole	6 Pole	8 Pole
71-80	470	595	690	750	395	540	655	635
90	485	625	720	785	420	570	685	690
100	710	890	1035	1150	570	780	940	1075
112	950	1240	1420	1580	790	1085	1310	1520
132	1420	1820	2100	2325	1160	1590	1915	2210
160	1800	2350	2720	3040	1480	2035	2450	2810
180	2490	3200	3780	4215	1990	2710	3270	3760
200	2915	3750	4350	4835	2225	3065	3710	4235
225	3270	4000	4700	5210	2460	3390	4130	4750
250	3590	4650	5400	5980	2725	3780	4575	5225
280	3700	8100	9375	10300	3280	4560	5590	6375
315 (2P)	4500	X	X	X	3825	X	X	X
315 (4/6/8)	X	15800	17950	19750	X	4855	5895	6780
355 (2P)	Upon Request				Upon Request			
355 (4/6/8)	Upon Request				Upon Request			

5.4 SPARE PARTS

All motors components must be replaced with original spare parts. In these case contact Proex directly and provide the serial number of the motor in order to be authorized for the repair or the motor itself.

1	Drive end shield (B3) – Flange (B5 – B14)	8	Bearings
2	Frame complete with winding	9	Shaft key
3	Non drive end shield	10	Wave spring
4	Terminal box	11	Fan (complete of fixing collar)
5	Terminal box cover	12	Fan cover
6	Feet (removable from 63 to 160)	13	Cable gland
7	Shaft complete of rotor	14	Terminal board



PRO-EX

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