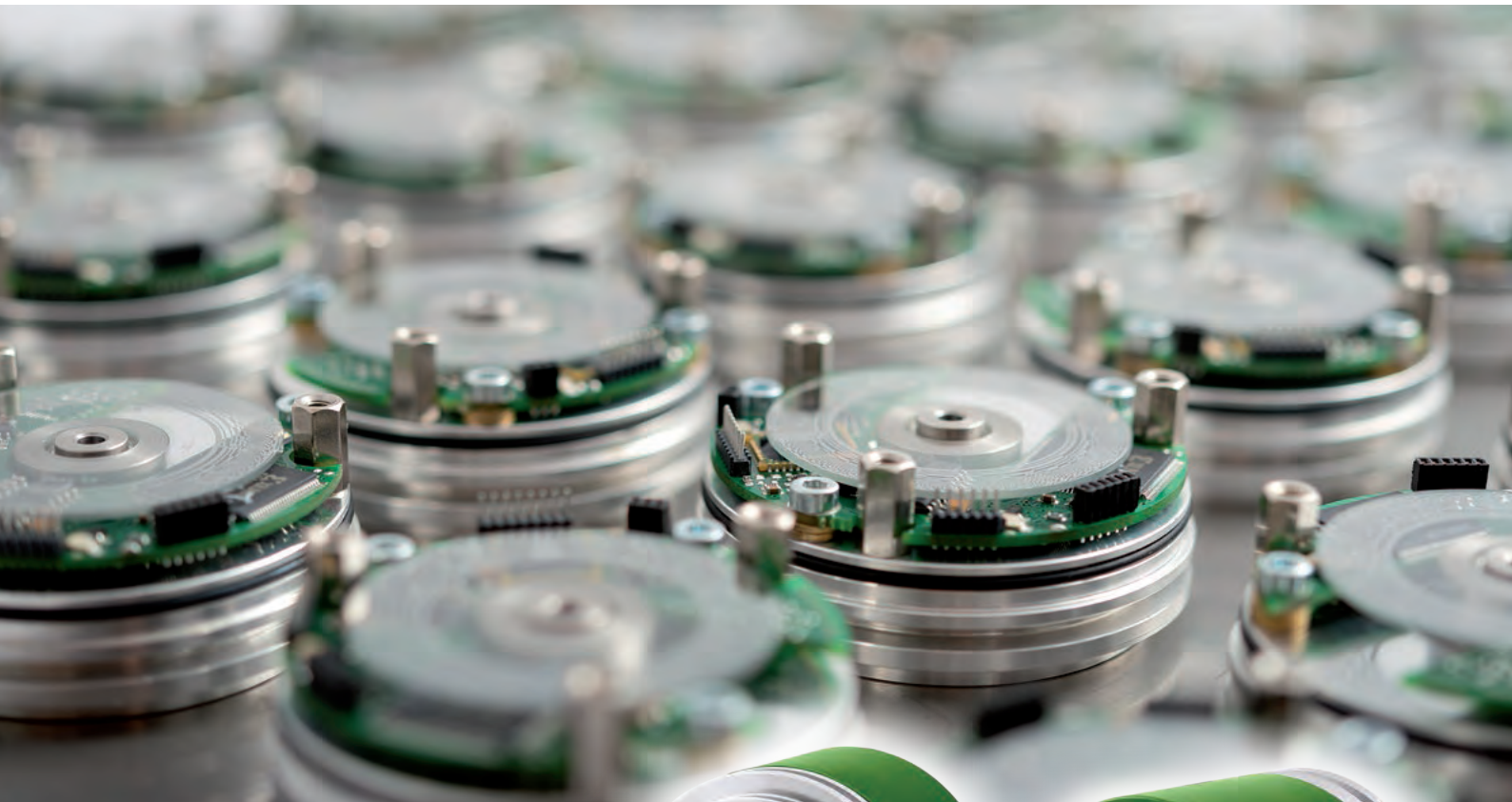





**30 YEARS
YOUNG**
1982.2012

..... **lika**[®]
Smart encoders & actuators



Incremental & absolute rotary encoders,  2013
heavy-duty, bearingless and feedback



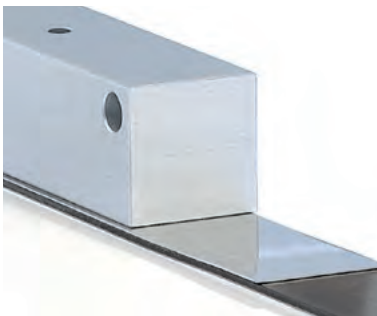
ROTAPULS
Incremental rotary encoders



ROTACOD
Absolute rotary & Fieldbus encoders



ROTAMAG
Rotary Magnetic encoder & Encoder modules



LINEPULS – LINECOD
Linear Absolute & Incremental encoders



DRAW-WIRE
Draw-wire encoders & potentiometers



COUPLINGS
Flexible & Transmission couplings



POSICONTROL
Displays & Signal converters
Encoder Interfaces



DRIVECOD
Rotary Actuators & Positioning units



**30 YEARS
YOUNG**
1982.2012

1982
Lika Electronic
founded in Schio (VI).

1986
Manufacturing of
absolute encoders with
integrated display and
incremental encoders
for the Italian market.

1991
Foundation of Lika
Trading commercial
corporate.

1993
Lika Electronic is the
first company in Italy
to offer a complete
portfolio of encoders
in the 58 mm diam.
range.

1997
Lika is first certified
to ISO 9001:1994.



1982

1986

1990

1995

1983
Lika numbers 8
customers.

1985
Lika starts the
production of
absolute encoders
for the German
market.

1987
Lika produces a 50 mm
diameter miniature
encoder, the smallest
absolute encoder in
Europe.

1995
The 100,000th
encoder rolled off the
production line.

1996
ROTACAM ASR58 is the
first absolute encoder
fitted with integrated
cam programmer.

An international family company, corporate profile



Lika Electronic stands for encoders and position measuring systems. Since its inception in 1982, Lika Electronic develops and manufactures *incremental and absolute, optical and magnetic, rotary and linear encoders, incremental & absolute sensors, linear and rotary incremental & absolute magnetic measurement systems, rotary actuators, displays, signal converters and encoder interfaces.*

Starting as a family-owned business, thanks to its technical competence and comprehensive know-how in the automation industry along with the high quality standards and the skill in providing solutions that target specific customer needs, over the years **Lika Electronic has grown becoming a forward thinking innovative and global company** among the leading manufacturers of optical encoders and magnetic measurement systems in Europe and worldwide.

Many key features include the extensive technical engineering skills, in-depth knowledge and expertise in digital and analogical electronic design as well as the proven daily practice in co-operation with universities, research institutions and customers in order to **develop and provide advanced electronic equipment and high-tech materials & devices tailored to specific customer and market requirements.** Moreover software development and mechanical & optical components design are entirely performed within the company. Production machinery and tools are often engineered and built internally to satisfy specific needs and performances.

Every day Lika Electronic is committed to being a step ahead and always at the forefront of innovation, looking to the future with the enthusiasm that steers the company towards new opportunities *without giving up the strength of being an international family company.*

Lika Electronic is certified for compliance with ISO 9001:2008 quality management system and is now committed to adopt an environmental management system complying with ISO 14001:2004 requirements. All Lika products are designed and manufactured to fully meet the requirements of CE, RoHS and REACH directives, most of them are UL and CSA compliant too. ATEX certified solutions suitable to be integrated into potential explosive environments and hazardous areas are also available.



Global presence, make us closer to the customer

Every day, everywhere Lika Electronic works in close contact with its customers to build strong, long-lasting relationships and support them at all times in each day-to-day requirement.

Lika's actions focus on customers' needs with daily challenges to develop reliable and cutting edge solutions.

Continuous innovation, outstanding expertise, overall quality, prompt action and maximum flexibility are the fundamental values that Lika Electronic is truly proud of offering its customers when working together.

Lika Electronic operates all over the world providing a widespread and efficient global distribution network, offering unrivalled technical support and excellent customer service.

At the present time the export share is approximately 60% of the turnover in more than 50 countries.

<p>1998 First 16-bit resolution single-turn absolute encoder engineered for installation in aerostatic probes developed by Florence University.</p>	<p>2000 ROSETTA space probe project gets under way in co-operation with CISAS.</p>	<p>2002 Production in antistatic environment (ESD). DRIVECOD & POSICONTROL product ranges are launched in the market.</p>	<p>2007 Lika Electronic celebrates its 25th anniversary with a series of special events.</p>	<p>2012 30th anniversary: "30 new products for our 30 years" event launched.</p>
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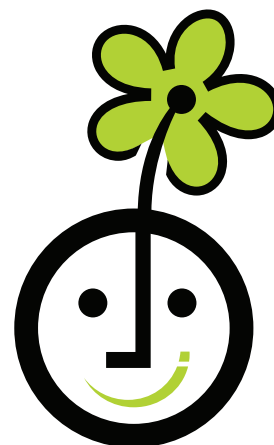


<p>1999 Lika Electronic moves its corporate headquarters to Carré (VI) establishing in new larger production and office premises.</p>	<p>2001 Foundation of Lika subsidiary in Germany.</p>	<p>2004 Ariane 5 rocket successfully launched: Rosetta probe fits Lika encoders.</p>	<p>2008 ALMA project: giant array of 12-m radio telescopes equipped with special custom-made Lika encoders.</p>	<p>2010 Lika introduces the innovative range of heavy-duty products dedicated to steel & iron industry and wind mills.</p>
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Environmental policies at Lika Electronic

Besides a daily investment in materials research, electronics improvement and software development, day after day also environmental values have become an unavoidable commitment in each choice and strategy of the company. For this purpose, even though discretionary, conscious about the importance of the human health, the environmental protection and the preservation of natural resources, since 2006 *Lika Electronic* has decided to fully comply with the directive 2002/95/EC, usually referred to as *RoHS*, i.e. *Restriction of Hazardous Substances Directive*; and two years later *Lika Electronic* has adhered to stringent directive 1907/2006/EC, usually referred to as *REACH*, banning the chemical substances reported in *ECHA's Candidate List* and in authorized list. Now *Lika Electronic* is committed to adopt an environmental management system complying with ISO 14001:2004 requirements in order to promote a responsible environmental policy among employees, suppliers and customers as well.

Dedication to corporate responsibility has recently led the company to implement a new real "green" investment for environmental sustainability: *Lika Electronic* is now equipped with a *photovoltaic system* consisting of 260 PV modules for a maximum power output of about 65 kW which prevents the emission of approximately 40 tonnes of CO₂ per year.



Customer service & assistance

Production and manufacturing processes from design to after-sales are constantly monitored and improved to ensure optimized, fast, resilient and cost-effective service. Thus you can trust in a dependable and on-time service -from production to delivery. Furthermore *Lika Electronic* is able to translate the customers' specific requirements and needs into customized solutions in very short time, both in small and large batches. A repairs workshop also operates within *Lika's* facilities where expert and thorough personnel provides fast and effective repair service guaranteeing reduced times and costs.

Lika's team is dynamic, professional and customer-focused and has relevant experience and technical competence.

Whether you need troubleshooting assistance or business advice it provides outstanding and responsive technical support and excellent customer service. English, Italian, German, French and Spanish are fluently spoken.

Offices and phone lines are open Monday to Friday 8am – 5pm CET.

Preferential items & express service

Lika Electronic provides more flexibility and faster action as all design and production processes are carried out in-house.

For this reason we are able to translate any needs into customized solutions in very short time. **Fast manufacturing service** is available on and intended to ensure production within 3 working days only. The service is subject to availability of all parts at our premises. Furthermore for our best selling encoders and configurations we offer a range of **Preferential items**. These are usually disposable on stock thus they can be often dispatched the same day, otherwise very short delivery time is guaranteed. When available, preferential items and configurations are listed in the datasheets.



Catalogues, user manuals and website

As a part of *Lika's* ongoing commitment to provide the highest level of support to make customers' job easier, a full set of technical and commercial documentation is easily available in our corporate website and upon request.

Catalogues, brochures, data sheets, user's manuals and installation guides are offered in the most common languages.

The general catalogue is a hands-on reference guide useful to describe the whole products portfolio and is available in more than 10 languages.

While series-specific and **thematic catalogues** provide detailed product information and technical specifications that can help you always make the right **choice**.

Quality policies at Lika Electronic

Quality policy has always been of highest priority for Lika Electronic.

Lika is every day committed to develop and manufacture products that are recognized by customers and the industry for their high quality and performances.

Quality policy statement has been established **since 1997 when Lika Electronic was first certified to ISO 9001:1994. Nowadays Lika Electronic is certified to ISO 9001:2008 compliant quality management system.** It attests that *Lika Electronic places the utmost importance in the quality, safety and reliability of its products and every day aims at ensuring the full satisfaction of customer's needs.*

This is achieved by continuously developing new products that implement the most updated technologies and can easily meet customers and markets requirements; by enhancing both internal and suppliers' processes for continual improvement of the system and the assurance of conformity; and by always meeting the regulations and complying early with future standards. All production and manufacturing processes as well as company management activities are involved in quality assurance and enhancement: from purchasing to goods receipt, from manufacturing to technical, from sales to account departments.



With the same purpose and even if not binding with this directive, Lika Electronic is committed to comply with **Directive 1907/2006/EC, usually referred to as REACH.**

REACH is the European Community Regulation on chemicals and their safe use.

It deals with the Registration, Evaluation, Authorization and Restriction of Chemical substances. The law entered into force on 1 June 2007.

The aim of REACH is to *improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances and progressive substitution of the most dangerous chemicals when suitable alternatives have been identified.*



All Lika encoders are **CE compliant** and fully meet the requirements of the EMC European Directives as well as the recent Directive 2011/65/EU (RoHS2).



Most of the products from Lika Electronic bear the **c-RU-us certification mark.**

The c-RU-us mark is a certification mark issued by Underwriters Laboratories stipulating that Lika encoders meet the requirements for the US (UL) standard (designated by the 'us') and the Canadian (CSA) standard (designated by the 'c').

They are listed under the files available on request.



All Lika encoders comply with the **Directive 2002/95/EC, usually referred to as RoHS,** i.e. Restriction of Hazardous Substances Directive, since 2006. The RoHS directive aims to restrict certain dangerous substances commonly used in electronic equipment.

Any RoHS compliant component is attested to be free from the presence of Lead (Pb), Cadmium (Cd), Mercury (Hg), Hexavalent chromium (Hex-Cr), Polybrominated biphenyls (PBB), and Polybrominated diphenyl ethers (PBDE).

This means that in all Lika products maximum concentrations of the afore-mentioned substances are under the restrictive limits permitted by this Directive.

July 2011 the new Directive 2011/65/EU, sometimes referred to as RoHS2, was published by the European Commission. *The main point to consider is that the RoHS directive is now a CE-marking Directive.* This means that compliance with RoHS Directive is required in order to place the CE mark on any product. **Lika Electronic declares that all products are here and now RoHS2 compliant and therefore they are allowed to bear the CE mark.**



Compliance with the **ATEX Directive 94/9/EC** is a legal requirement in all European Union Member States for any equipment intended for use in potentially explosive atmospheres. Lika Electronic designs and manufactures a full range of ATEX certified encoders in both incremental and absolute versions.

For more information on ATEX certified encoders refer to page 13

WEEE and batteries disposal information



Directive 2012/19/UE (as previous 2002/96/EC) is intended, as a first priority, to prevent waste electric and electronic equipment (hence the acronym WEEE) from being introduced into the unsorted waste stream; and in addition to promote reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste.

Furthermore it encourages the "ecological" design and production of electrical and electronic equipment which take into account and facilitate dismantling and recovery, in particular the re-use and recycling of WEEE, their components and materials.

Extended producer and user responsibility for separate collection is the precondition to ensure specific treatment and recycling of WEEE and is necessary to achieve the chosen level of protection of human health and the environment.

Products manufactured by Lika Electronic are not covered by WEEE directive currently as they do not fall under the categories coming within the scope of the Directive.

WEEE directive applies to standalone products; our products cannot function entirely on their own, are always integrated into larger systems and come as part of complex equipment.

Lika Electronic is working every day to achieve full compliance with both RoHS and REACH directives; and in accordance with them it has decided to ban from the whole range of products the use of batteries containing mercury, lead and cadmium.

Aside from this, electric and electronic equipment and batteries may anyway contain materials, components and substances which can be dangerous to the environment and harmful to human health if not disposed properly.

So you should not dispose of electrical and electronic equipment and batteries as unsorted municipal waste.

Please we advise you to dispose of waste so as to reduce environmental impact and increase re-use, recycling and recovering of WEEE.

For this reason the symbol of the crossed-out wheelee bin appears in the documentation of all our products.

For customers who wish to send us back Lika products at end of their life, we are willing to recycle and dispose of them in compliance with Directives and regulations in force.

Quality & warranty sticker

Lika Electronic is every day committed at ensuring the maximum quality, reliability and durability of its products.

Thus production and manufacturing processes are constantly monitored and improved to provide optimized, fast, resilient and cost-effective solutions.

Competent and skilled teamwork is further the key to achieve innovative and safe products that fully meet the customers' expectations.

Compliance with the strict quality requirements which guide each daily action and decision of Lika is proved by the Quality & Warranty Seal of Approval applied to each product before leaving the premises.

It attests that each product has been manufactured, verified and tested individually by expert and thorough personnel having relevant experience and technical competence; furthermore it certifies that the product has been subjected to rigorous testing throughout its development and production in order to assess its safety, performance and conformity to Lika's quality standards.

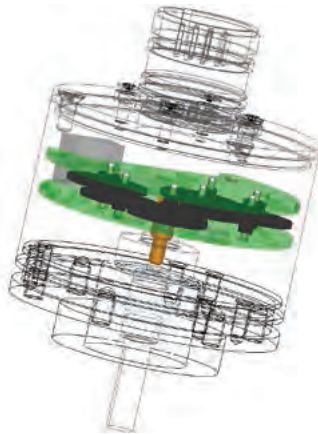


Rotary encoders

A rotary encoder is an electro-mechanical device (transducer) specifically designed to translate the motion of a rotary axis, i.e. a rotary mechanical movement such as the one of a motor or a shaft, into either analogue/digital electrical signals or a digital code. In this way, using appropriate electronic equipment the encoder can provide information about travel, position, displacement, direction, velocity and acceleration.

An encoder can be found in the widest variety of industrial sectors, wherever a motor is installed or a motion is generated, such as in *automotive, wood, paper, steel, aerospace and chemical industries, robotics, lifts and cranes, painting machines, packaging machinery, mechanical engineering, conveyors, among others*. And each application needs its very own solution that has to be uniquely suitable for specific aims. Automotive, aerospace and packaging industries need flexibility, high processing speed and absolutely safe and reliable signal transmissions; harsh environments affected by oil, dirt, dust, moisture as well as severe temperature fluctuations require rugged and high protection rate encoders; wood, paper and steel industries demand robust encoders capable of withstanding both high mechanical loadings and extreme shock and vibration levels; the use in **hazardous areas** such as on painting machines, chemical plants, petrol refineries and laboratories, off-shore platforms and fertiliser plants imposes the installation of **ATEX certified equipment**.

The proper solution for each and all applications. The following technical notes are intended to help you evaluate our products and always make the right choice.



Rotary encoders can be either incremental or absolute.

Most of the incremental encoders produce square waves signals but also sinusoidal signals and can provide travel, position, displacement and velocity information; positional information is relative, this means that it is possible to know both if the axis is rotating and if it is rotating clockwise or counterclockwise; but it is not possible to gather information about the absolute position of the axis. For this reason the homing operation is always required at the beginning of the process to determine the absolute position of the system (detection of the reference point or zero point). Information is expressed in pulses per revolution (PPR).

An absolute encoder is designed to output the absolute position information; it has a unique code pattern, thus it can provide a unique digital code for each angular position of the axis.

The main feature is that it is always possible to know exactly the position of the axis. For instance, if you turn off the power supply and move the encoder shaft or the device, then at power on *the absolute encoder will output the current position of the axis precisely*. This means that no homing operation is required to determine the absolute position.

An absolute encoder provides to the motion control a digital code that can be in pure Binary, Gray or BCD output code format. Customarily it is equipped with parallel or serial (SSI, BISS, etc.) output circuits, but can afford almost all fieldbus interfaces available on the market.

Absolute encoders can be either single-turn or multi-turn.

Single-turn encoders provide the absolute position information per each revolution and the counting operation resumes again after each revolution; thus the resolution of the encoder is the number of information per turn (typically expressed in counts per revolution -cpr-, otherwise information per revolution).

While **multi-turn encoders** provide standard absolute information, but rely upon an additional internal counting process to monitor and track the number of rotations: in this way multiple revolutions can be performed before restarting the counting operation.

This results in a double resolution (typically expressed in overall bits): the absolute position per each revolution and the information on the number of revolutions.

The overall information is univocal.

Incremental encoder

Absolute encoder

Products by category, products by application

Lika products are research-driven and designed to set the standards.

They all apply the latest state-of-the-art technologies and aim at meeting early the ever-changing requirements of customers and markets. Dependability, high quality and innovative strength are part of each one of them.

Encoders and actuators, sensors and interfaces, they only fit selected advanced components and are inspected individually before delivery, ensuring they can operate safely and reliably throughout the lifetime of any application.

Nevertheless these basic properties need to be carefully balanced as not all are suitable for specific requirements in the same manner.

Lika products are practice-based and customer-oriented and are born out of its proven experience and expertise.

For this reason **Lika Electronic can offer a wide products portfolio devised for many application and operating environments.**

And this is why the products listed in this catalogue are divided into *five main categories according to their specialized application*: **light-duty, industrial, feedback, heavy-duty, ATEX.**

Light-duty encoders are used in light industrial and laboratory applications.

The working environment is generally neat and tidy while temperature, moisture and dirt conditions are controlled. They are not affected neither by mechanical tensions nor by chemical agents or relevant temperature fluctuations. For these reasons they have low-medium IP-rated environmental protection. On the other hand they need to be versatile and offer a large variety of both mechanical and electrical interfaces (flexible mounting possibilities for both solid and hollow shaft versions, several output circuits and even fieldbus interfaces).

Light-duty encoders are offered in several versions providing:

- incremental and absolute information
- optical and magnetic technology
- solid and hollow shaft mechanical interfaces
- compact dimensions

Application:

- electronic assembly systems
- semiconductor industry
- printing, labelling & graphical machinery
- measuring machinery
- electro-medical instruments
- office automation

Light-duty encoders

Recommended types	
Incremental:	I28, MI36-MC36, MI36K I40-I41, CK41-CK46
Absolute:	MS36-MSC36, MM36-MMC36
Bearingless:	IM30-IM31-IM56

ROTAPULS • ROTACOD

Technical information

Industrial category is the most versatile and is intended to target the widest requirements of industrial and motion control markets.

Because of a large variety of applications, industrial encoders need to be highly flexible and even multi-purpose, thus they offer several features; furthermore they must strike a careful balance between providing adequate protection against harsh industrial conditions and ensuring high speeds and accuracies as well as absolute safe signal transmissions.

Industrial products boast a rugged design and high-protection standards with immunity to dirt, debris and environmental factors and are able to handle high shock and vibration impacts as well as large temperature fluctuations.

Their high quality and outstanding dependability are exemplified by performance with maximum accuracy at highest speeds, in a full range of industrial network connections.

Industrial encoders are offered in several versions providing:

- Incremental and absolute information
- additional incremental / absolute tracks
- optical and magnetic technology
- solid and hollow shaft versions
- several fieldbus interfaces
- increased IP protection rate

Application:

- packaging machinery
- food & beverage industry
- metal & plastic working machinery
- woodworking machinery
- stone & marbles working machinery
- pharmaceutical
- textiles machinery
- robotics and product handling equipment
- elevators

Feedback encoders are specifically designed for position feedback of electric motors.

Thus they encompass standard interfaces suited to both communication and data exchange and mechanical installation in order to meet the requirements of a wide range of feedback applications. As they are installed in motor shaft they usually have small dimensions and in particular minimal depth; they are available in both solid and hollow shaft versions, anyway hollow shaft encoders are more compact, while solid shaft encoders are bigger and need flexible couplings, fixing clamps, adapting flanges or mounting bells for installation.

Developed to meet critical requirements although IP protection rate is not necessarily high, **they are able to handle high temperatures and speeds and boast excellent accuracy**, safe signal transmission and high counting frequencies. Some of them feature insulated bearings protected against eddy currents and interface immunity.

Feedback encoders are offered in several versions providing:

- Incremental and absolute information
- absolute single-turn and multi-turn versions
- additional incremental / absolute tracks
- bearingless construction
- solid and hollow shaft mechanical interfaces
- highest resolutions

Application:

- general purpose electric motors (AC and DC)
- closed loop stepper motors
- brushless motors, servomotors, etc.
- rotary and linear generic applications

Industrial encoders

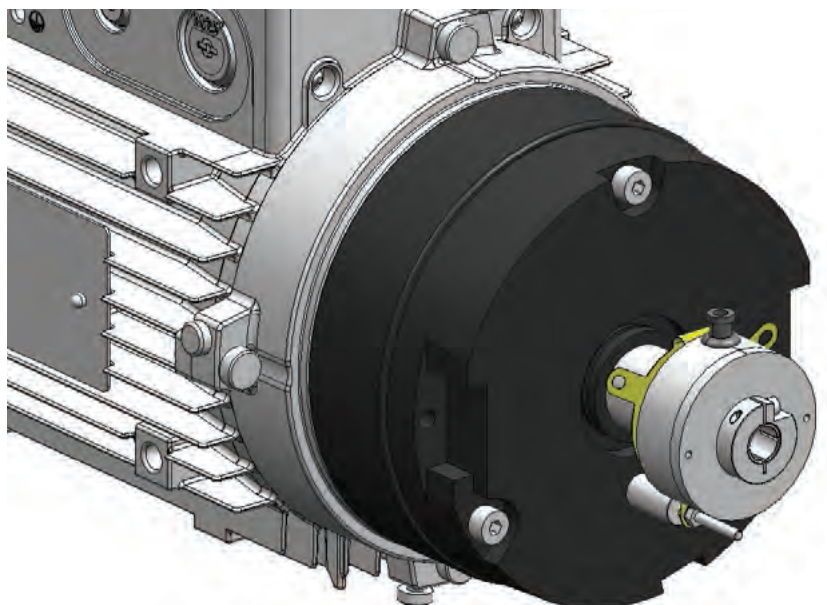
Recommended types

Almost all types with some restrictions on light duty and bearingless encoders.
Series with Ø58mm are the most recommended.

Feedback encoders

Recommended types

Incremental:	C50, CB50, CB59-CB60, C80, C81, C82
Absolute:	AS36-ASC36, AM36-AMC36, HS58 series HM58 series, HSCT, HMCT
Bearingless:	IM30-IM31-IM56, SGSM-SGSD MIK36-MSK36, SMRI



ROTAPULS • ROTACOD

Technical information

The harshest and most critical environments affected by oil, grease, dirt, the finest of dust particles, moisture, water jets, wash down cleaning, high pressure steam, common chemical agents as well as severe temperature fluctuations require rugged and high protection level encoders.

Heavy-duty encoders are designed for the toughest applications and built to last.

They are robust and capable of withstanding both highest mechanical loadings and extreme shock and vibration levels as they fit selected components and increased size ball bearings. They feature reliable design, sturdy construction and hermetically sealed housing for dependable enduring service.

Furthermore they **are designed to offer outstanding reliability and absolute safety**, with little or no maintenance. Usually they are devised for applications that demand high accuracy, therefore they encompass superior features.

Heavy-duty encoders are offered in several versions providing:

- incremental and absolute information
- absolute single-turn and multi-turn versions
- additional incremental / absolute tracks
- optical and magnetic technology
- cable and connector versions
- extra robust housing
- increased size ball bearings
- highest IP protection rate

Application:

- ore mills, steel mills and metallurgic plants
- cranes, hoists and lifting equipment
- die casting industry
- aerospace industry
- utility vehicles and mobile equipment
- wind power plants
- marine industry and off-shore plants
- harbour equipment
- wood, paper and metal working industries

Heavy-duty encoders

Recommended types	
Incremental:	XC77, C81, I115, I116, C100, C101 I70, ICS
Absolute:	MH58S, XAC77, XAC77 FB
Bearingless:	SGSM-SGSD, SMRI



ROTAPULS • ROTACOD

Technical information

Compliance with the ATEX Directive 94/9/EC is a legal requirement in all European Union Member States for any equipment intended for use in potentially explosive atmospheres.

Lika Electronic designs and manufactures a comprehensive range of **ATEX certified encoders in both incremental and absolute versions** suitable to be integrated into applications in hazardous areas such as in mining industry, surface industry, chemical plants, petrol refineries and laboratories, painting machines, enamelling machines, fertiliser plants, food industry, off-shore platforms, ATEX motors and ATEX elevators.

In such environments and applications where fire or explosion hazards may exist due to flammable gases, vapours or liquids (such as hydrocarbons, solvents, varnishes, diluent, gas, alcohol, dyes, perfumes, chemical products, agents for manufacture of plastics, etc.), combustible dust or powders as well as ignitable fibres or flyings (such as magnesium, aluminium, sulphur, cellulose, cereals, carbon, wood, milk, resins, sugars, starch, polystyrenes, fertilizer, etc.), equipments must be safe against high temperatures, sparks, arcs and electrical phenomena. Furthermore the enclosure must be strong enough to contain an explosion within and to withstand everyday use in the most demanding conditions.



ATEX certified encoders all provide airtight and flameproof enclosures and high ignition protection levels against both gas and dust explosive atmospheres and **are intended for use in Zones 1, 2, 21 and 22 and in the temperature category T6.**

Please note that the higher is the protection rate and the lower is the external surface maximum temperature, less the encoder may become source of explosion and ignition.

ATEX certified encoders

Recommended types	
Incremental:	XC77
Absolute:	XAC77

Lika encoders bear the following ATEX marking:



II 2GD Ex d IIC T6, Ex tD A21 IP65 T85°C

This means that they can be used in environments where explosive atmosphere can happen (group II), provide high level of protection for both gas and dust explosive atmospheres (2GD) and fit an explosion-proof casing (Ex d) against the most dangerous gases group (IIC: hydrogen and acetylene) with maximum surface temperatures below 85°C (T6).

Furthermore, in particular about dust, their casing is dust-proof with IP65 protection rate so explosive dust cannot penetrate inside the encoder (Ex tD IP65) and their external surface cannot reach a temperature higher than 85°C.

ATEX certified encoders are suitable for use in Zones 1, 2, 21, 22; Zones 1 and 21 refer to areas in which an explosive mixture of air and flammable substances in form of gas (1) or dust (21) is likely to occur in normal operation; while the lower level zones 2 and 22 refer to areas in which an explosive mixture of air and flammable substances in form of gas (2) or dust (22) is not likely to occur in normal operation and if it occurs it will persist only for a short time.

ATEX encoders are offered in the following versions providing:

- incremental and absolute information
- absolute multi-turn version
- optical technology
- hollow shaft mechanical interface
- several fieldbus interfaces

Application:

- mining industry
- surface industry
- chemical plants, petrol refineries and laboratories
- painting machines
- enamelling machines
- fertiliser plants
- food industry
- off-shore platforms
- ATEX-motors, ATEX-elevators

ROTAPULS • ROTACOD

Technical information

Lika Electronic offers a varied range of **industrial, miniature and fieldbus stainless steel encoders suitable to meet the severe requirements of the food & beverage industry** as well as to withstand the most aggressive and tricky operating environments such as in chemical and petrochemical industry, mobile equipment, marine installations, pharmaceutical, medical and surgical applications.

Hygiene, safety and security requirements are particularly stringent in the food and beverage industry. Companies in this sector need to comply with very severe regulations which impose the highest demands on the quality, safety and durability of materials and equipment. Materials must be first-rate, tough and resistant to corrosion and salt as well as to cleaning agents and chemical contaminants; furthermore they must often cope with the rigours of continuous sanitary wash down and sterilisation processes, even at high temperatures. Equipment must be built-to-last and needs to be cleaned easily and quickly to avoid harmful substances to accumulate, thus a high degree of protection is necessarily required.

A comprehensive line of Lika Electronic's incremental and absolute encoders *is offered with AISI 410 stainless steel enclosure* and specific increased characteristics to meet such hard requirements.

They all feature stainless steel frame, flange and shaft with specific hygiene design and smooth and paint-free finish which ensure exceptional resistance to corrosion and antibacterial properties and avoid trapped contaminants. In addition they mount rugged long-lasting bearings protected in a stainless steel housing for enhanced encapsulation.

This results in a high-rated IP protection (IP65/IP67) and excellent durability under extreme conditions and temperatures (both high and low).

Also connectors and cables are expressly intended to deal with chemical exposure and frequent aggressive cleaning; their materials specifically suit the demands of food processing applications. Furthermore all exposed materials are selected to be non-toxic and safe for contact with edible products.

The encoder range for food and beverage industry comes in both incremental and absolute versions and a variety of construction features, interfaces and functions to cover multiple areas of application.

Special stainless steel encoders for food & beverage industry

Recommended types	
Incremental:	MI36K, MC36K, I58SK
Absolute:	AM58K



Mechanical and environmental information

Mechanical coupling is a key issue for the choice of an encoder.

All encoders can be equipped with solid shaft, blind hollow shaft and through hollow shaft. Shaft type depends on the mechanical characteristics of the equipment the encoder has to be coupled to.

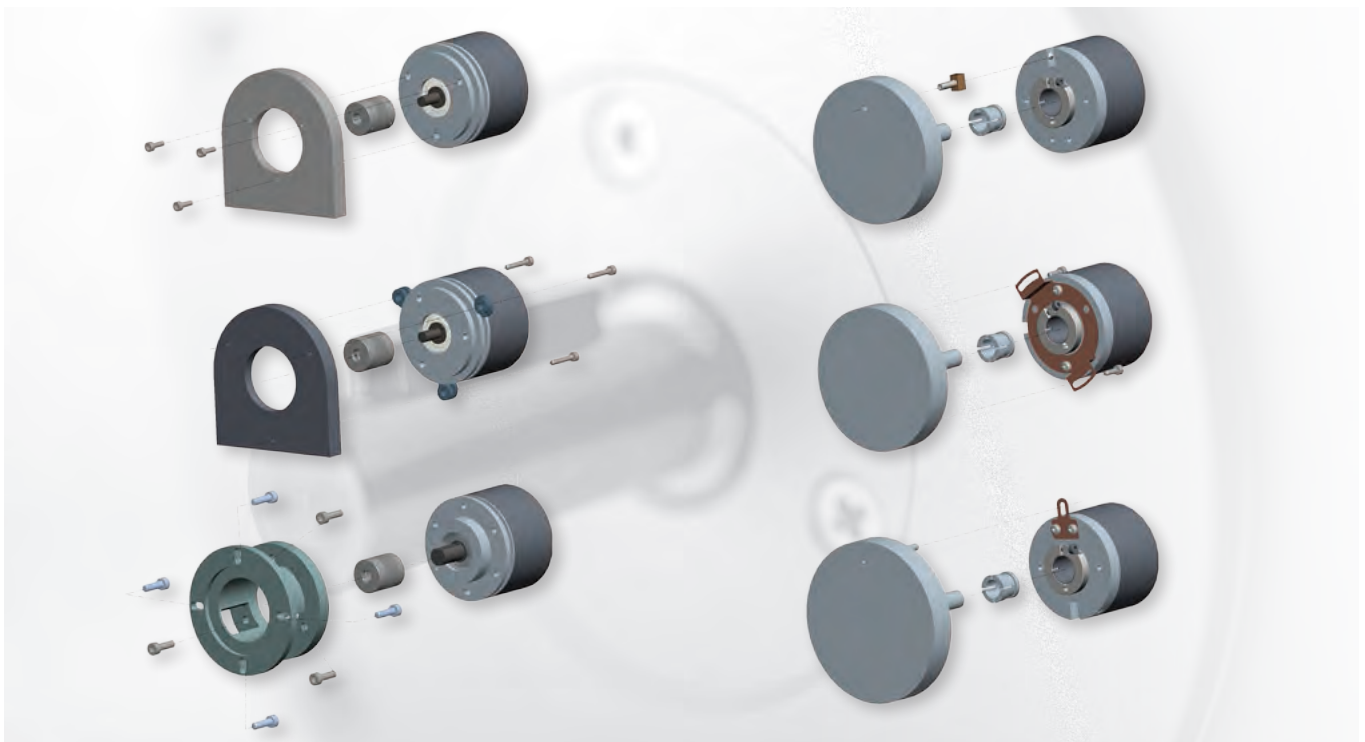
Blind and through hollow shaft encoders are more compact and space saving.

Anti-rotation pin or fixing plates absorb misalignment and reduce shaft overload, while eccentricity and therefore vibrations cannot be removed.

Solid shaft encoders instead are bigger, can mount flexible couplings to reduce shaft overload and must be fastened using fixing clamps, adapting flanges or mounting bells for installation; thus they require more space; conversely they withstand shaft overload and thermal expansion better.

A correct coupling is crucial to guarantee an optimal lifetime and a proper operation of the encoder.

For instance, should the misalignment tolerances between the shaft of the encoder and the motor not be respected, then this could lead to damage of the internal bearings and cause the encoder to reduce its reliability over time. Lika Electronic can supply a comprehensive range of flexible couplings, reducing sleeves, fixing clamps, adapting flanges and mounting bells. See on page 18 in this catalogue for an encoder accessories overview.



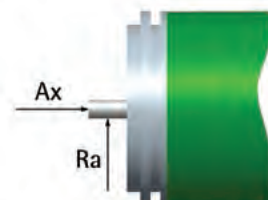
Maximum axial and radial shaft loadings are indicated in each datasheet under the section "Mechanical specifications".

Maximum shaft loading (see A_x and R_a in the Figure) is the maximum axial and radial force that can be exerted on the shaft. Values are calculated in the points shown in the Figure. All encoders are equipped with a couple of bearings to withstand higher forces in axial and radial loadings. Extra robust housings and increased size ball bearings ensure superior durability to the heavy-duty series of encoders. Lika Electronic selects life-lubricated bearings with high reliability ratings. Lifetime is mentioned in each datasheet and is expressed in number of revolutions. Maximum values are permissible providing that the encoder is installed properly, following carefully the instructions and respecting the mounting tolerances given in the technical documentation. Any error and misalignment is necessarily converted into a force exerted on the shaft and the bearings.

Flexible couplings should be always mounted on solid shaft encoders. Blind hollow shaft and through hollow shaft encoders provide anti-rotation pins or fixing plates between the encoder and the motor assembly. All these accessories are designed to reduce the forces exerted on the bearings. On the other way we advise you against coupling rigidly the encoder and the motor which would lead to a premature wearing of the bearings and internal damages as well.

Great caution should be exercised when using rack-and-pins, measuring wheels, pulleys, timing belts or spindles.

For any information please do not hesitate to contact Lika Electronic.



Shaft loadings

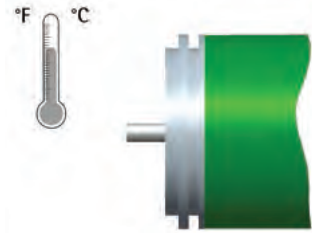
To guarantee the encoder reliability over time and a proper working, **the operating temperature range indicated in each datasheet under the section "Environmental specifications" has to be fulfilled carefully.**

When operating, the encoder can reach the range of temperature indicated in the datasheet. Within the stated range of temperature the encoder meets the performance specifications listed in the datasheet. The minimum and maximum temperature values have been measured in compliance with the standards **CEI IEC 68-2-1 and CEI IEC 68-2-2.**

The operating temperature range depends on several factors such as the ambient temperature, the supply voltage, the type of casing and the mechanical installation, the rotational speed, etc. Each and all of them definitely influence the operating temperature value.

For instance operating the encoder at the maximum rotational speed could be acceptable at low ambient temperature but could cause the tolerance range to be exceeded at high ambient temperature.

Operating temperature is measured on the encoder flange in proximity of the ball bearings.



Operating temperature

This is the **maximum shock acceleration** that the encoder is able to withstand without inducing a mechanical weakness and losing the performances specified in the datasheet.

Shock test is performed in compliance with the international standard IEC EN 60068-2-27:2008 applying an acceleration of 100 g for a duration of 6 ms.

Maximum values are permissible providing that the encoder is installed properly, *following carefully the instructions given in the technical documentation and respecting the mounting tolerances indicated by the manufacturer.* Any mechanical shock and vibration exceeding the stated values may cause damage to the encoder.

Keep in mind that an encoder is a delicate electronic equipment, for this reason it should not be subjected to excessive mechanical shock and vibration during both installation and operation.

Shock

This is the **maximum sustained vibration** that the encoder is able to withstand without inducing a mechanical weakness and losing the performances specified in the datasheet.

Vibration test is performed in compliance with the international standard IEC EN 60068-2-6:2007 (10 g, 5-2000 Hz, 0.75 mm). Maximum values are permissible providing that the encoder is installed properly, following carefully the instructions given in the technical documentation and respecting the mounting tolerances indicated by the manufacturer.

Any mechanical shock and vibration exceeding the stated values may cause damage to the encoder. Keep in mind that an encoder is a delicate electronic equipment, for this reason it should not be subjected to excessive mechanical shock and vibration during both installation and operation.

Vibration

Most of the outputs (refer to the section "Output circuits") **are protected against short-circuit.** Short-circuit protection is intended to keep the encoder electronics safe from accidental and temporary connection of one or more outputs to 0VDC, +VDC or to each other, supposing that the power voltage is connected properly.

If such a situation arises, no damage is caused to the circuitry, nevertheless it is compulsory to re-establish immediately the proper connection.

Short-circuit protection

Most of the Lika encoder versions (except some +5Vdc power supply versions) implement the reverse polarity protection to prevent the internal electronics from being damaged in case the polarity is accidentally reversed on the connection.

Reverse polarity protection

ROTAPULS • ROTACOD

Technical information

IP -International Protection- code as defined in the international standard IEC 60529 classifies the degrees of protection from solid objects and accidental contacts as well as from liquids provided by the enclosures of the electrical equipment.

The protection rate is defined by the **IP abbreviation followed by a two-digit number**. *The first digit indicates the level of protection of the enclosure against particles and solid objects; while the second digit indicates the level of protection against liquids.*

IP ratings are summarized in the tables below.

IP first digit Protection against solid objects		IP second digit Protection against liquids	
0	No protection	0	No protection
1	Protected against solid objects 50 mm or greater	1	Protected against vertically dripping water
2	Protected against solid objects 12 mm or greater	2	Protected against vertically dripping water, when tilted 15 degrees
3	Protected against solid objects 2,5 mm or greater	3	Protected against water spraying at an angle up to 60 degrees
4	Protected against solid objects 1 mm or greater	4	Protected against water splashing from any direction
5	Protected against dust limited ingress	5	Protected against jets of water from any directions
6	Totally protected against dust	6	Protected against powerful jets of water from any directions
		7	Protected against immersion between a depth of 150 mm and 1000 mm
		8	Protected against continuous submersion

The **IP69K protection rate** is not defined in the international standard IEC 60529 but in the German standard DIN 40050-9 which was originally intended to concern the road vehicles and nowadays is generally and widely considered as an integration of the IEC 60529 rating system. The IP69K protection rate applies to equipment able to withstand high-pressure and high-temperature wash down and even steam cleaning applications.

The United States National Electrical Manufacturers Association (NEMA) also publishes protection ratings for enclosures similar to the IP rating system. However, it also dictates other product features not addressed by IP codes, such as corrosion resistance. Thus, while it is possible to map NEMA ratings that satisfy or exceed the IP Code criteria, it is not possible to map IP codes to NEMA enclosure ratings, as the IP Code does not mandate the additional requirements. The table above indicates the minimum NEMA rating that satisfies or exceeds a given IP code, but can only be used in that way, not to map IP to NEMA.

NEMA enclosure rating	IP code
1	IP10
2	IP11
3	IP54
3R	IP14
3S	IP54
4	IP66
4X	IP66
5	IP52
6	IP67
6P	IP67
12 and 12K	IP52
13	IP54

IP protection ratings

IP69K

NEMA ratings and IP equivalency chart

ROTAPULS • ROTACOD

Accessories

Lika Electronic encoders are offered in a comprehensive range of choices and options to perfectly suit specific needs in many industries and applications.

In addition a wide variety of encoder accessories such as cables, connectors, flexible couplings, brackets, mounting bells, adapting flanges, fixing clamps, reducing sleeves, metric wheels and gears, cable pulling assemblies, displays, signal converters and encoder interfaces are provided.

They all come to singularly complement the encoder offer and match any individual requirements.

Please see on page 224 for any technical information on the encoder accessories.

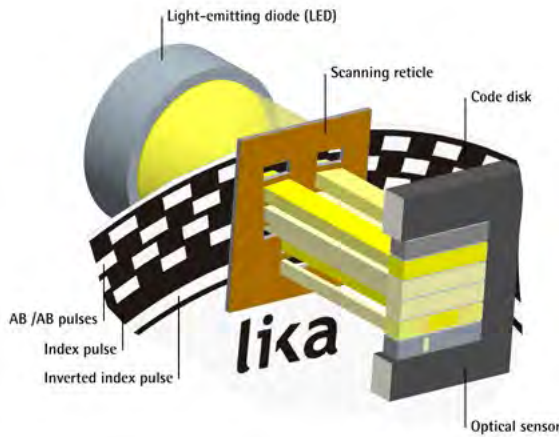
Encoder accessories

 <p>Cables</p>	 <p>Connectors</p>	 <p>Flexible couplings</p>
 <p>Brackets, mounting bells and adapting flanges</p>	 <p>Reducing sleeves</p>	 <p>Metric wheels, pinions and rack</p>
 <p>Draw-wire units</p>	 <p>Displays</p>	 <p>Signal converters and encoder interfaces</p>

ROTAPULS

Incremental encoders working principle

The working principle behind the optical incremental encoders lies in a **code disk**, mounted on the rotating shaft, with a radial grating of transparent/opaque slots around the perimeter. This pattern can have from two (AB) to six (ABO, /ABO) tracks providing the incremental information.



As the disk rotates, the slots in the pattern are penetrated by a light beam generated by a light source mounted on one side of the disk. The transmitted light is then sensed by an **optical sensor** placed on the opposite side of the disk. A **scanning reticle** collimates the light beam directly to the optical sensor.

The optical sensor converts the light-dark sequence given by the pattern into electric signals, typically a sine wave.

An **index pulse** (or 0 channel) can also be provided once per turns as relative positioning reference (home position). A phase-shifted between A and B pattern allows to detect the counting direction. Several output circuits are available to meet the characteristics of the subsequent control unit.

Optical technology is non-contacting and therefore wear-free.

There are two magnetic measuring methods using either a magnetic code ring with MR sensing element or an IC sensor, they depend on the dimensions of the encoder and the mechanical characteristics of its shaft.

Most magnetic incremental encoders utilize a magneto-resistive (MR) sensing element and a magnetic code ring mounted directly on the encoder shaft. The magnetic code ring is fitted with two separate tracks: an incremental track for relative position information and an index pulse track.

The sequence of north and south poles coded all along the ring is detected by MR sensor and converted into sinusoidal electrical signals. These are amplified to correct voltage level and digitized by the translation circuitry before being sent to output.

Magnetic encoders are optimized to considerably reduce the effects of the electromagnetic fields that could affect the signals quality and accuracy. Several output circuits and mechanical versions are available to meet all requirements. Lika Electronic is among the few manufacturers offering magnetic encoders with through hollow shafts.

The smallest encoders, with a diameter of 36 mm, use a different magnetic technology requiring the installation of a Hall sensor. In such devices a magnet on the encoder shaft is detected by the Hall sensor providing sine/cosine signals. They are converted into A and B quadrature signals.

Only solid and blind hollow shaft versions are available with Hall sensor technology.

Magnetic technology is non-contact and frictionless and therefore eliminates wear.



In a very basic way we can state that optical encoders can reach much finer precision and higher accuracy than magnetic encoders, thus they are ideally suited for applications where very high resolutions are required. In few words they are very good value for money.

While magnetic encoders are insensitive to most contaminants and therefore typically suitable for installation in harsh and aggressive environments and are able to guarantee higher shock, vibration and temperature fluctuations resistance along with lower costs; furthermore they can be more easily protected against moisture, the finest of dust particles, humidity, water, oil, chemical agents using methods such as tropicalization, conformal coating, encapsulating or varnishing.

Optical incremental encoder: working principle

Magnetic rotary incremental encoder: working principle

Optical encoders vs magnetic encoders

ROTAPULS

Output signals

When referring to an incremental encoder, the **resolution (or pulse rate)** means the **number of pulses emitted by each output channel per revolution**.

The physical resolution depends on the number of slots in the circular track pattern of the code disc (optical version) or on the number of north-south poles sequence information in the code ring (magnetic version).

Typically the incremental resolution is expressed in pulses per revolution (PPR).

Lika Electronic's portfolio encompasses incremental encoders with up to 18000 PPR.

In this catalog the resolution of the encoders is always referred to as "physical resolution".

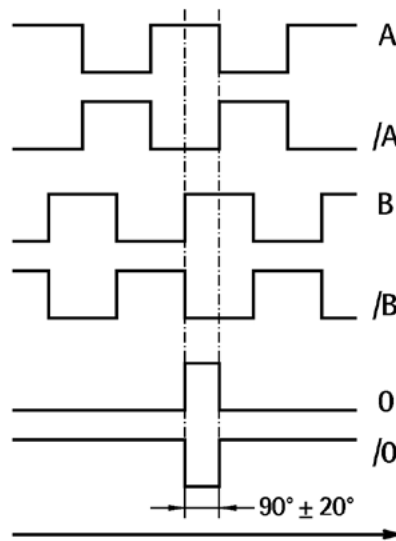
See also "Pulse multiplication" hereafter.

Incremental encoders seldom provide only one A output channel (uni-directional pulses). They can be used uniquely when the information on the direction of rotation is not required.

All Lika encoders are dual channel encoders at least.

The whole range of Lika incremental encoders provides A and B output channels (bi-directional pulses, also referred to as quadrature).

A and B channels supply square wave signals phase-shifted by 90 electrical degrees. Thanks to this displacement, the direction of rotation can be determined. In fact when the rising edge of the signal A leads the rising edge of the channel B, clockwise direction (CW) is detected; and on the contrary, when the rising edge of the signal B leads the rising edge of the channel A, counterclockwise direction (CCW) is detected.



Resolution or pulse rate

A channel
(uni-directional output)

A and B channels
(bi-directional output, single ended output)

Index pulse
(0 channel)

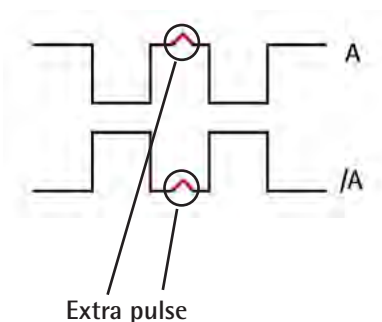
Inverted signals
(complementary or differential outputs)

In addition to A and B channels, **Lika incremental encoders can provide also the Index pulse (0 channel)**: it provides the zero signal once per revolution as relative positioning reference (home position). Hence following electronic equipment senses the position of the encoder within its revolution and relative position information can be gathered.

When noisy electrical environment conditions or long cable lengths could lead to unsafe communication, A, B and 0 signals should be paired to inverted signals (/A, /B and /0, typically referred to as A NOT, B NOT and 0 NOT). They are typically generated by inverting the electrical output (for instance, when A signal goes HIGH, /A signal goes LOW and vice versa).

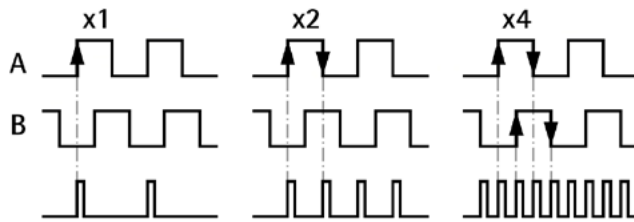
Inverted signals allow pulses to be filtered in order to have clean signals. In fact noisy pulses (missed or extra pulses) affect both normal and complementary signals in the same way and thus they can be easily detected and trimmed.

See the Figure: the extra pulse (in red) which affects both channels A and /A can be easily trimmed by the differential receiver to obtain a clean signal.



Using adequate subsequent electronic equipment the resolution of an incremental encoder can be increased by taking advantage of the rising and falling edges of the signals in both channels A and B.

In this way the distance between two successive edges is the resolution of the device (measuring step): hence an encoder having a resolution of 1024 physical pulses per revolution can generate 2048 or 4096 pulses per revolution. In this catalog the resolution of the encoders is always referred to as number of periods per channel (x 1 pulse multiplication).



Pulse multiplication

The counting frequency is indicated in the electrical specifications of each incremental encoder and is very useful for properly coupling an encoder to any related device such as a control unit or a motor. Furthermore, please note that there is a straight relationship between the counting frequency and the signal distortion.

The longer is the cable in fact, the greater is its capacitance; and the capacitance affects the signal quality causing the higher frequencies to be "filtered" so distorting the signal. When such a situation could arise, encoders with line driver or "power" circuit are highly recommended. See also "Cable length" section.

The maximum frequency of an encoder, expressed in kHz, results from the number of revolutions per minute (RPM) and the number of pulses per revolution (PPR) and is typically between 100 and 300 kHz. It can be calculated by using the following algorithm:

$$\text{Max. counting frequency (kHz)} = \frac{\text{RPM} * \text{PPR}}{60 * 1000}$$

It follows that the higher the resolution and the maximum rotational speed of the encoder, the higher the counting frequency; this has to be considered carefully referring to the following electronic equipment and the run of the cables.

Reversing the formula you can easily calculate the number of revolutions starting from the counting frequency value.

$$\text{RPM} = \frac{\text{Max. counting frequency (kHz)} * 60 * 1000}{\text{PPR}}$$

The reversed formula can be very useful -for instance- when you know the maximum frequency that can be transmitted over a given cable length and you need to know the maximum rotation speed the encoder is allowed to reach at the required resolution.

Counting frequency

Output circuits

As most control units only use digital signals (square waves signals), therefore the sinusoidal signals generated by the optical or magnetic scanning have to be digitized before being issued to output. Several output circuit types are available to incremental encoders.

Their choice depends on some considerations, for instance the type of input the controller is expecting and the cables length.

NPN o. c. output circuit is a current sinking output circuit, used when the following electronic equipment sources current. This output circuit is usually required when the encoder and the following electronic equipment operate at different supply voltages.

NPN transistor must be available in the encoder, while the external equipment must be fitted with pull-up resistor.

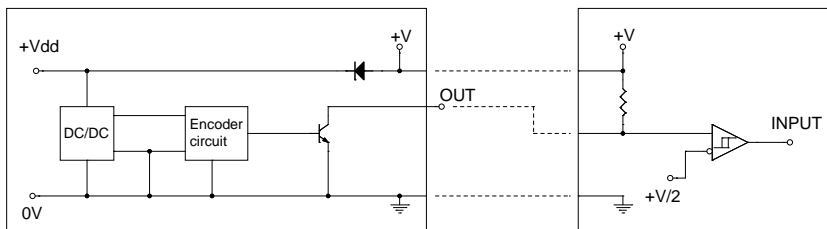
Advantages: NPN o. c. output is useful when the encoder and the subsequent controller have different supply voltages. This means that the open collector allows for the power source to be different from the main power supply. For instance, we can have 5 V power supply while the output signal is 24 V.

Disadvantages: inverted signals are not provided.

Power supply (Vin)	Max. sinking current	Peak sinking current	Typical rising/falling edge time	Vout low @40mA	Vout high @40mA
+10 +30 Vdc	40 mA	80 mA	3000 ns / 700 ns	≤ 0,5 Vdc	acc. to following electronics

Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
•	-	on request	30 m / 100 ft

Recommended input circuit



PNP o. c. output circuit is a current sourcing output circuit, used when the following electronic equipment sinks current. PNP transistor must be available in the encoder. This output circuit is seldom used.

Disadvantages: inverted signals are not provided.

Power supply (Vin)	Max. output current	Peak output current	Typical rising/falling edge time	Vout low @40mA	Vout high @40mA
+10 +30 Vdc	40 mA	80 mA	550 ns / 470 ns	acc. to following electronics	(Vin - 1,25) Vdc

Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
•	-	on request	30 m / 100 ft

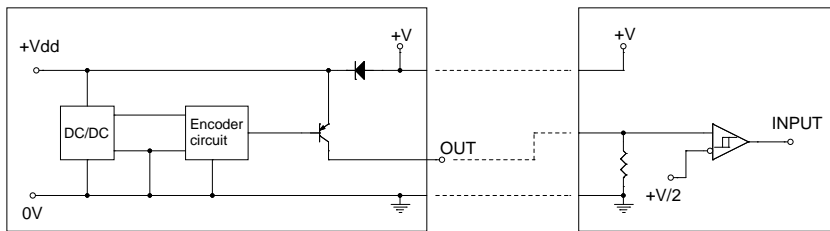
NPN open collector (code N)

PNP open collector (code P)

ROTAPULS

Output circuits

Recommended input circuit



Push-Pull electronic bases on a 7272 circuit (code Y) and provides square-waves signals phase-shifted by 90 electrical degrees. It is a general-purpose circuit capable of either sourcing or sinking current up to 80 mA (peak) per output and suitable for most motion control equipment. When the output is in logic state high, current will source to the downstream electronic equipment. When the output is in logic state low, current will sink from the load. Push-Pull output can provide inverted signals as an option (see "Output signals" on page 20). Customarily encoders with Push-Pull output circuit are operated at 10 to 30Vdc (typically 12 or 24Vdc).

Advantages: high compatibility, suitable for interface connections even with NPN or PNP inputs circuits, inverted signals allow use with longer cables.

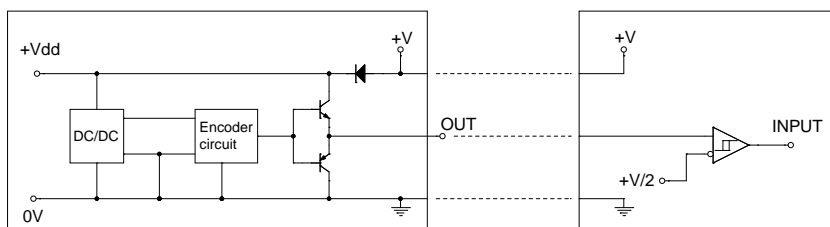
Disadvantages: medium interference immunity, needs external filters for noise reduction.

Push-Pull / HTL (code Y)

Power supply (Vin)	Max. output current	Peak output current	Typical rising/falling edge time	Vout low @40mA	Vout high @40mA
+10 +30 Vdc	40 mA	80 mA	550 ns / 470 ns	≤ 0,5 Vdc	(Vin - 1,25) Vdc

Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
•	-	on request	30 m (AB0) 180 m (AB0 /AB0)

Recommended input circuit



ROTAPULS

Output circuits

For safe signal transmission over very long distances (exceeding 100 m) and maximum preservation of the signals quality, **Power Push-Pull electronic offers great benefits.**

Power Push-Pull preserves the general characteristics of the standard Push-Pull, but can reach much higher output power values, thus considerably reducing the quality degradation or the loss of signals on long cable runs. Encoders with Power Push-Pull output circuit are operated at 10 to 30Vdc (typically 12 or 24Vdc).

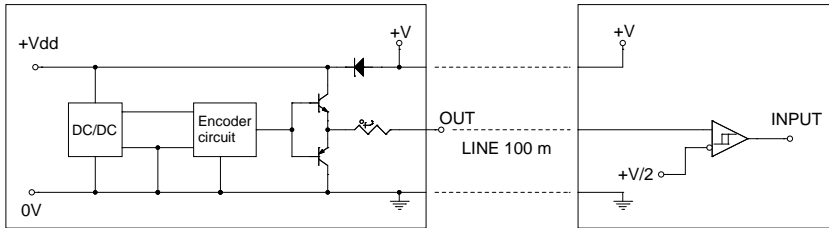
Advantages: high compatibility, suitable for interface connections even with NPN or PNP inputs circuits, safe signal transmission over long cables.

Disadvantages: medium interference immunity, needs external filters for noise reduction.

Power supply (Vin)	Max. output current	Peak output current	Typical rising/falling edge time	Vout low @40mA	Vout high @40mA
+10 +30 Vdc	100 mA	300 mA	300 ns / 100 ns	≤ 0,5 Vdc	(Vin - 1,25) Vdc

Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
•	•	•	250 m / 820 ft

Recommended input circuit



Differential Line Driver output bases on a 26LS31 circuit (code L). It is a sourcing output circuit highly recommended when noisy electrical environment conditions or long cable lengths could lead to unsafe communication. Line driver electronic provides square-wave ABO signals and inverted /ABO signals (see "Output signals").

In fact noisy pulses (missed or extra pulses) that affect both normal and inverted signals in the same way can be easily detected and trimmed by the differential line receiver.

When the encoder is operated at 5Vdc ± 5% it complies with EIA RS-422 standard.

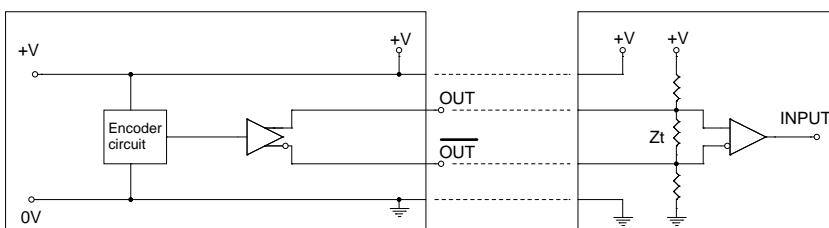
Advantages: high interference immunity, long run of cables.

Disadvantages: requires Line Receiver for optimal performance.

Power supply (Vin)	Max. output current	Peak output current	Typical rising/falling edge time	Vout low @40mA	Vout high @40mA
+5 Vdc	20 mA	-	60 ns / 30 ns	≤ 0,5 Vdc	≥ 2,5 Vdc

Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
-	-	•	150 m / 495 ft

Recommended input circuit



Power Push-Pull (HTL) (code T)

Line Driver (RS422) / TTL (code L)

ROTAPULS

Output circuits

For increased signals quality even over very long distances (exceeding 100 m), the Power Line Driver circuit (code K) can be provided. It preserves the general characteristics of the standard Line Driver, but has built-in characteristic impedance adaption for 75Ω lines. The outputs are designed for a high driver power of up to 300mA at 5V. This considerably reduces quality degradation or loss of signals on long cable runs.

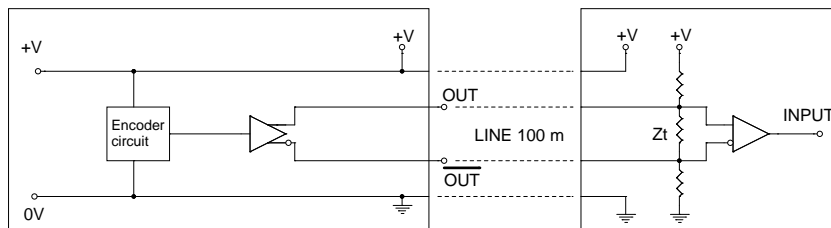
Advantages: high interference immunity, very long run of cables.

Disadvantages: requires Line Receiver for optimal performance, outputs protection.

Power supply (Vin)	Max. output current	Peak output current	Typical rising/falling edge time	Vout low @40mA	Vout high @40mA
+5 Vdc	100 mA	300 mA	30 ns / 10 ns	≤ 1,5 Vdc	≥ 2,5 Vdc

Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
•	•	•	250 m / 820 ft

Recommended input circuit



This is a Push-Pull-based output circuit compatible with Line Driver, designed by Lika Electronic in the late nineties and now widely accepted as a standard by all encoder manufacturers. To ensure compatibility with Line Receiver inputs, Universal circuit is always provided with complementary signals.

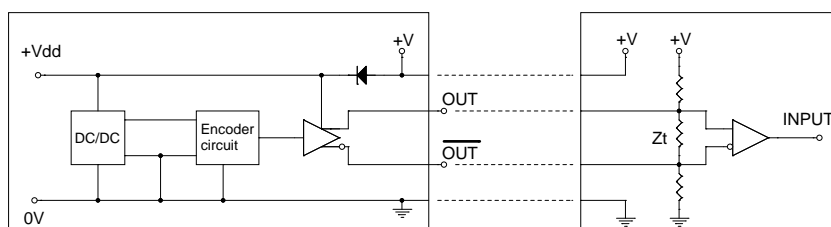
Advantages: high compatibility, advantages of both Push-Pull and/or Line Driver output circuits, allows for reduction of models in stock.

Disadvantages: same as Push-Pull and/or Line Driver.

Power supply (Vin)	Max. output current	Peak output current	Typical rising/falling edge time	Vout low @40mA	Vout high @40mA
+5 +30 Vdc	40 mA	80 mA	550 ns / 470 ns	≤ 0,4 Vdc	(Vin - 1,25) Vdc

Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
•	•	•	180 m / 590 ft

Recommended input circuit



Power Line Driver / TTL (code K)

Universal circuit Push-Pull + Line Driver / HTL + TTL (code H)

ROTAPULS

Output circuits

1Vpp output circuit provides sinusoidal analog signals phase-shifted by 90 electrical degrees (sine and cosine) for external interpolation. Sinusoidal signals have an amplitude of typically 0.5 Vpp (peak-to-peak) and a 2.5V offset.

1Vpp output level results from differential signals detection.

The frequency of output signals is proportional to the rotation speed of the device.

Sinusoidal signals can be highly interpolated by the following electronic in order to increase the resolution. In this way the transmission frequency along the cable is significantly reduced.

A (COS) and B (SIN) signals (standard code sequence) plus 0 signal are shown in the Figure.

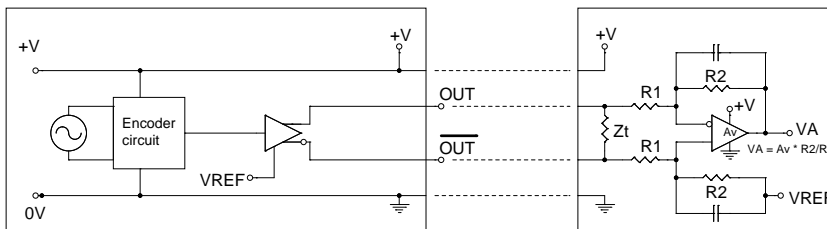
1Vpp sin/cos (code V)

Advantages: sinusoidal signals can be highly interpolated, thus increasing the resolution and reducing the transmission frequency over long cables.

Disadvantages: needs electronics for interpolation.

Power supply (Vin)	Max. output current	Peak output current	Thermal protection	Short-circuit protection	Inverted signals	Max. cable length
+5 Vdc	40 mA	80 mA	-	-	•	50 m 165 ft

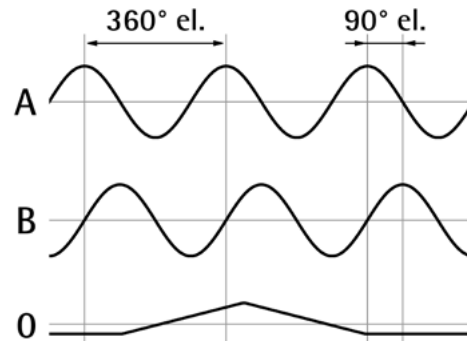
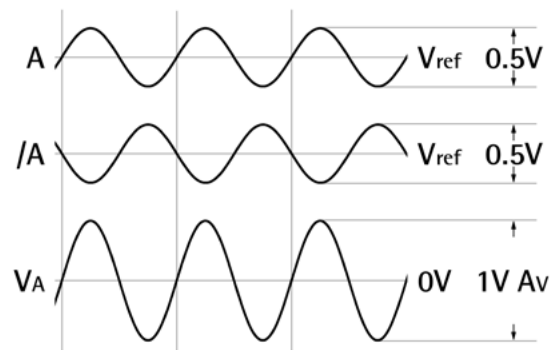
Recommended input circuit



$$V_{REF} = 2,5V \pm 0,5V$$

$$V_A = 1V_{pp} - A_v$$

$$A_v = R_2/R_1$$



ROTAPULS

Cable length vs. counting frequency

We highly recommend the cable lengths reported in the following tables to be respected strictly.

Please note that data listed below may vary due to the following factors:

- the supply voltage of the encoder;
- the quality of the cable;
- the electrical noise coming from the ground connection;
- the features of the controller connected to the encoder;
- the ambient temperature;

For the afore-mentioned reasons the recommended cable lengths could be shorter depending on each specific application.

Cable lengths

Maximum cable lengths in relation to frequencies

Output circuit	Max. cable length m / ft	Max. counting frequency
Push-Pull (ABO signals)	10 m / 35 ft	100 kHz
	20 m / 65 ft	50 kHz
PNP o.c., NPN o.c.	30 m / 100 ft	25 kHz

Output circuit	Max. cable length m / ft	Max. counting frequency
Push-Pull (ABO /ABO signals)	60 m / 200 ft	100 kHz
	120 m / 395 ft	50 kHz
PP/LD universal circuit	180 m / 590 ft	25 kHz

Output circuit	Max. cable length m / ft	Max. counting frequency
Power Push-Pull	100 m / 330 ft	100 kHz
	200 m / 655 ft	50 kHz
	250 m / 820 ft	25 kHz

Output circuit	Max. cable length m / ft	Max. counting frequency
Line Driver (RS422)	50 m / 165 ft	100 kHz
	100 m / 330 ft	50 kHz
	150 m / 495 ft	25 kHz

Output circuit	Max. cable length m / ft	Max. counting frequency
Power Line Driver	90 m / 295 ft	100 kHz
	180 m / 590 ft	50 kHz
	250 m / 820 ft	25 kHz

At ambient temperature (23°C)

Please note the higher the resolution and the maximum rotational speed of the encoder, the higher the counting frequency.

There is a straight relationship between the counting frequency and the signal distortion. The longer is the cable in fact, the greater is its capacitance; and capacitance affects the signal quality causing the higher frequencies to be "filtered" so distorting the signal.

Using the following formula you can easily calculate the number of revolutions the encoder is allowed to reach starting from the counting frequency value.

$$\text{RPM} = \frac{\text{Max. frequency (kHz)} * 60 * 1000}{\text{PPR}}$$

For reference see also page 21.

ROTACOD

Absolute encoders working principle

The working principle behind the optical absolute encoders lies in a disc where a unique **Gray code pattern** is printed (or seldom punched).

The **code disc** bears a grating design forming several tracks whose number corresponds to the bit size of the output data word (bits resolution): thus the more are the tracks, the higher will be the resolution. Moreover the number of slits in a track increments a power of 2 from the previous track (starting from the centre). It follows that if, for instance, the disc is fitted with 13 tracks, then 213 positions are available (8192 information per turn).

As stated, each track represents one bit of the output: the inner track represents the most significant bit (msb) while the outer track represents the least significant bit (lsb).

As the disk rotates, the slits in the pattern are penetrated by a light beam generated by a light source (GaAl **light-emitting diode**) mounted on one side of the disk; the transmitted light is then sensed by an **optical sensor** placed radially on the opposite side of the disk.

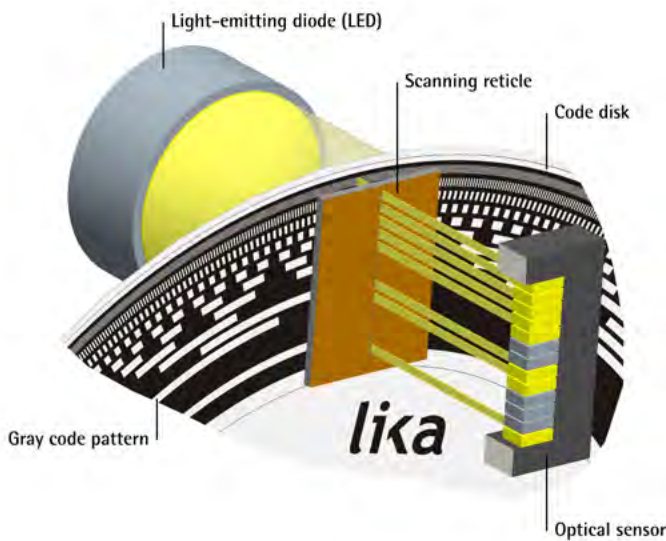
A **scanning reticle** is also provided between the disk and the optical sensor in order to channel the light beam directly to the photo-elements in the optical sensor.

The photo-elements then convert the light/dark sequence given by the slits in each track into logic level 1 / 0 values.

The sequence of transparent (empty) and opaque (solid) slits in the tracks is arranged and designed in such a way that the on / off switch of the light beam through the slits in a radial section results in a Gray code word.

The coded information is then output directly, otherwise it can be converted into a binary or BCD code before being sent to the output circuit. Despite the seeming complexity of the absolute encoders output, *the main advantage is that the positional information is always known and retained, even after the power is turned off and then on again.*

Optical absolute encoder: working principle



Optical absolute encoders are available in both single-turn and multi-turn versions.

In single-turn version they can boast a resolution up to 524.288 counts per revolution (19-bit output); while in multi-turn version they are available with up to 262.144 cpr (18-bit output) and up to 16.384 revolutions (14-bit output); the overall resolution is up to 32 bits (18 + 14).

Optical technology is non-contacting and therefore wear-free.

ROTACOD • ROTAMAG

Absolute encoders working principle

Lika Electronic is among the few manufacturers offering magnetic encoders in the whole variety of mechanical mounting options: with solid shaft, with blind hollow shaft and with through hollow shaft.

There are two magnetic measuring methods, they depend on the mechanical characteristics of the shaft. Solid and blind hollow shaft version encoders are equipped with an IC sensor.

A **2-pole magnet** integral with the **encoder shaft** rotates over the centre of a chip (**interpolator**) so providing a complete sine and cosine wave at each turn.

The absolute angle measurement determines the angular position of the shaft.

Then the absolute information is available to output as a serial bit stream (SSI interface).

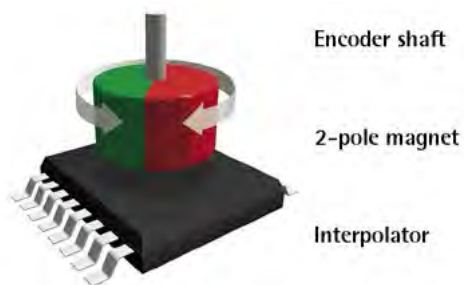
Through hollow shaft encoders are equipped with a 2-pole (or several couples of poles) magnetic ring mounted directly on the encoder shaft; they are further fitted with two sensors which are phase-shifted by 90 degrees: one sensor is designed to provide the sine wave while the second is designed to provide the cosine wave. The absolute angle measurement determines the angular position of the shaft. Then the absolute information is available to output as a serial bit stream (SSI interface).

Magnetic absolute encoders are available in both single-turn and multi-turn versions.

In single-turn version they can boast a resolution up to 8.192 counts per revolution (13-bit output); while in multi-turn version they are available with up to 4.096 cpr (12-bit output) and up to 65.536 revolutions (16-bit output) so obtaining an overall resolution of 28 bits (12 + 16).

They are optimized to considerably reduce the effects of the electromagnetic fields that could affect the signals clarity and system accuracy.

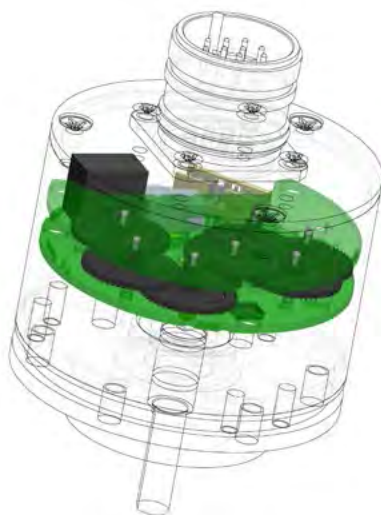
Magnetic technology is non-contact and frictionless and therefore eliminates wear.



Absolute encoders can be either single-turn or multi-turn.

Single-turn encoders provide the absolute position information per each revolution and the counting operation resumes again after each revolution; thus the resolution of the encoder is the number of information per turn (typically expressed in counts per revolution -cpr-, otherwise information per revolution).

While **multi-turn encoders** provide standard absolute information, but rely upon an additional internal counting process to monitor and track the number of rotations: in this way multiple revolutions can be performed before restarting the counting operation. This results in a double resolution (typically expressed in overall bits): the absolute position per each revolution and the information on the number of revolutions. The overall information is univocal.



Magnetic rotary absolute encoder: working principle

Absolute single-turn and multi-turn encoders

In a very basic way we can state that optical encoders can reach much finer precision and higher accuracy than magnetic encoders, thus they are ideally suited for applications where very high resolutions are required. They are intended for the most dynamic and high demanding motion systems and are very good value for money.

While magnetic encoders are insensitive to most contaminants and therefore typically suitable for installation in harsh and aggressive environments and are able to guarantee higher shock, vibration and temperature fluctuations resistance along with lower costs; furthermore they can be more easily protected against moisture, the finest of dust particles, humidity, water, oil, chemical agents using methods such as tropicalization, conformal coating, encapsulating or varnishing.

Optical encoders vs magnetic encoders

ROTACOD

Output codes

The absolute encoders provide the absolute position information in a code format. Thus the output information can be represented in Binary, Gray or BCD code.

In the base-2 number system only two digits are used: 0 and 1. For this reason it is the base of data processing in computing and electronic systems where 0 and 1 can be represented, electronically, as states "off" and "on". Binary code represents the information through the base-2 number system. It is very efficient, but has a great disadvantage from the point of view of the measuring equipment: more than one digit at a time often changes in consecutive positions. Because of the variations caused by gate delays, line impedances, etc. transitions do not occur simultaneously and this could result in erroneous readings and therefore lead to significant measuring errors. Consider, for instance, the following sequence:

Decimal	0	1	2	3	4	5	6	7
Binary (4 digits)	0000	0001	0010	0011	0100	0101	0110	0111
Gray (4 digits)	0000	0001	0011	0010	0110	0111	0101	0100

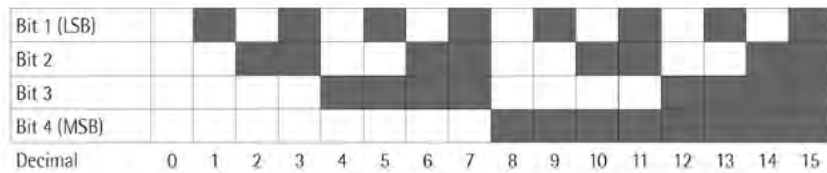
From position 1 to 2 (decimal), the last two digits both change in the binary representation (0 → 1; 1 → 0).

The same happens from position 3 to 4, where the last three digits all change (0 → 1; 1 → 0; 1 → 0). During operation, a sensing error of the detection elements could result in a positioning command error.

For instance, let's suppose the following wrong sequence: 0001 → 0011 → 0010 (position 1 → 3 → 2 instead of 1 → 2 → 3). Motion controller would command position 1, then position 3 and then a reverse motion to position 2.

Anyway please consider that Lika encoders are designed to ensure that only consecutive position values are always transmitted.

Binary code 4-bit representation (high logic level is represented in black)



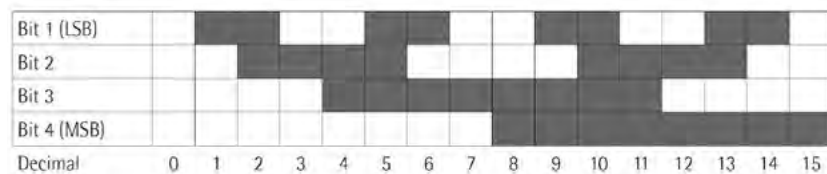
As binary code, also Gray code, patented by Bell Laboratories researcher Frank Gray in 1947, represents the information through the base-2 number system; but the binary strings are ordered so that two successive values differ in only one bit (see the table under "Binary code" point); and this property is preserved even at transition from the last to the first position of the sequence, provided that the number of information (namely, the resolution) is a power of 2 (otherwise, we must exploit the property of the so-called "Shifted Gray" code or "Gray Excess" code, see the section "Shifted Gray code or Gray Excess code" hereafter).

This is a safer method than binary code, because any sequence where more than one bit at a time changes can be easily and immediately detected by the control unit.

Anyway, the maximum error is always the value of the LSB.

All absolute encoders from Lika Electronic are equipped with a Gray code pattern disc.

Gray code 4-bit representation (high logic level is represented in black)



Binary code

Gray code

BCD code (binary-coded decimal) represents the decimal numbers using for each digit the corresponding 4-bit binary value. This means that only binary numbers from 0 to 9 are used. For instance: decimal number 123 is represented as: 0001 0010 0011 (1111011 in binary code). The main advantage of BCD code is its straight relation with decimal code which allows to easily convert the binary numbers into decimal numbers and vice versa. On the other hand it requires more memory. BCD code is more and more rarely used, in particular in outdated electronics and spare parts now.

BCD code

It is sometimes necessary to have a resolution which is different from the values expressed by powers of 2 (2^n). These cases are commonly referred to as "shifted" Gray and Binary codes. It is useful to note that in these cases:

- the initial count value is not zero (except after zero setting/preset).
 - the final count value does not coincide with the max. value of the information requested.
- To calculate the initial and final values of the output information, it is necessary to use the following algorithm:

Example

a shifted Gray code of 360 counts/rev. is required

$$\Delta = \frac{\text{Integral Gray} - \text{Shifted Gray}}{2}$$

where:

Integral Gray: represents the standard value of the information (expressed by 2^n) immediately superior to the max. value desired.

Shifted Gray: represents the max. value of the information in shifted code desired.

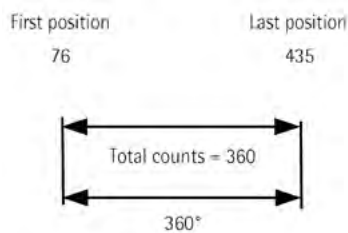
Δ : represents the initial count value (first output information).

$\Delta-1$: represents the quantity to be added to the max. value of information required to obtain the final count value (last output information).

therefore:

$$\Delta = \frac{512-360}{2} = 76$$

$$\Delta-1 = 75; 360 + 75 = 435$$



Shifted code encoders can only be supplied in single-turn version.

The absolute position information can be provided to the following control via a wide variety of output circuits (interfaces). **Typically, we can distinguish between electrical interfaces (parallel, serial, analogue) and fieldbus interfaces.**

The absolute encoders are customarily fitted with either parallel or serial (SSI, BISS, etc.) output circuits, the analogue circuit is more rarely used. The electrical interfaces are simple, cost-effective and easily fulfil the requirements of most industrial applications. Nevertheless in the last years fieldbus interfaces are rapidly gaining ground worldwide because of their compatibility in more complex installations.

Fieldbus technology in fact permits to improve performances thanks to complete device interface (bi-directional data transmission, enhanced programmability, diagnostic information, etc.), achieve communication transparency, simplify and standardize installations allowing several devices to be simply connected in the same network.

In addition the use of standardised bus cables provides a simplified and safe connectivity thus saving time and money whilst reducing the risk of errors.

Probably, the parallel output is, among the electrical interfaces, the most commonly used for the absolute encoders and most and foremost for the single-turn encoders, as an alternative to serial or SSI electrical interfaces. It is very simple and fast and provides the output information (such as the absolute position) simultaneously (this means that multiple bits are output in the same time using separate transmission lines for each one), in pure Binary, Gray or BCD code format. Parallel output encoders integrate NPN, PNP or Push-Pull drivers (for any information see page 22). Zero setting/Preset, Counting direction, Latch, Tri-state and Parity bit features are often implemented (see page 40).

Because of the increasing resolutions of the absolute encoders this output circuit requires up to 32 wires per cable and consequently additional components, so having a negative impact on the costs; for this reason the parallel output is more and more decreasing in the preference nowadays and often replaced by serial or fieldbus interfaces.

The following table shows the maximum cable lengths in relation to frequencies.

Max. cable length m [ft] @	100 [328]	50 [164]	30 [100]
Frequency [kHz]	20	60	100

At ambient temperature (23°C), $V_{enc} = 24V$

Advantages: fast, all data available simultaneously.

Disadvantages: more lines mean more conductors and components and therefore higher number of inputs, short cable lengths.

For recommended NPN, PNP and Push-Pull input circuits please refer to page 22.

Parallel output

Analogue output

Analogue electronics are especially used for position or velocity feedback and provide a continuously variable unique signal, namely a voltage or current signal, instead of a two-level discrete representation of the information (digital signal).

Their choice and use depends on the specific application, 4-20mA current output is nearly the standard in several fields and further allows for a refined OVERRUN function.

In the optical encoders, the digital information is converted into current or voltage analogue signals before being issued to the following electronics.

A full range of both voltage and current analogue signal outputs are available: 0 to 5V, 0 to 10V, -5 to +5V, -10 to +10V, 4 to 20mA, 0 to 24mA and 4 to 24mA.

Encoders with analogue output interface are available in both single-turn and multi-turn version. Among the models available in the analogue encoders portfolio, EM58 PA is the fully programmable absolute analogue encoder with software-selectable analogue outputs. It allows the full range of voltage and current outputs to be programmed according to any specific requirement. The analogue output encoders range includes special versions equipped with keys fitted in the rear of the enclosure; they allow to simply define the linear or angular displacement of the application by setting the start and stop reference points of the measuring range. Thus the initial and final limits of the stroke are the minimum and maximum values of the analogue range respectively.

It doesn't matter whether the displacement to measure is 1-, 25- or 99.5-revolution long, it will be scaled in the whole analogue range. The analogue encoders can further implement the OVERRUN function. It operates as a limit switch and allows to detect an overtravel position either by decreasing/increasing the output value beyond the analogue range or by keeping low/high the signal level outside the set axis travel.

The following table shows the maximum cable lengths for both voltage and current analogue outputs.

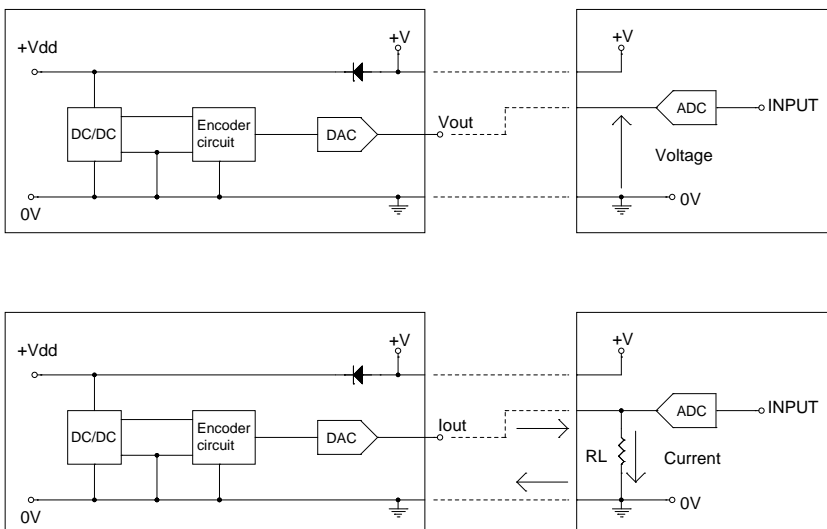
Max. cable length m [ft] @	Voltage analogue	Current analogue
	100 [328] with 1 MΩ max. load	150 [490]

At ambient temperature (23°C), $V_{enc} = 20V$

Advantages: current signals are better suited to transmission over long cable runs, voltage electronics interface directly with D/A and A/D converters and analogue multiplexing devices.

Disadvantages: more susceptible to noise than digital circuits, affected by EMI

Recommended input circuits



ROTACOD

Output circuits and fieldbus interfaces

SSI (the acronym for Synchronous Serial Interface) is a synchronous point-to-point serial interface engineered for unidirectional data transmission between one Master and one Slave. Developed in the first eighties, it is based on the RS-422 serial standard. Its most peculiar feature is that data transmission is achieved by synchronizing both the Master and the Slave devices to a common clock signal generated by the controller; in this way the output information is clocked out at each controller's request. Furthermore only two pairs of twisted wires are used for data and clock signals, thus a six-wire cable is required.



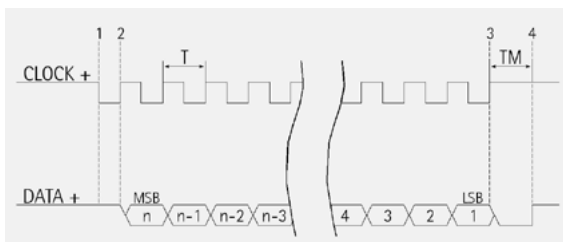
The main advantages in comparison with parallel or asynchronous data transmissions are:

- less conductors are required for transmission;
- less electronic components;
- possibility of insulating the circuits galvanically by means of optocouplers;
- high data transmission frequency;
- hardware interface independent from the resolution of the absolute encoder.

Furthermore the differential transmission increases the noise immunity and decreases the noise emissions. It allows multiplexing from several encoders, thus process controls are more reliable with simplified line design and easier data management.

Data transmission is carried out as follows.

At the first falling edge of the clock signal (1, the logic level changes from high to low) the absolute position value is stored while at the following rising edge (2) the transmission of data information begins starting from the MSB.



At each change of the clock signal and at each subsequent rising edge (2) one bit is clocked out at a time, up to LSB, so completing the data word transmission.

The cycle ends at the last rising edge of the clock signal (3). This means that up to $n + 1$ rising edges of the clock signals are required for each data word transmission (where n is the bit resolution); for instance, a 13-bit encoder needs 14 clock edges.

If the number of clocks is greater than the number of bits of the data word, then the system will send a zero (low logic level signal) at each additional clock, zeros will either lead (LSB ALIGNED protocol) or follow (MSB ALIGNED protocol) or lead and/or follow the data word (TREE FORMAT protocol).

After the period T_m monoflop time, having a typical duration of 12 μsec , calculated from the end of the clock signal transmission, the encoder is then ready for the next transmission and therefore the data signal is switched high.

SSI interface has a frequency of data transmission ranging between 100 kHz and 2 MHz.

The clock frequency (baud rate) depends on the length of the cable and must comply with the technical information reported in the following table:

Max. cable length m [ft] @	400 [1310]	200 [655]	100 [330]	60 [200]	30 [100]	15 [50]
Clock frequency [kHz]	100	200	300	500	900	1800

At ambient temperature (23°C)

The clock signal has a typical logic level of 5V, the same as the output signal which has customarily a logic level of 5V in compliance with RS-422 standard.

If the single-turn resolution is lower than 13 bits, then the protocol will provide 13 clock signals (+1 edge, as stated); if the single-turn resolution is higher than 13 bits, then the protocol will provide 25 clock signals instead.

Multi-turn encoders provide either 25 or 32 clock signals according to the length of the data word (bit resolution). The output code can be either Binary or Gray.

"Tree format" is the most common protocol and the SSI standard.

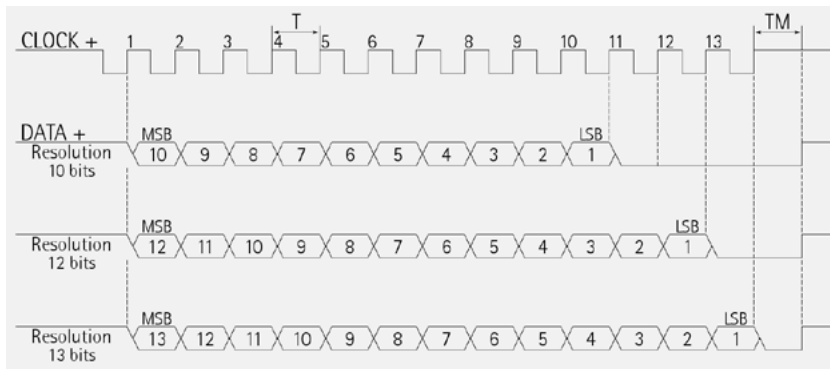
It is typically used in the single-turn encoders having a resolution up to 13 bits and in the multi-turn encoders having a resolution up to 25 bits (13-bit single-turn + 12-bit multi-turn). The whole transmitted data is divided into 12 bits on the left side of the central axes dedicated to the information on the number of revolutions; and into 13 bits on the right side of the axes dedicated to the information on the number of counts per revolution (see Figure 2).

Thus the multi-turn information is transmitted first. If less than 13 + 12 bits are required, then unused bits are forced to logic level low (0); they lead the multi-turn information on one hand and follow the single-turn information on the other hand.

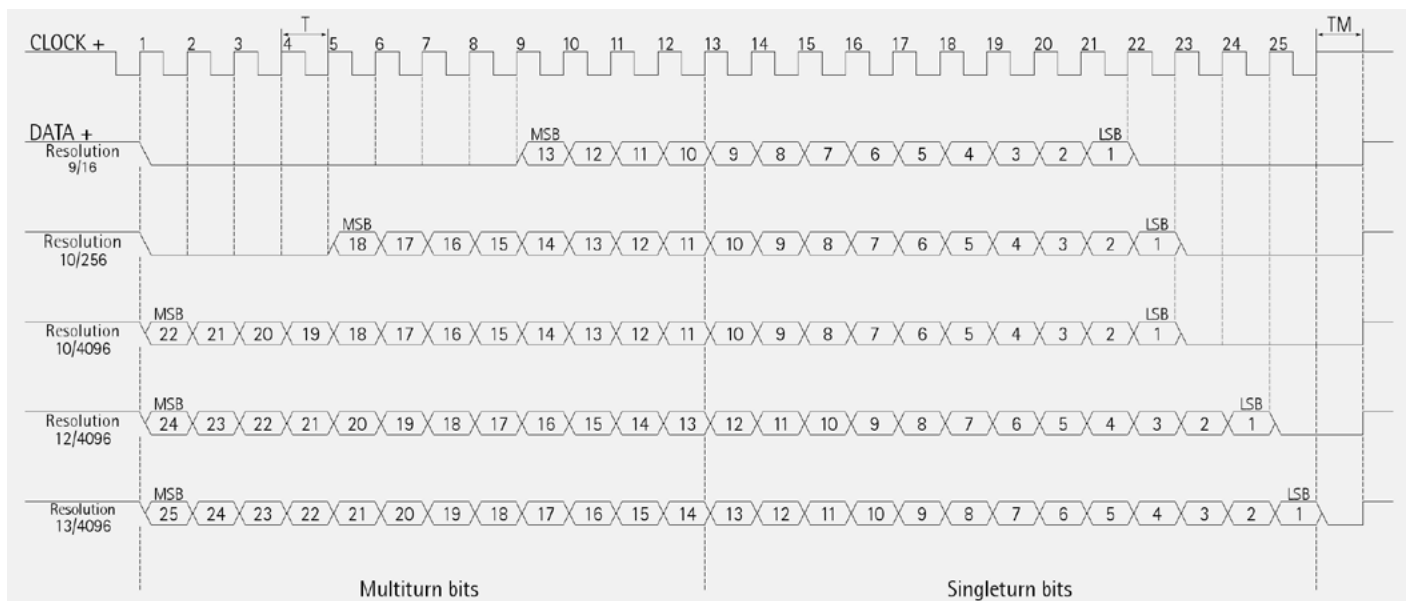
As you can easily assume, the "Tree format" protocol is not compatible with single-turn encoders having a resolution higher than 13 bits and with multi-turn encoders having an overall resolution higher than 25 bits and a single-turn information higher than 13 bits anyway. In single-turn encoders the protocol will provide 13 clock signals; while in multi-turn encoders the protocol will provide 25 clock signals.

"TREE FORMAT" protocol (standard)

1 - 13 bit single-turn protocol scheme



2 - 25 bit multi-turn protocol scheme



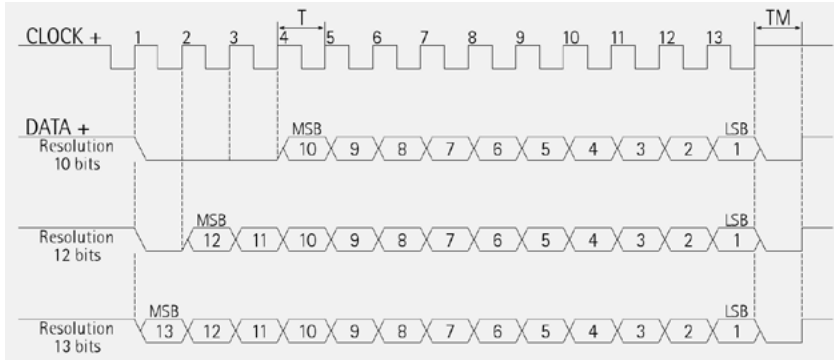
ROTACOD

Output circuits and fieldbus interfaces

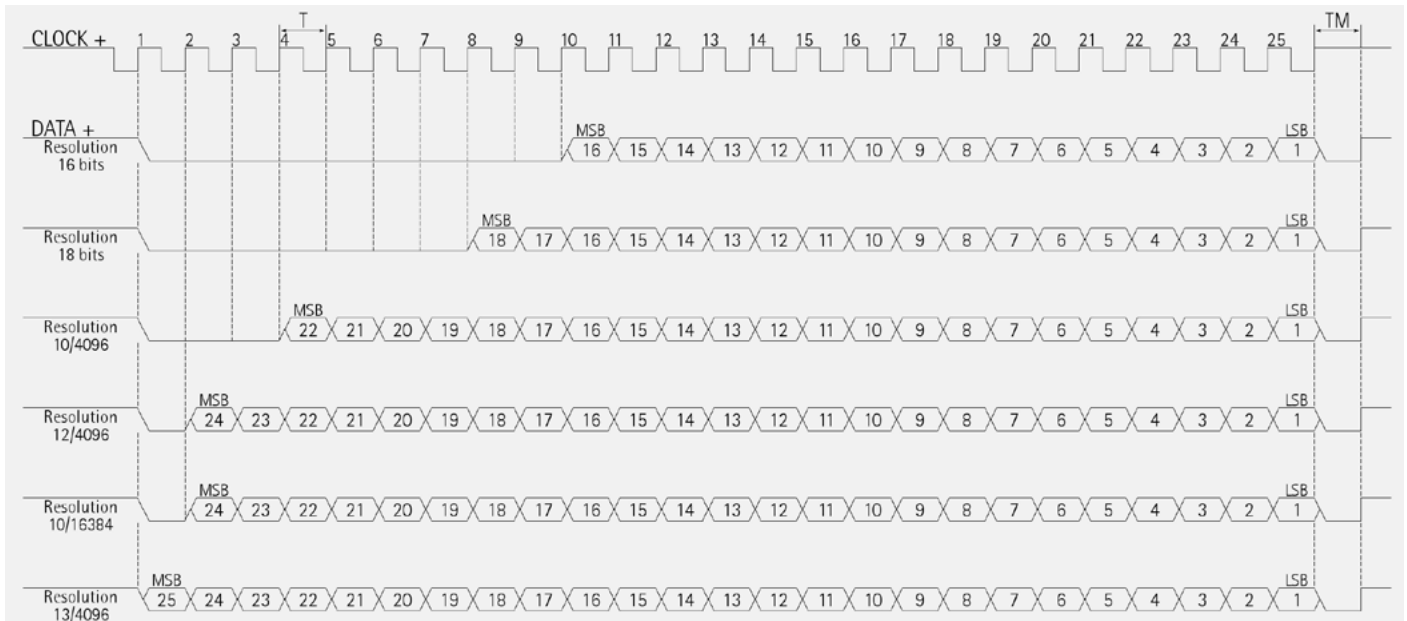
“LSB right aligned” protocol is used as an alternative to the “Tree format” protocol and allows to right align the bits, beginning from MSB to LSB; LSB is then sent at the last clock cycle. If the number of clock signals is higher than the data bits, then unused bits are forced to logic level low (0) and lead the data word. This protocol can be used in encoders having any resolution. Information can be variously arranged for single and multi-turn versions. If the encoder overall resolution is lower than 13 bits, then the protocol will provide 13 clock signals; if it is between 13 and 25 bits, then the protocol will provide 25 clock signals; if it is higher than 25 bits, then the protocol will provide 32 clock signals instead.

“LSB RIGHT ALIGNED” protocol

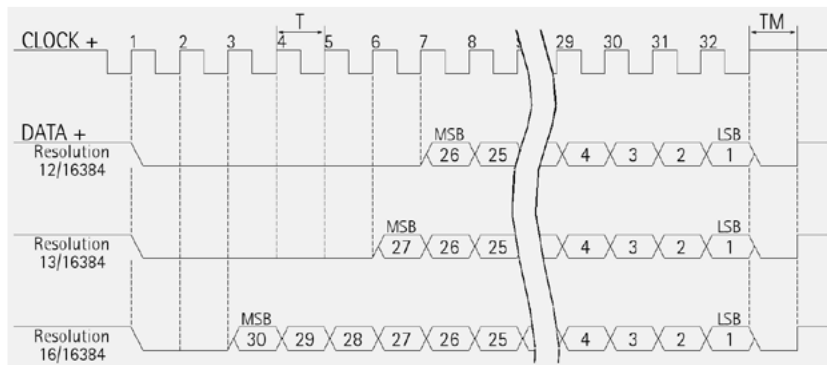
3 – Up to 13 bit single turn LSB RIGHT ALIGNED protocol scheme



4 – Up to 25 bit single turn and multi turn LSB RIGHT ALIGNED protocol scheme



5 – From 26 bit multi turn LSB RIGHT ALIGNED protocol scheme



ROTACOD

Output circuits and fieldbus interfaces

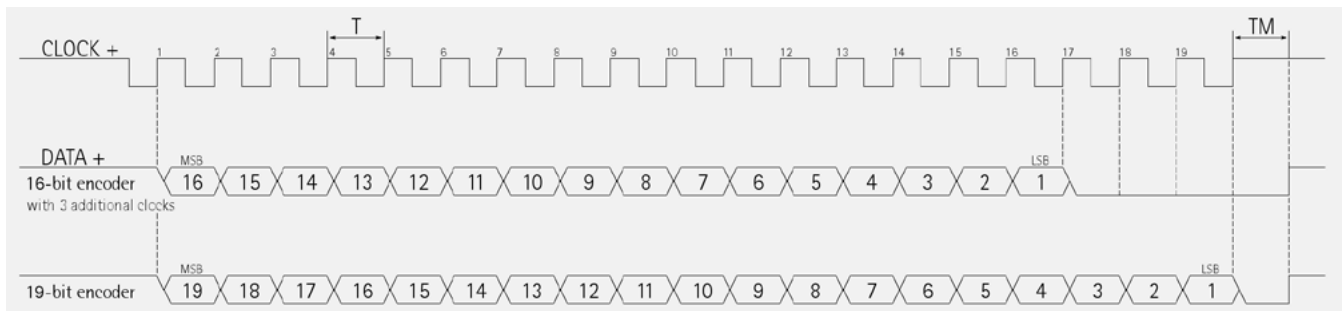
“MSB left aligned” protocol is a further alternative and allows to left align the bits, beginning from MSB to LSB; MSB is then sent at the first clock cycle. If the number of clock signals is higher than the data bits, then unused bits are forced to logic level low (0) and follow the data word. Also this protocol can be used in encoders having any resolution.

Information can be variously arranged for single and multi-turn versions.

The number of clocks to be sent to the encoder must equal the number of data bits at least, anyway it can be higher, as stated previously. The great advantage of this protocol over the TREE format and the LSB RIGHT ALIGNED format is that data can be transmitted with a minimum time loss and the T_m monoflop time can immediately follow the data bits without any additional clock signal.

“MSB LEFT ALIGNED” protocol

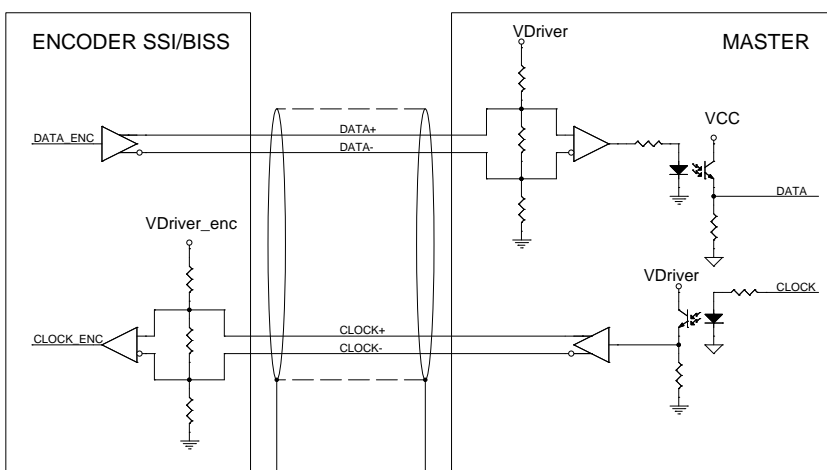
6 – MSB LEFT ALIGNED protocol scheme



Advantages: simple, efficient and cost-effective, less conductors, less electronic components, transmission rate up to 2 Mbps, circuit can be galvanically insulated by means of optocouplers, increased noise immunity, long cable runs.

Disadvantages: point-to-point architecture, transmission speed lower than parallel interface.

Recommended input circuit



ROTACOD

Output circuits and fieldbus interfaces

BiSS is a digital, bidirectional, serial and synchronous interface expressly developed and released in 2002 for sensors and actuators.

Nowadays it has become widely popular in several industrial sectors that require high operating speeds and improved robustness against EMC interference, while simultaneously reducing costs.

It is hardware compatible with SSI interface but offers additional features and options such as multi-slave networking (up to 8 Slaves), higher frequency of data transmission up to 10 MHz, diagnostic information. BiSS safeguards communication between position encoders or measuring devices and industrial controls, such as a drive control and is able to transfer measurement values coming from up to 8 Slaves simultaneously, if necessary.

Lika Electronic implements both B-mode and C-mode versions of the BiSS protocol.

For 1 to 8 subscribers (Slaves) the Master interface provides a clock signal both for the simultaneous acquirement of all position information and the following synchronous serial data transmission. Only four unidirectional RS-422 data lines are required; minimum Slave electronics are incorporated into ICs (integrated circuits).

When the Master sends a clock pulse on the line MA, then the Slave sends the reply directly on the return line SL with the stored position data. Commands and parameters can be swapped on a PWM pulse form; this is, however, not necessary to start the BiSS protocol.

Within each data cycle the Master learns and compensates for line delays, thus permitting clock rates up to 10 Mbit/s even using cables up to 1000-m long.

Changes which may occur in line conditions, for example during cable drag, are corrected. The precision of the synchronization among several position encoders and along various axes is less than 1 microsecond; furthermore the signal delay registered by the Master is clearly accessible to the control unit, thus allowing further optimization.

The BiSS protocol classifies each subscriber under one of the following data sections: sensor data, actuator data, register data and multi-cycle data. These data sections can boast various configurations in order to customize and optimize access and transmission performances and in this way they fulfil the requirements of a large variety of sensor applications. A bidirectional parameter communication for device configuration - available also for parameters referred to as OEM - is customarily available in the register data section.

Data that changes slowly, such as counts per revolution or motor temperatures, is allocated to the multi-cycle data section; while data that changes quickly is allocated to the sensor data section.

Control cycle times shorter than 10 μ s are thus not a problem, even for data words up to 64-bit long. In fact there is enough space in the protocol for redundancy and this space is customarily used to implement a CRC (cyclic redundancy check). Framed by just one start and one stop bit, sensor data is transmitted at the highest core data rate; a single multi-cycle data bit is optional.

The individual user's freedom of design for specific devices is not curbed by the necessity of keeping solutions compatible with other BiSS products and this results in cutting down on unnecessary additional costs. A BiSS subscriber is defined in its entirety by just a few parameters; an XML device description file supplied with the sensor makes it easier and faster to set up the unit with a control system.

If this does not have a BiSS input yet, BiSS devices can be switched over to SSI mode.

Any further information on BiSS interface is available at www.biss-interface.com.

Advantages: simple, efficient and cost-effective, full digital, bi-directional and synchronous, less conductors, less electronic components, higher frequency of data transmission up to 10 MHz, long cable runs.

Disadvantages: transmission speed lower than parallel interface.

Max. cable length m [ft]	1000 [3280]	500 [1640]	200 [655]	100 [330]	60 [200]	25 [80]	10 [35]
Frequency	100 kHz	200 kHz	500 kHz	1 MHz	2 MHz	5 MHz	10 MHz

At ambient temperature (23°C)

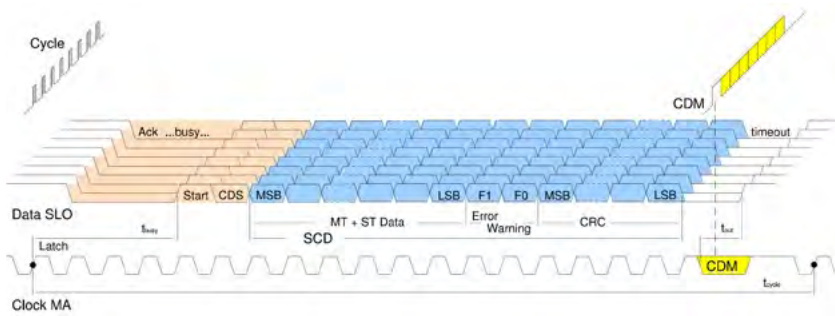


ROTACOD

Output circuits and fieldbus interfaces

Lika absolute encoders are always Slave devices and comply with the "BiSS C-mode interface" and the "Standard encoder profile". They support a point-to-point configuration, thus they have to be installed in "single-master - single-slave" networks only (not in "single-master - multi-slave" networks). CLOCK and DATA signal levels are according to "EIA standard RS-422". The BiSS C-mode protocol implemented in Lika absolute encoders uses two types of data transmission protocols:

- **Single Cycle Data (SCD):** is the primary data transmission protocol. It is used to send process data from Slave to Master.
- **Control Data (CD):** transmission of a single bit following the SCD data. It is used to read or write data into the registers of the slave.

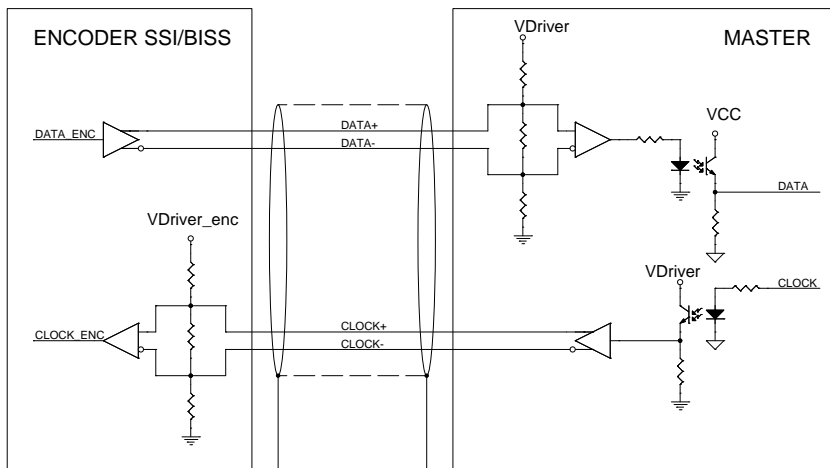


Among the parameters available: position readout, speed value, scaling function, preset and offset values.

BiSS at a glance

Number of stations	Setting the nodes	Setting the baud rate	Transmission rate	Cable length	Cable
-	-	-	Up to 10Mbit/s	Up to 1000 m	Lika T12 type cable

Recommended input circuit



ROTACOD

Input & output functions for SSI and Bit parallel encoders

Using the Zero setting / Preset function, the output value can be set either to zero (reset) or to a desired value (preset) via an external signal issued by a PLC or other controller device. When the internal microprocessor receives the signal it resets or presets the output information. This can be very useful, for example, for synchronizing the encoder readout with the 0 mechanical position of the axis to measure. To set the zero or the preset, the Zero setting / Preset signal must be connected to +Vdc for 100 µs at least; then it must be disconnected. In normal conditions its voltage must be at 0Vdc or floating. The Zero setting / Preset operation must be performed after having set the Counting direction (Complementary). We suggest setting the zero / Preset when the encoder is in stop.

It is also known as Complementary. The counting direction circuit allows the count up also when the shaft is rotating counterclockwise. Connect the counting direction input to 0VDC to have an increasing count when the encoder is turning clockwise (CW, viewed from the shaft side); connect the counting direction input to +VDC to have an increasing count when the encoder is turning counterclockwise (CCW). This feature is available as a standard in the whole range of absolute encoders.

Parity bit is an optional function used for checking in a very basic way whether errors occur during transmission. *It is the simplest form of error detecting code and offers the advantage that only one bit is required for error detection.* On the other hand it only indicates that a parity error occurred in the transmission and there is no way to determine which particular bit is corrupted. Furthermore the parity bit is only guaranteed to detect an odd number of bit errors. If an even number of bits have errors, the parity bit records the correct number of ones, even though the data is corrupt. It can be either even or odd. When even parity bit is set, the sum of the bits having logic level 1 in the character has to be even. The reverse when odd parity bit is set. Like encoders provide an ODD parity bit.

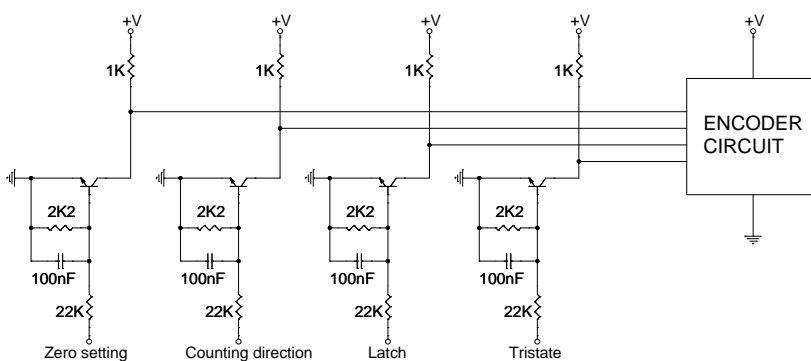
Latch circuit allows to temporarily store the information that the encoder is providing to output in a defined moment. Information will be available until the latch signal is deactivated. This can be very useful when, for instance, the transmission speed of the encoder is faster than the data acquisition of the interface electronics: in this case information is "frozen" until data is fully acquired. Connect the Latch input to 0Vdc to deactivate this function; on the contrary, connect it to +Vdc to activate the Latch and "frozen" the output information.

Tri-state circuit allows the transmission of the output information from the encoder to be interrupted. In this way, for instance, it is possible to have several encoders connected in parallel (multiplexing) but a single control unit and shared circuitry; information about the position of each encoder can be acquired with an updating time equal to the duration of the multiplexing cycle. Connect the Tri-state input to +Vdc to run the encoder in a standard mode (outputs are normally activated); connect it to 0Vdc or floating voltage to enable the function and thus disable the outputs.

At-a-glance summary

Function	1 (high) ≥ 10 Vdc	0 (low) ≤ 8 Vdc
Zero setting	Activated	Deactivated
Counting direction	CCW positive counting	CW positive counting
Latch	Data stored	Latch deactivated
Tri-state	Outputs activated	Outputs deactivated

Recommended input circuit



Zero setting / Preset

Counting direction

Parity bit

Latch

Tri-state

We highly recommend the cable lengths reported in the following tables to be respected strictly.

Tests have been carried out by connecting the encoder to the Lika LD200 universal position display through a DS3486 line receiver complying with EIA standards.

Data listed below may vary due to the following factors:

- the electrical noise coming from the power supply line;
- the electrical noise coming from the earthing (ground) connection of the encoder;
- the features of the controller connected to the encoder;
- the ambient temperature;
- the working voltage of the encoder (parallel output only).

Cable length

Maximum cable lengths in relation to counting frequency

Interface / output circuit	Max. cable length m [ft] @	Frequency [kHz]
Parallel output (20V)	100 [328]	20
	50 [164]	60
SSI (RS-422)	400 [1310]	100
	75 [245]	400
BiSS	1000 [3280]	100
	60 [200]	2000

	Max. cable length m [ft]	
Analogue output	Voltage analogue	100 [328] with 1 MΩ max. load
	Current analogue	150 [490]

At ambient temperature (23°C)

Please note the higher the resolution and the maximum rotational speed of the encoder, the higher the counting frequency.

There is a straight relationship between the counting frequency and the signal distortion. The longer is the cable in fact, the greater is its capacitance; and capacitance affects the signal quality causing the higher frequencies to be "filtered" so distorting the signal.

Using the following formula you can easily calculate the number of revolutions the encoder is allowed to reach starting from the counting frequency value.

$$\text{RPM} = \frac{\text{Max.frequency(kHz)} * 60 * 1000}{\text{PPR}}$$

where RPM is revolutions per minute and PPR is pulses per revolution.

This formula can be very useful -for instance- when you know the maximum frequency that can be transmitted over a given cable length and you need to know the maximum rotation speed the encoder is allowed to reach at the required resolution.

ROTACOD

Output circuits and fieldbus interfaces



EtherCAT (Ethernet for Control Automation Technology) is an open Ethernet-based fieldbus system which applies Ethernet features to fieldbus technology.

Its development and administrative management are entrusted to the EtherCAT Technology Group (ETG) (www.ethercat.org). EtherCAT bus is simply a single large Ethernet "device" which receives and sends Ethernet telegrams (standard Ethernet dataframes in accordance with IEEE 802.3). However, the "device" does not contain an Ethernet controller, but one Master and some Slaves. Moreover any control with a commercially available Ethernet controller should be able to be used as an EtherCAT Master: standard structural components in fact such as Ethernet switches should be usable for EtherCAT. Telegrams are processed directly "on the fly". While the telegrams (delayed by only a few bits) are already passed on, the Slave recognizes relevant commands and executes them accordingly. Processing is done within the hardware and is therefore independent of the response times of any microprocessors that may be connected. Flexible topology variants arbitrarily extendable namely Line, Star, Tree, Daisy Chain + Drop Lines are possible, even in the same network. Slave configuration can be done both via XML configuration file (EtherCAT Slave Information ESI) provided by the device manufacturer and by loading data directly from EEPROM (Slave Information Interface SII). The number of devices which can be installed in the EtherCAT network is virtually unlimited, while up to 65.535 nodes can be connected for each segment. The transmission rate is 100 Mbit/s with full-duplex communication (Fast Ethernet).

Lika encoders with EtherCAT interface are Slave devices and support the CANopen Over EtherCAT (CoE) protocol for data transfer; in particular they comply with "Device Profile for encoders" Class 2 established in "CIA Draft Standard 301" and "CIA Draft Standard 406" publications for CANopen; furthermore they comply with EtherCAT standard established in ETG.1000 protocol conformance. As CANopen communication protocol, also EtherCAT uses PDOs and SDOs. PDO (Process Data Object) messages are used to process real time data (transmission of process data in real time, bus cycle time of 62 μ s only, the faster in the market); while SDO (Service Data Object) messages are used to set and read values from the "Object dictionary" of the remote device. The following transmission modes are available: FreeRun: asynchronous mode, encoder position is sampled directly from EtherCAT frame sent by the Master; position update is performed by an internal timer of the controller every 100 microseconds; Synchronous with SM3: data is sampled and then copied into Sync Manager buffer as soon as the previous data are read by the Master (SM event); in this way new sampled data is synchronous with Master readings; Synchronous with DC: data is sampled and then copied into Sync Manager buffer simultaneously at SYNC0 event generated by the ESC capture/compare unit. Furthermore, Lika devices support the EtherCAT State Machine ESM with Init state, Pre-operational state, Safe-Operational state and Operational state; and implement the FOE protocol for firmware update. Among the parameters available: position readout, counting direction, scaling function, preset and offset values, errors register and diagnostic information.

Encoders are fitted with diagnostic LEDs; they do not need bus termination resistance.

EtherCAT at a glance:

Number of stations	Setting the nodes	Setting the baud rate	Transmission rate	Cable length	Cable
Virtually unlimited	Software, automatic	-	100 Mbit/s full duplex	Up to 100 m (330 ft)	Standard EtherCAT / M12 connectors

PROFINET IO is the open industrial network devised for automation applications and built on the Ethernet application layer (TCP/IP and IT standards).

For PROFINET IO the layers 1 through 7a of the ISO/OSI (Open Systems Interconnection) reference model are exclusively based on internationally proven standards. The functionality of PROFINET is defined in layer 7b. PROFINET IO complies with IEEE802.3 Ethernet Standard and follows the standards IEC 61158 and IEC61784, so it is 100% Ethernet compatible.

Its technology development and standardization are entrusted to Profibus & Profinet International (PI), the international umbrella organization including members of more than 1400 companies (<http://www.profibus.com/>).

PROFINET IO is expressly developed to connect controllers (named IO controllers, equivalent to Profibus DP Masters), peripheral devices (named IO devices, similar to Profibus DP Slaves) and programming devices / PCs (named IO supervisors) with Ethernet Real Time (RT) and Isochronous Real Time (IRT) communication all the way.

Real Time channel is used for time-critical process data and allows to meet the real-time requirements of the automation engineering (cycle times < 500 µs, jitter < 1 µs); while IRT is suitable for sophisticated motion control and high performance applications in factory automation and permits cycle times lower than 250 µs with less than 1 µs jitter. The standard TCP/IP channel is used for parametrization, configuration and acyclic read/write operations. A PROFINET IO system requires at least one IO Controller and one IO Device.

The most frequent network topologies can be implemented and even mixed together including Star, Line, Tree and Ring structures by means of copper or fiber-optic cables. The number of devices (each one fitted with its own MAC address, IP address and device name) which can be connected in the PROFINET network is virtually unlimited.

The transmission rate is 100Mbit/s with full duplex communication (Fast Ethernet).

PROFINET IO Devices are configured using a configuration tool which acts as the IO Supervisor. The IO Supervisor uses a GSD (General Station Description) file based on XML language, thus it is called GSDML file.

PROFINET encoders from Lika Electronic fully comply with the encoder profile specifications V4.1 version 3.162. Please note that the encoder profile is based on the PROFIdrive profile. Furthermore they fulfil the requirements of the Application Classes 3 and 4, thus they are intended for clock-synchronous (isochronous) real-time applications with cyclic and synchronous data transmission. Furthermore they can also be used in applications without clock synchronization.

PROFINET encoders supports the standard telegrams 81, 82, 83 and 84.

The IO data is transferred to and from the Encoder Object (EO) via the Cyclic Data Exchange Service. The EO comprises the following mandatory functionalities:

- parameters;
- measuring task (i.e. position value, velocity value, ...);
- IO data (cyclical transmission of control and actual values);
- support for Alarm Mechanism.

Among the parameters available: code sequence, scaling function, preset (Class 4 functionalities), position readout, offset value, velocity value, velocity measuring unit, acyclic Error Data communication and diagnostic information. Encoders are fitted with diagnostic LEDs.

PROFINET at a glance

Number of stations	Setting the IP address	Setting the baud rate	Transmission rate	Cable length	Cable
Virtually unlimited	Software / automatic via DCP	-	100 Mbit/s full duplex	Up to 100 m 330 ft	M12 D-coded Profinet connectors

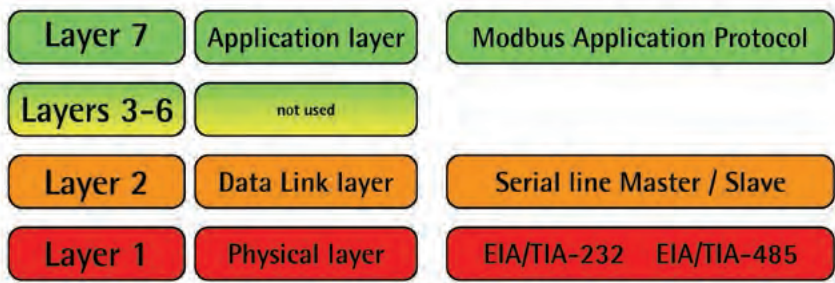


ROTACOD

Output circuits and fieldbus interfaces

Modbus RTU is a serial communication open protocol developed in the seventies of the last century by Modicon which is now widely used in the industry and has become a standard for device-to-device communication in several industrial automation systems.

The development and update of Modbus protocol is managed by the Modbus Organization (www.modbus.org), formed of independent users and suppliers of Modbus compliant devices. Modbus RTU allows for communication between up to 247 nodes in a true multi-drop network over a serial EIA-485 physical layer. The Modbus Serial Line protocol is a Master – Slaves protocol. Lika encoders are Slave devices and implement the Modbus application protocol (level 7 of OSI model) and the “Modbus over Serial Line” protocol (levels 1 & 2 of OSI model). Only one Master is connected to the bus and one or several Slave nodes can also be connected to the same serial bus. A Modbus communication is always initiated by the Master. The Slave nodes will never transmit data without receiving a request from the Master node. MODBUS RTU messages (registers) are simple data strings with 16-bit CRC (Cyclic Redundant Checksum for error checking). The simplicity of these messages is meant to ensure reliability. Modbus interface does not need any configuration file to be installed.



The main reasons behind such large implementation and diffusion of the Modbus interface are:

- Modbus bases on RS-485/RS-232 serial communication which is well established and universally supported;
- it is basic yet complete, flexible and most of all reliable;
- it is really simple to implement and easy-to-use;
- it is significantly more inexpensive to deploy than other industrial fieldbus protocols and requires less resources;
- it is open and can be used royalty-free.

Encoders fitted with Modbus RTU interface come with a program expressly developed and released by Lika Electronic: it allows the operator to set the working parameters of the device; control manually some movements and functions; and monitor the work cycles of the unit. The program is supplied for free and can be installed in any PC fitted with a Windows operating system (Windows XP or later). In this way you can easily and quickly programme, set up and start the encoder even before mounting at your convenience.

Among the parameters available: position readout, counting direction, scaling function, pre-set and offset values, errors register and diagnostic information.

Encoders are fitted with diagnostic LEDs and bus termination resistance.

Modbus at a glance

Number of stations	Setting the nodes	Setting the baud rate	Transmission rate	Cable length	Cable
Up to 247	Dip switches	Dip switches	Up to 115.2 Kbit/s	Up to 1000 m 3300 ft	Cable / M12 connectors

ROTACOD

Output circuits and fieldbus interfaces

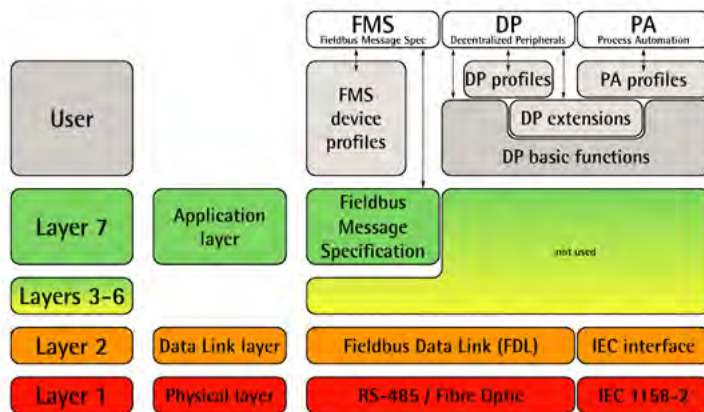
Profibus (a portmanteau word of PROcess Field BUS) is a standard digital communication system for fieldbus widely used in automation industry for exchanging control data and I/O signals. Its technology development and administrative management are entrusted to the Profibus International organization (PI) (www.profibus.com).

Profibus complies with the European Fieldbus Standard EN 50170 which allows a standardized development. It is the most popular fieldbus protocol in Europe.

Profibus communication protocol is built in accordance with the ISO/OSI (Open Systems Interconnection) reference model and developed on the four Physical (1), Data Link (2), Application (7) and User layers.

A Profibus network supports up to 126 stations and transmission rates up to 12Mbit/s. Serial communication is always used.

Profibus is a Multi-Master – Multi-Slave system with cyclic or acyclic access. Master device is able to detect all the Slaves connected to the network thanks to the GSD (General Station Description) configuration files which are provided by the device manufacturers (or GSE, GSI, etc. depending on the language being used). GSD file is a readable ASCII text file and contains both general and device-specific information needful for communication. Furthermore each of the entries describes a feature that is supported by the Profibus device.



Profibus protocol supports a Master-Slave access method where the Master controls the communication on the bus and is the only allowed to issue messages without external request; while the Slave is a passive peripheral device and is only enabled to reply to explicit requests from the Master.

In conjunction with Master-Slave access method, token passing procedure is implemented allowing the Master devices to take control of the bus alternately. This procedure is intended to ensure that each Master keeps the token ownership for equal and regular time slices.

Time slice assigned to each Master for managing the network depends on the number of active nodes in the bus and the token hold time. In this way token is passed periodically from node to node around the network in a defined, recurring sequence (logical ring).



ROTACOD

Output circuits and fieldbus interfaces

RS-485 is the most commonly used transmission technology for PROFIBUS; it is simple, easy-to-use and cost-effective and is primarily used for tasks that require high transmission rates. RS-485 transmission technology uses shielded twisted pair copper cables with one conductor pair. A Profibus system that is to accommodate more than 32 stations must be divided into several bus segments. These individual bus segments with up to 32 stations each one are connected to each other by repeaters (also referred to as line amplifiers).

The following table shows the maximum transmission rates in relation to permissible line length.

Baud rate [Kbit/s]	9,6	19,2	93,75	187,5	500	1500	12000
Max. cable length	1200 m 4000 ft	1200 m 4000 ft	1200 m 4000 ft	1000 m 3300 ft	400 m 1300 ft	200 m 660 ft	100 m 330 ft

Lika encoders with Profibus interface (absolute single-turn and multi-turn encoders) implement Profibus DP (Decentralized Peripherals) communication protocol and can be set as Class 1, Class 2 or Class 2 (+VEL) devices. Encoder class has to be set at device configuration. Class 1 provides the basic functionalities of DP such as:

- position readout;
- setting of the counting direction;
- setting of the preset value;
- 16-byte reduced diagnostic information (Hx58x series only).

Class 2 supports extended enhancements in addition to functionalities of Class 1:

- scaling function;
- 63-byte extended diagnostic information (Hx58x series only).

Class 2(+VEL) contains further enhancements in addition to functionalities of Class 2:

- transmission of velocity value (Hx58x series only);
- unit of measurement for velocity value (Hx58x series only).

Thanks to Profibus DP, encoders can be coupled reducing costs and increasing performances; furthermore they fulfil each configuration, parametrization and diagnostic requirement. Among the parameters available: position readout, counting direction, velocity value (Hx58x series only), scaling function, preset value.

Encoders are fitted with diagnostic LEDs and bus termination resistance.

Profibus at a glance

Number of stations	Setting the nodes	Setting the baud rate	Transmission rate	Cable length	Cable
Up to 126	Dip switches or software	Software	Up to 12Mbit/s	Up to 1200 m 4000 ft	Standard Profibus M12 connectors

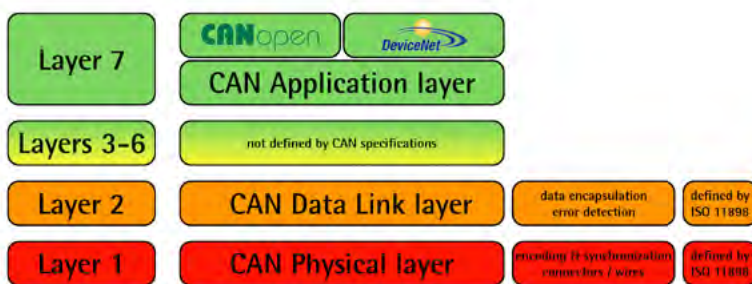
ROTACOD

Output circuits and fieldbus interfaces

First developed in the automotive industrial sector, **CANbus (Controller Area Network) serial bus system** has thereafter established itself in a variety of industrial applications, in particular where noisy electrical environment conditions could lead to unsafe communication.

International Organization for Standardization (ISO) has established the CAN standard in ISO 11898, developing the protocol over the first two layers of the ISO/OSI (Open Systems Interconnection) reference model; while all the other protocol layers are the network designer's choice.

Unlike other protocols that define all ISO/OSI layers, developers intentionally limited the CAN specifications so manufacturers are free to choose a specific implementation of the higher protocol layers; for this reason other CAN-based protocols have been developed at higher layers as CANopen and DeviceNet or other proprietary protocols.



CANbus standard and CANopen communication protocol are administered by *CAN in Automation* (www.can-cia.org), while DeviceNet communication protocol is managed by the Open DeviceNet Vendors Association (www.odva.org). CANopen is widely used in Europe, while DeviceNet is more popular in North America.

CANopen is a CAN-based communication protocol which implements the higher layers of the ISO/OSI (Open Systems Interconnection) reference model. Its technology development and standardization are entrusted to CiA (CAN in Automation).

CANopen is a Single Master - Multi Slave communication protocol.

Master device is able to detect all the Slaves connected to the network thanks to the EDS (Electronic Datasheet) configuration files which are provided by the device manufacturers (EDS files for CANopen devices are different from EDS files for DeviceNet devices).

The EDS file contains the complete list of all working parameters of the Slave device and information for configuring the communication between the Master and the Slave.

In the CANopen network, the Master device must be addressed to 0, while the Slave nodes have address between 1 and 127. Maximum transmission rate is up to 1Mbit/s.

The following table shows the maximum transmission rates in relation to permissible line length.

Baud rate [Kbit/s]	10	20	62,25	125	250	500	800	1000
Max. cable length	5000 m 16400 ft	2500 m 8200 ft	1000 m 3300 ft	500 m 1650 ft	250 m 820 ft	100 m 330 ft	50 m 165 ft	30 m 100 ft

Lika encoders with CANopen interface (absolute single-turn and multi-turn encoders) comply with "Device Profile for encoders" Class 2 established in "CIA Draft Standard 301" and "CIA Draft Standard 406" publications; in specific applications they comply with "CIA Draft Standard Proposal 417 - Application Profile for Lift Control Systems".

ROTACOD

Output circuits and fieldbus interfaces

Lika devices with CANopen support the CANopen network management (NMT) slave state machine (Initialization state, Pre-operational state, Operational state, Stopped state) and use COBs (Communication Objects), in particular: NMT (Network Management) messages to issue state machine change commands (i.e. to start and stop the devices) and detect remote device boot-ups and error conditions; PDO (Process Data Object) messages to process real time data (transmission of process data in real time); and SDO (Service Data Object) messages to set and read values from the "Object dictionary" of the remote device. Furthermore they implement some standard objects such as the synchronization object (SYNC) and the Nodeguarding. Among the parameters available: position readout, counting direction, velocity value (Hx58x series only), scaling function, preset and offset values, two min. and max. software limit switches, errors register and diagnostic information. Encoders are fitted with diagnostic LEDs and bus termination resistance.

CANopen at a glance

Number of stations	Setting the nodes	Setting the baud rate	Transmission rate	Cable length	Cable
Up to 127	Dip switches or software	Dip switches or software	Up to 1Mbit/s	Up to 5000 m 16400 ft	Standard CANopen / M12 connectors

DeviceNet is a CAN-based communication protocol which implements the higher layers of the ISO/OSI (Open Systems Interconnection) reference model.

Designed by Allen-Bradley (now owned Rockwell Automation) and developed and managed by ODVA (Open DeviceNet Vendor Association), DeviceNet is a peer-to-peer data exchange protocol where the Master/Slave communication is set as a sub-function of the peer-to-peer communication. The Master device is able to detect all the Slaves connected to the network thanks to the EDS (Electronic Datasheet) configuration files which are provided by the device manufacturers (EDS files for DeviceNet devices are different from EDS files for CANopen devices).

The EDS file contains the complete list of all working parameters of the Slave device and information for configuring the communication between the Master and the Slave.

DeviceNet network supports up to 64 stations (from 0 to 63) and transmission rates up to 500Kbit/s.

The following table shows the maximum transmission rates in relation to permissible line length.

Baud rate [Kbit/s]	125	250	500
Max. cable length	500 m / 1650 ft	250 m / 820 ft	100 m / 330 ft

Lika encoders with DeviceNet interface (absolute single-turn and multi-turn encoders) are "Group 2 only server" devices and do not support UCM (Unconnected Message Manager) functionality. Lika DeviceNet encoders support two kind of communication messages: I/O messages: they are high-priority messages whose meaning is explained in the "Message-ID"; Slave devices use these messages to send process data (position and velocity values); Explicit Messages: they are low-priority messages and are used to start and close communications between the Master and the Slave, to read and write Slave configurations and to send diagnostic messages. The following transmission modes are available: "polled" where the Master device sends a polled request and the Slave device replies sending its position value; "cyclic", where the Slave sends an "I/O message" cyclically, time between two transmissions is set in the "Expected packet rate" of cyclic mode; "change of state", where the Slave sends an "I/O message" every time its state changes or every heartbeat rate.

Among the parameters available: position readout, counting direction, scaling function, preset and offset values, error messages and diagnostic information. Encoders are fitted with diagnostic LEDs and bus termination resistance.

DeviceNet at a glance











Number of stations	Setting the nodes	Setting the baud rate	Transmission rate	Cable length	Cable
Up to 64	Dip switches	Dip switches	Up to 500Kbit/s	Up to 500 m 1650 ft	Standard DeviceNet M12 connectors







ROTAPULS incremental encoders

	Page	Housing \varnothing (mm)	Shaft max. \varnothing (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (PPR)	Output frequency max. (kHz)	Power supply (Vdc)	NPN	PNP	1Vpp	Push-Pull	Line Driver	Universal circuit	Operating temp. °C (°F) min. – max.	Protection max.
					connector	cable											
	64	28	● 5	3000		•	1024	100	+5 +10 +30 +5 +30	•			•	•	•	-20 +70 (-4 +158)	IP54
Light-duty																	
	66	36	● 6 ○ 6	12000		•	2048	300	+5 +10 +30	•			•	•		-25 +85 (-13 +185)	IP67
Light-duty																	
	68	36	● 6	12000		•	2048	300	+5 +10 +30	•			•	•		-25 +85 (-13 +185)	IP67
Light-duty Food																	
	70	40	● 8	6000		•	5000	100	+5 +10 +30 +5 +30	•	•		•	•	•	-25 +85 (-13 +185)	IP66
Light-duty																	
	72	41 46	○ 6	6000		•	5000	100	+5 +10 +30 +5 +30	•	•		•	•	•	-25 +85 (-13 +185)	IP65
Light-duty																	
	74 76	50	○ 10	6000 3000		•	2048 2500	100	+5 +10 +30 +5 +30	•			•	•	•	-40 +100 (-40 +212) -25 +85 (-13 +185)	IP65
Industrial / Feedback																	
	78	50	○ 10	6000		•	2500/ 8 poles	200	+5 +10 +30				•	•		-20 +100 (-4 +212)	IP20
Feedback																	
	80	58	● 12	12000		•	10000	300	+5 +10 +30 +5 +30	•	•	•	•	•	•	-40 +100 (-40 +212)	IP65
Industrial																	
	82	58	● 12	12000		•	10000	300	+5 +10 +30 +5 +30	•	•	•	•	•	•	-40 +100 (-40 +212)	IP66
Industrial Food																	

ROTAPULS incremental encoders

		Page	Housing ø (mm)	Shaft max. ø (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (PPR)	Output frequency max. (kHz)	Power supply (Vdc)	NPN	PNP	1 Vpp	Push-Pull	Line Driver	Universal circuit	Operating temp. °C (°F) min. – max.	Protection max.
						connector	cable											
	IP58 - CP58 Programmable encoder Industrial	84	58	● 12 ○ 15	12000	•	•	32768	1000	+5 +30				•	•	•	-40 +100 (-40 +212)	IP65
	C58 - C59 - C60 Optical standard encoders Through hollow shaft Industrial	86	58	○ 15	6000	•	•	5000	100	+5 +10 +30 +5 +30				•	•	•	-40 +100 (-40 +212)	IP65
	C58A - C58R Optical standard encoders Through hollow shaft Industrial / Feedback	88	58	○ 15	6000	•	•	5000	100	+5 +10 +30 +5 +30				•	•	•	-40 +100 (-40 +212)	IP65
	CK58 - CK59 - CK60 Optical standard encoders Blind hollow shaft Industrial	90	58	○ 15	6000	•	•	10000	300	+5 +10 +30 +5 +30	•	•	•	•	•	•	-40 +100 (-40 +212)	IP65
	CB59 - CB60 Optical encoders for servo motors Sine/cosine Feedback / Lift	92	58	● 1:10 ○ 15	12000			2048/ 1 sin/cos	300	+5			•				-20 +100 (-4 +212)	IP40
	MI58 - MI58S Magnetic encoders Sealed circuits Industrial	94	58	● 12	12000	•	•	10000	500	+5 +10 +30 +5 +30				•	•	•	-25 +85 (-13 +185)	IP67
	MC58 - MC59 - MC60 Magnetic encoders Sealed circuits Through hollow shaft Industrial	94	58	○ 15	6000	•	•	10000	500	+5 +10 +30 +5 +30				•	•	•	-25 +85 (-13 +185)	IP67
	I65 - IT65 Optical encoders Square flange, US size Industrial	98	65	● 12	6000	•	•	10000	300	+5 +10 +30 +5 +30	•	•		•	•	•	-40 +100 (-40 +212)	IP66
	IT68 Optical encoder Industrial	100	65	● 15	6000	•	•	10000	300	+5 +10 +30 +5 +30	•	•		•	•	•	-40 +100 (-40 +212)	IP66



ROTAPULS incremental encoders

		Page	Housing ϕ (mm)	Shaft max. ϕ (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (PPR)	Output frequency max. (kHz)	Power supply (Vdc)	NPN	PNP	1Vpp	Push-Pull	Line Driver	Universal circuit	Operating temp. °C (°F) min. - max.	Protection max.
						connector	cable											
	XC77 Optical encoder ATEX II 2GD Ex d IIC T6 Zones 1, 2, 21, 22 Heavy-duty	102	77	○ 14	6000	•		10000	300	+5 +10 +30 +5 +30	•			•	•	•	-25 +85 (-13 +185)	IP66
	C80 Optical encoder for lift motors Feedback / Lift	104	80	○ 30	6000	•	•	4096	100	+5 +10 +30 +5 +30				•	•	•	-40 +100 (-40 +212)	IP65
	C81 Optical encoder Through hollow shaft Heavy-duty Feedback	106	80	○ 44	3000	•		4096	200	+5 +10 +30 +5 +30			•	•	•	•	-40 +100 (-40 +212)	IP65
	C82 Optical encoder for lift motors Feedback / Lift	108	80	○ 44	3000	•	•	8192	200	+5 +10 +30 +5 +30				•	•	•	-40 +100 (-40 +212)	IP65
	I115 - I116 Optical encoders Redundant version (I116) Heavy-duty / Wind	110 112	115	● 11	6000	•		5000	100	+5 +10 +30 +5 +30	•	•		•	•	•	-40 +100 (-40 +212)	IP66
	C100 - C101 Optical encoders for wind generator applications Redundant version (C101) Heavy-duty / Wind	114 116	100	○ 1:17 ○ 16	6000	•	•	2500 2048	100	+5 +10 +30 +5 +30				•	•	•	-40 +100 (-40 +212)	IP65
	I70 Belt pulley with integrated encoder Heavy-duty	118	54	-	3600	•		500	30	+10 +30				•			-20 +85 (-4 +185)	IP65
	ICS Optical encoder Spring loaded shaft Heavy-duty	120	172x80 x53	● 12	6000	•		1068	60	+5 +10 +30 +5 +30	•	•		•	•	•	-25 +85 (-13 +185)	IP65
	I105 Optical encoder High resolution Industrial	122	105	● 10	6000	•	•	18000	300	+5 +10 +30 +5 +30				•	•	•	-25 +85 (-13 +185)	IP65





ROTACOD absolute encoders

	Page	Housing ϕ (mm)	Shaft max. ϕ (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (bits)	Power supply (Vdc)	NPN / Push-Pull	SSI	BISS	Modbus / RS485	Add. incremental track	Analogue output	Operating temp. °C (°F) min. – max.	Protection max.
					connector	cable										
	124	36	● 6 ○ 6	12000	•		13	+10 +30		•					-20 +85 (-4 +185)	IP67
Light-duty																
	126	36	● 6 ○ 6	12000	•		12 x 15	+10 +30		•					-20 +85 (-4 +185)	IP67
Light-duty																
	128	36	● 6 ○ 6	6000	•		20	+10 +30		•	•				-40 +100 (-40 +212)	IP65
Industrial / Feedback																
	130	36	● 6 ○ 6	6000	•		20 x 12	+10 +30		•	•				-40 +100 (-40 +212)	IP65
Industrial / Feedback																
	132	58	● 12 ○ 15	12000	•	•	13	+7,5 +34	•	•	•	•			-40 +100 (-40 +212)	IP67
Industrial																
	135 138	58	● 12 ○ 15	12000	•	•	13 x 14	+7,5 +34	•	•	•	•			-40 +100 (-40 +212)	IP67
Industrial																
	141	58	● 12 ○ 15	6000	•	•	19 + 2048	+10 +30		•	•		•		-40 +100 (-40 +212)	IP65
Industrial / Feedback																
	144	58	● 12 ○ 15	6000	•	•	16 x 14 + 2048	+10 +30		•	•		•		-40 +100 (-40 +212)	IP65
Industrial / Feedback																
	147	58	○ 15	6000	•	•	18 16 x 12 + 2048	+10 +30		•	•		•		-25 +85 (-13 +185)	IP65
Industrial / Feedback																





ROTACOD absolute encoders

		Page	Housing ϕ (mm)	Shaft max. ϕ (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (bits)	Power supply (Vdc)	NPN / Push-Pull	SSI	BISS	Modbus / RS485	Add. incremental track	Analogue output	Operating temp. °C (°F) (max.)	Protection max.
						connector	cable										
	AS58 - AS58S - ASC58 Optical singleturn encoders Industrial	149	58	● 12 ○ 15	6000	•	•	13	+10 +30	•	•					-40 +100 (-40 +212)	IP65
	AM58 - AM58S - AMC58 Optical multiturn encoders Industrial	152	58	● 12 ○ 15	6000	•	•	13 x 12	+10 +30	•	•					-40 +100 (-40 +212)	IP65
	MH58S Magnetic multiturn For wind generators, steel mills & mobile equipment Heavy-duty / Wind	155	58	● 10	6000	•		12 x 12	+10 +30		•			•		-40 +85 (-40 +185)	IP67
	MM58 - MM58S - MMC58 Magnetic multiturn encoders Industrial	157	58	● 12 ○ 15	12000		•	12 x 16	+10 +30		•					-20 +85 (-4 +185)	IP67
	HM58 P - HM58S P HMC58 P Optical multiturn encoders Programmable Industrial	159	58	● 12 ○ 15	6000	•	•	18 x 14	+10 +30	•	•					-40 +100 (-40 +212)	IP65
	EM58 TA Programmable encoder with analogue output Teach-in buttons Industrial	162	58	● 12 ○ 15	12000	•	•	12 x 14	+13 +30					•		-25 +85 (-13 +185)	IP67
	AS58 A - AM58 A Optical absolute encoders Analogue output Industrial	165	58	● 12 ○ 15	6000	•		12 12 x 4 9 x 6 6 x 8	+15 +30					•		-25 +85 (-13 +185)	IP65
	EM58 PA Optical multiturn encoder Programmable analogue output Industrial	168	58	● 12 ○ 15	6000	•		12 x 14	+15 +30					•		-25 +85 (-13 +185)	IP65
	ASR58 - AMR58 Optical singleturn and multiturn encoders Integrated cam switch programmer Industrial	171	58	● 12	6000	•		12 12 x 8	+10 +30	•				•		-25 +85 (-13 +185)	IP65

ROTACOD absolute encoders

	Page	Housing ø (mm)	Shaft max. ø (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (Bit)	Power supply (Vdc)	NPN / Push-Pull	SSI	BISS	Modbus / RS485	Add. incremental track	Analogue output	Operating temp. °C (°F) (max.)	Protection max.
					connector	cable										
	174	65	● 12	6000	•	•	13 x 14	+10 +30	•	•			•		-40 +100 (-40 +212)	IP66
Industrial																
	177	77	○ 14	6000		•	16 x 14	+10 +30	•	•	•		•	•	-25 +85 (-13 +185)	IP65
Heavy-duty																
	180	88	● 10 ○ 15	6000	•		13 x 12	+10 +30		•					-40 +100 (-40 +212)	IP65
Industrial																

ROTACOD absolute encoders • Fieldbus

	Page	Housing ø (mm)	Shaft max. ø (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (bits)	Power supply (Vdc)	CANopen	CANopen LIFT	Profibus-DP	DeviceNet	EtherCAT	Operating temp. °C (°F) (max.)	Protection max.
					connector	cable									
	182	58	● 12 ○ 15	6000			13 13 x 12	+10 +30			•			-25 +85 (-13 +185)	IP65
Industrial															
	184	58	● 12 ○ 15	6000			13 13 x 12	+10 +30	•	•				-25 +85 (-13 +185)	IP65
Industrial															
	186	58	● 12 ○ 15	6000			18 16 x 14	+10 +30	•	•	•	•		-25 +85 (-13 +185)	IP65
Industrial															

ROTACOD Absolute encoders • Fieldbus

	Page	Housing ø (mm)	Shaft max. ø (mm)	Shaft rotational speed max. (rpm)	Connection		Connection cap with PG	Connection cap with connectors	Resolution max. (bits)	Power supply (Vdc)	CANopen / CANlift	Profibus-DP	DeviceNet	EtherCAT	Profinet	Operating temp. °C (°F) min. - max.	Protection max.
					connector	cable											
	188	58	● 12	6000			•	•	13 x 12	+10 +30	•	•				-25 +85 (-13 +185)	IP65
AM58 K Optical multiturn encoders Profibus, CANbus interface Stainless steel version Industrial / Food																	
	190	58	● 12 ○ 15	6000	•	•			18 16 x 14	+10 +30	•					-25 +85 (-13 +185)	IP65
ASx58x - AMx58x CANopen Direct connection Single & multiturn Industrial																	
	193	58	● 12 ○ 15	6000			-	•	16 x 14	+10 +30				•		-25 +85 (-13 +185)	IP65
HM58 EC - HM58S EC HMC58 EC Optical multiturn encoders EtherCAT interface Industrial																	
	195	58	● 12 ○ 15	6000			-	•	16 x 14	+10 +30					•	-25 +85 (-13 +185)	IP65
EM58 -HS58 - HM58 PT Optical encoders Profinet interface Industrial																	
	177	77	○ 14	6000		•			18 16 x 14	+10 +30	•	•				-25 +85 (-13 +185)	IP66
XAC77 PB + CB ATEX multiturn encoder Profibus and CANbus interfaces (point to point) Heavy-duty																	
	197	77	○ 14	6000			•	•	18 16 x 14	+10 +30	•	•	•			-25 +85 (-13 +185)	IP66
XAC77 FB Absolute encoder Profibus, CANbus and DeviceNet interfaces Heavy-duty																	



ROTAPULS • ROTACOD bearingless encoders

	Page	Housing ϕ (mm)	Shaft max. ϕ (mm)	Shaft rotational speed max. (rpm)	Connection		Resolution max. (PPR)	Output frequency max. (kHz)	Power supply (Vdc)	NPN	PNP	1 Vpp	Push-Pull	Line Driver	SSI	Operating temp. °C (°F) min. – max.	Protection max.
					connector	cable											
	199	30÷56	Ø 8	3000	•		2048	100	+5	•						-40 +85 (-40 +185)	IP20
Light-duty Feedback																	
	203	-	Ø 50	6000		•	1024	100	+5 +10 +30				•	•		-40 +85 (-40 +185)	IP68
Heavy-duty Feedback																	
	205	36	Ø 10	40000		•	2048	300	+5 +10 +30	•	•		•	•		-20 +85 (-4 +185)	IP68
Industrial Feedback																	
	205	36	Ø 10	40000		•	13 Bit	300	+10 +30						•	-20 +85 (-4 +185)	IP68
Industrial Feedback																	
	207	-	Ø 250		•	•	90000	2000	+5 +10 +30				•	•		-20 +85 (-4 +185)	IP67
Heavy-duty Feedback																	
		-	Ø 380		•	•	18 Bit	-	+10 +30						•	-20 +85 (-4 +185)	IP67
Heavy-duty Feedback																	

DRAW WIRE UNITS & Accessories

		Dimensions (mm)	Measurement length max. (mm)	Stroke per turn (mm)	Measuring speed max. (m/sec)	Sensor		Potentiometer	Incremental encoder	Absolute encoder	Fieldbus encoder	Atex encoder
						integrated	external					
	SFP Draw wire potentiometer Miniature Light-duty	56 x 55 x 79	2000	100	2	•		•				
	SFE Draw wire encoder Miniature Light-duty	56 x 55 x 64	2000	100	2	•			•			
	SFA Draw wire encoder Miniature Light-duty	56 x 56 x 79	2000	100	2	•				•		
	SFI - SFA Draw wire unit Industrial	125 x 83 x 58	6800	200 204,8	2,5		•		•	•	•	
	SAK-10000 SAK-15000 Draw wire unit Reinforced winding mechanism Industrial	233,5 x 128 x 135	15000	300	10		•		•	•	•	•
	SBK-20000, SBK-30000 SBK-40000, SBK-50000 Draw wire unit Reinforced winding mechanism Industrial	401 x 190 x 200	50000	500	10		•		•	•	•	•



Flexible couplings

Complete range of encoder and transmission couplings

Flexible or rigid
Zero-backlash
Electrically insulated
Vibration absorbing
High torque & stiffness versions
Grub screw or collar fixing
Versions with keyway
Stainless steel versions



Mounting and Connection accessories

Mounting accessories for encoders and electrical connections


Spring loaded brackets
Mounting bells and adapter flanges
Fixing clamps, Reducing sleeves
Connectors
Cordsets



Metric wheels and Gears

Metric wheels with 200 and 500 mm circumference
Aluminum or Rubber surface
Metric wheel encoders (IR65 series on request)
Racks and pinions (ICS series)

LINEPULS incremental magnetic sensors

		Dimensions (mm)	Connection		Resolution max. (µm)	Travel speed max. (m/s)	Push-Pull	Line Driver	1Vpp	Reference	Limit switches	Power supply (Vdc)	Operating temp. °C (°F) min. – max.	Protection max.
			connector	cable										
	MT - MTS Magnetic tape Incremental coding	MT: 10 MTS: 5 x 100 m max.	-	-	-	-	-	-	-	-	-	-	-40 +120 (-40 +248)	IP67
	SME51 Magnetic sensor Status LED, wipers Industrial	40 x 25 x 10	•	•	5	16	•	•	•	•	•	+5 +10 +30	-25 +85 (-13 +185)	IP67
	SME52 Magnetic sensor Status LED, wipers Limit switches Industrial	40 x 25 x 10	•	•	5	16	•	•	•	•	•	+5 +10 +30	-25 +85 (-13 +185)	IP67
	SME21 Magnetic sensor Status LED, wipers Industrial / Feedback	40 x 25 x 10	•	•	1	16	•	•	•	•	•	+5 +10 +30	-25 +85 (-13 +185)	IP67
	SME22 Magnetic sensor Status LED, wipers Limit switches Industrial / Feedback	40 x 25 x 10	•	•	1	16	•	•	•	•	•	+5 +10 +30	-25 +85 (-13 +185)	IP67
	SME11 High performance sensor for linear motors Status LED, wipers Feedback	40 x 25 x 10	•	•	0,5	16	•	•	•	•	•	+5 +10 +30	-25 +85 (-13 +185)	IP67
	SME12 High performance sensor for linear motors Status LED, wipers Limit switches Feedback	40 x 25 x 10	•	•	0,5	16	•	•	•	•	•	+5 +10 +30	-25 +85 (-13 +185)	IP67
	SMS11 Magnetic sensor for linear motors Sine/cosine output Feedback	40 x 25 x 10	•	•	1000	16	•	•	•	•	•	+5	-25 +85 (-13 +185)	IP67
	SMS12 Magnetic sensor for linear motors Sine/cosine output Limit switches Feedback	40 x 25 x 10	•	•	1000	16	•	•	•	•	•	+5	-25 +85 (-13 +185)	IP67







LINEPULS incremental magnetic sensors

		Dimensions (mm)	Connection		Resolution max. (µm)	Travel speed max. (m/s)	Push-Pull	Line Driver	1Vpp	Reference	Limit switches	Power supply (Vdc)	Operating temp. °C (°F) min. – max.	Protection max.
			connector	cable										
	SMB2 - SMB5 Magnetic sensors External converter Industrial	25 x 15 x 8,5		•	50	16	•	•				+5 +10 +30	-25 +85 (-13 +185)	IP68
	SMI2 - SMI5 Linear incremental encoder with resolution selector Feedback	25 x 15 x 8,5	•		2	16	•	•				+5 +10 +30	-25 +85 (-13 +185)	IP68
	SMSR Miniature magnetic sensor for linear motors and pick & place applications Feedback	25 x 15 x 8,5		•	1000	10			•			+5	-25 +85 (-13 +185)	IP68
	SMX2 - SMX5 Magnetic speed sensors Heavy-duty	M10 x 30		•	5 mm (1.25) 2 mm (0.5)	30 (7,5 kHz)	•	•				+5 +30	-10 +70 (+14 +158)	IP67
	SMK Robust magnetic sensor for standard applications Heavy-duty	40 x 25 x 10		•	10	2,5	•	•				+5 +10 +30	-25 +85 (-13 +185)	IP67
	SML - SMH Robust magnetic sensors for standard applications Heavy-duty	40 x 25 x 10		•	100	10	•	•				+5 +10 +30	-25 +85 (-13 +185)	IP67
	SMIG Magnetic system with self-guiding sensor head Heavy-duty	80 x 48 x 28	•	•	5	1	•	•				+5 +10 +30	-25 +85 (-13 +185)	IP67

LINECOD absolute magnetic sensors

		Dimensions (mm)	Connection		Resolution max. (µm)	Travel speed max. (m/s)	SSI	BiSS	RS485	Profibus	CANopen / CANlift	Analogue	Power supply (Vdc)	Operating temp. °C (°F) min. – max.	Protection max.
			connector	cable											
	MTA1 - MTA5 Magnetic tape Absolute coding	20 x 5,1 m	-	-	-	-	-	-	-	-	-	-	-	-40 +120 (-40 +248)	IP67
	SMA5 Compact magnetic sensor SSI interface Industrial	65 x 20 x 20		•	5	5	•						+10 +30	-25 +85 (-13 +185)	IP67
	SMA1 Compact magnetic sensor BiSS + sin/cos interface Feedback	85 x 21 x 20		•	5	5	•	•					+10 +30	-25 +85 (-13 +185)	IP67
	SMAG Magnetic system with self-guiding sensor head Heavy-duty	80 x 48 x 28	•	•	5	1	•						+10 +30	-25 +85 (-13 +185)	IP65
	SMAX Low cost magnetic sensor Heavy-duty	80 x 40 x 22		•	100	5	•		•			•	+10 +30	-25 +85 (-13 +185)	IP68 IP69K
	SMAL Magnetic sensor for long distances Elevators Industrial	190 x 52 x 45	•	•	1 mm	5	•		•	•	•		+10 +30	-25 +85 (-13 +185)	IP54
	SMAL2 Magnetic sensor for long distances Elevators Lift / Industrial	147 x 100 x 60		•	0,1 mm	5	•		•		•		+10 +30	-25 +85 (-13 +185)	IP54










DRIVECOD rotary actuators

		Dimensions (mm)	Hollow shaft ø (mm)	Shaft rotational speed max. (rpm)	Nominal torque (Nm)	Max. torque (Nm)	Motor brake	Power supply (Vdc)	RS232 service Modbus	CANopen	Profibus	Modbus RS485	Operating temp. °C (°F) min. - max.	Protection max.
	RD1A Positioning unit with absolute encoder Brushless motor Diagnostic LEDs Industrial	59 x 112 x 125	14	240 120 60	1,2 2,4 5	3 6 12		24	•	•	•	•	0 +60 (32 +140)	IP65
	RD12A Positioning unit with absolute encoder Brushless motor Diagnostic LEDs Industrial	59 x 142 x 125	14	240 120 60	1,2 2,4 5	3 6 12	•	24	•	•	•	•	0 +60 (32 +140)	IP65
	RD5 Compact positioning unit with absolute encoder Brushless motor Industrial	48,3 x 88 x 126,6	14	60	5	12		24		•	•	•	0 +60 (32 +140)	IP54
	RD52 Compact positioning unit with absolute encoder Brushless motor Industrial	48,3 x 88 x 126,6	14	60	5	12	•	24		•	•	•	0 +60 (32 +140)	IP54
	RD4 Positioning unit with absolute encoder Brushless motor Heavy-duty	65 x 153 x 160	20	94 62	10 15	15 30		24		•	•	•	0 +60 (32 +140)	IP65

POSICONTROL displays & interfaces

	Display	Display mode			Dimensions (mm)	Input				Counting frequency max. (kHz)	Interface RS232 / RS485	Power supply	Output max.	
		linear	angular	mm/inch		ABO	SSI	1Vpp	Magnetic sensor					
	LD120 Compact LED display for magnetic sensors	LED 5 digit	•	•	•	72 x 36 x 62				•	-	•	+10 +30	-
	Industrial													
	LD112 Compact LCD battery display	LCD 6 digit	•	•	•	72 x 48 x 31				•	-		battery	-
	Industrial													
	LD111 - LD141 Ultracompact OEM battery display	LCD 6 digit	•	•	•	61 x 39 x 23 87 x 60,5 x 47				•	-		battery	-
	Industrial													
	LD140 - LD142 Standard battery display	LCD 6 digit	•	•	•	96 x 72 x 47				•	-	•	battery	-
	Industrial													
	LD200 Universal position display	LED 8 digit	•	•	•	96 x 48 x 49	•	•	•	•	500	•	24 Vdc	3 x 24V @ 23mA
	Industrial													
	LD250 Absolute multi-function display	LED 6 digit	•		•	96 x 48 x 141				•	-	•	24 Vdc 115/230 Vac	0/4 - 20mA 0...±10Vdc
	Industrial													
	LD300 Incremental multi-function display	LED 6 digit	•		•	96 x 48 x 141	•				100	•	24 Vdc 115/230 Vac	0/4 - 20mA 0...±10Vdc
	Industrial													
	MC111- MC150 Position display for encoders Economic version (MC111)	LED 6 digit	•			96 x 72 x 60 96 x 72 x 71	•				25 1000		24 Vdc/Vac 24 Vdc/Vac 115 Vac 230 Vac	2 x 24V @ 600mA
	Industrial													
	MC221 Compact 2 axes position display	2 x LED 6 digit	•			96 x 96 x 72	•				500		24 Vdc	2 x 24V @ 600mA
	Industrial													

POSICONTROL displays & interfaces

		Description	Input	Output	Service interface	Functions
	IF10 Industrial	Universal incremental encoder signal splitter, converter & switcher DIN rail mounting	2 inputs HTL or TTL / RS422	2 outputs HTL or TTL / RS422		Adjustable inputs and outputs signal levels (can be mixed) Contactless switch-over Up to 1 MHz input frequency
	IF20 Industrial	Signal converter for incremental encoder DIN rail mounting	HTL or TTL / RS422	HTL or TTL / RS422		Output voltage according to remote voltage Input/Output galvanically separated AB quadrature to UP/DOWN conversion
	IF30 Industrial	Sine/Cosine signal interpolator DIN rail mounting	1Vpp	HTL (AB0) or RS422 (AB0 /AB0)		Adjustable interpolation rate up to x50 Adjustable pulse divider Filtering functions
	IF50 Industrial	Incremental signal to Analogue converter DIN rail mounting	HTL or TTL / RS422	± 10 V 0- 20 mA 4 - 20 mA	RS232 RS485	Signal linearization Scaling factor Teach-in function
	IF51 Industrial	Absolute SSI to Analogue converter DIN rail mounting	SSI (up to 25 bit)	± 10 V 0- 20 mA 4 - 20 mA	RS232 RS485	Bit blanking function Signal linearization Scaling factor
	IF52 Industrial	Absolute SSI to Bit parallel converter DIN rail mounting	SSI (up to 25 bit)	Push-Pull	RS232	Signal linearization Scaling factor
	IF60 - IF61 Heavy-duty	Fibre-optic signal converters for incremental encoders IF60 transmitter IF61 receiver	HTL or TTL / RS422	Optical signal		Safe signal transmission up to 1000 m Suitable for explosive areas and environments with extremely high electromagnetic fields
	IF62 - IF63 Heavy-duty	Fibre-optic signal converters for absolute encoders IF62 transmitter IF63 receiver	SSI	Optical signal		Safe signal transmission up to 1500 m Suitable for explosive areas and environments with extremely high electromagnetic fields

ROTAPULS

Incremental encoder

Series

I28



- Miniature incremental encoder, Ø 28mm
- Robust metal housing
- Resolution up to 2048 pulses/rev.
- For office equipment, electromedical and light industrial applications



I28

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP54
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

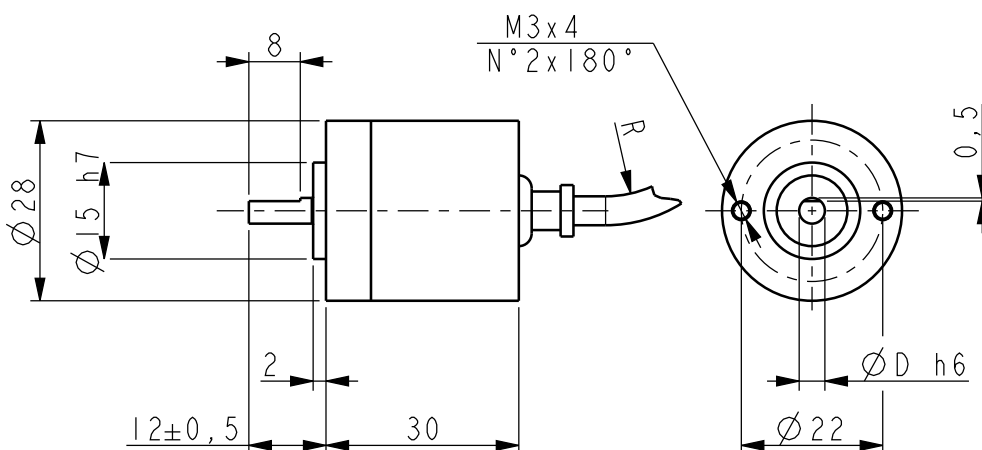
Dimensions:	see drawing
Shaft diameter:	Ø 4, 5 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	3000 rpm max.
Starting torque (at 20°C):	0,1 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 50 g (1,7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	100-200-360-500-512-720-1000-1024-1440-2000-2048
Counting frequency:	30 ÷ 100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V,+5V +30V
Consumption:	50 mA max.
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes



I28

Order code

I28	-	X Ⓐ	-	XXXX Ⓑ	XXX Ⓒ	XX Ⓓ	XX Ⓔ	/Sxxx Ⓕ
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<p>Ⓐ OUTPUT CIRCUITS</p> <p>Y = Push Pull L = Line Driver (RS422) H = PP/LD Universal circuit</p>	<p>Ⓑ RESOLUTION (PPR)</p> <p>See electrical specifications</p>	<p>Ⓒ OUTPUT SIGNALS</p> <p>BNF = AB BCU = AB, /AB ZNF = ABO ZCU = ABO, /ABO</p>	<p>Ⓓ SUPPLY VOLTAGE</p> <p>1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y output circuit) 4 = +5V÷+30V (H output circuit)</p>	<p>Ⓔ CUSTOM VERSION</p>	<p>Ⓕ CABLE LENGTH</p> <p>- = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p>
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ROTAMAG

Magnetic incremental encoders

Series

MI36 • MC36



- Compact magnetic incremental encoder
- Resolution up to 2048 pulses/rev.
- Ø 6 mm solid or hollow shaft
- IP67 with sealed circuits (optional)



MI36 • MC36

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• IP67 protection with sealed circuits

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	12000 rpm max.
Starting torque (at 20°C):	0,1 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 50 g (1,7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

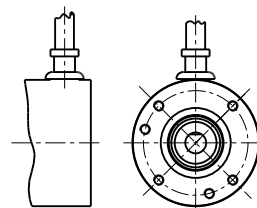
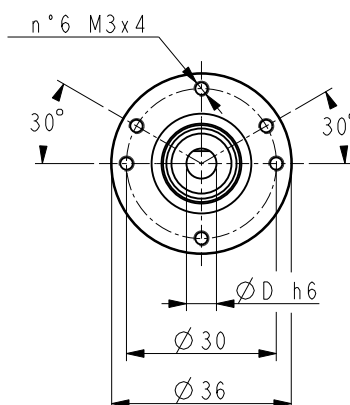
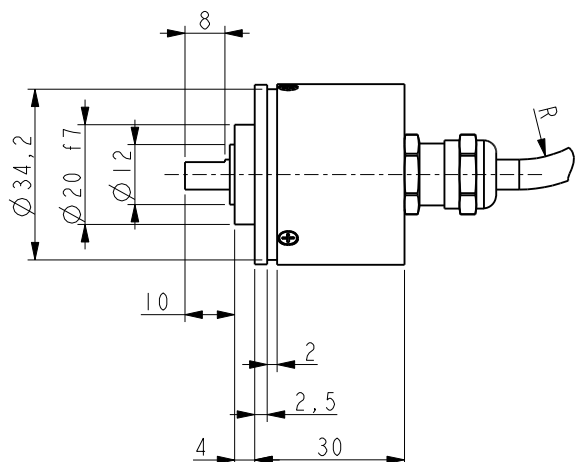
Resolution (PPR):	4-8-10-16-20-25-32-40-50-64-80-100-125-128 200-250-256-400-500-512-1024-2048
Accuracy:	± 1°
Counting frequency:	300 kHz max.
Output circuits:	NPN, Push-Pull, Line Driver
Power supply:	5Vdc ±5%, +10Vdc +30Vdc
Consumption:	50 mA max.
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4

MATERIALS

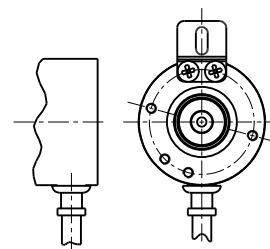
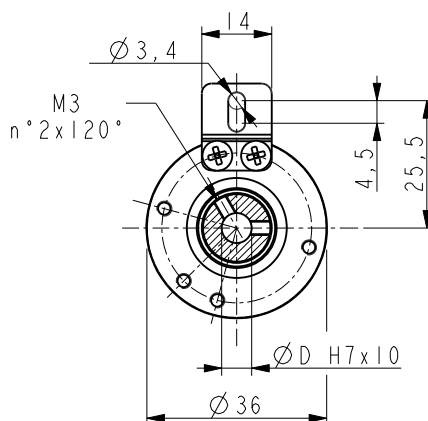
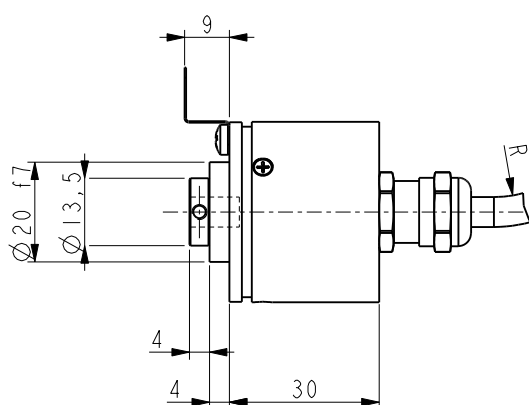
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

PAN-6:	Aluminium coupling
PGF-6:	Flexible coupling



MI36



MC36

Order code

MI36	-	X	-	XXXX	XXX	X	X	X	X	XX	/Sxxx
MC36		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)

<p>(a) OUTPUT CIRCUITS N = NPN o.c. Y = Push Pull L = Line Driver (RS422)</p> <p>(b) RESOLUTION (PPR) See electrical specifications</p>	<p>(c) OUTPUT SIGNALS BNF = AB BCU = AB, /AB ZNF = ABO ZCU = ABO, /ABO</p> <p>(d) SUPPLY VOLTAGE 1 = +5V±5% (L output circuit) 2 = +10V± +30V (Y or N output circuit)</p>	<p>(e) SHAFT DIAMETER 6 = 6 mm</p> <p>(f) CONNECTION POSITION - = axial R = radial</p>	<p>(g) PROTECTION - = IP65 J = IP67 with sealed circuits</p> <p>(h) CABLE LENGTH - = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p>
			<p>(i) CUSTOM VERSION</p>

ROTAMAG

Magnetic incremental encoder

Series

MI36K • MC36K



- Compact magnetic encoders
- Stainless steel housing for the food industry
- IP67 protection with sealed circuits (option)



MI36K • MC36K

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• IP67 protection with sealed circuits

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6 mm
Shaft loading (axial and radial):	20 N max.
Shaft rotational speed:	12000 rpm max.
Starting torque (at 20°C):	0,1 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	cabl e output 1 m (3.3 ft)
Weight:	~ 50 g (1,7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

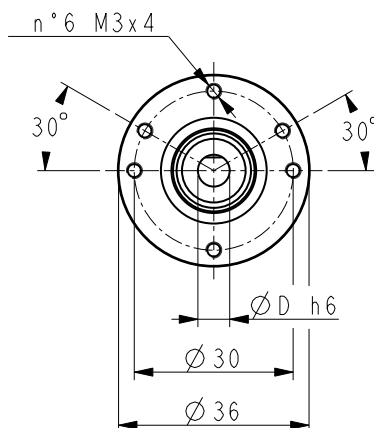
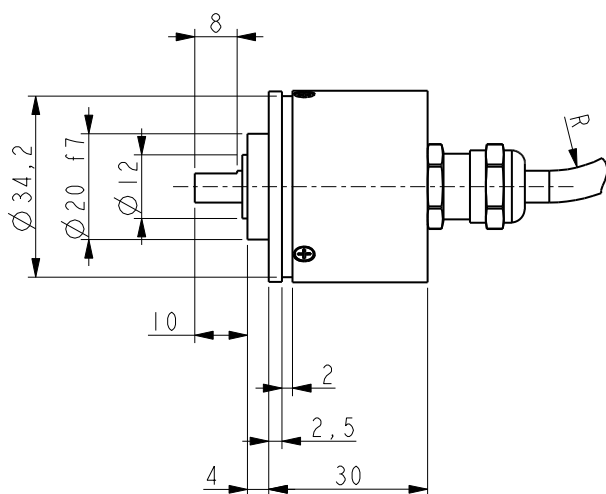
Resolution (PPR):	4-8-10-16-20-25-32-40-50-64-80-100-125-128 200-250-256-400-500-512-1024-2048
Accuracy:	± 1°
Counting frequency:	300 kHz max.
Output circuits:	NPN, Push-Pull, Line Driver
Power supply:	5Vdc ±5%, +10Vdc +30Vdc
Consumption:	50 mA max.
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4

MATERIALS

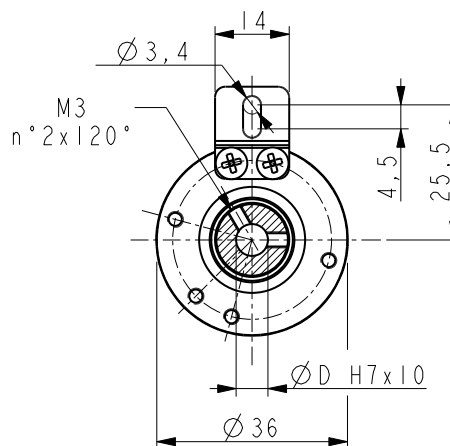
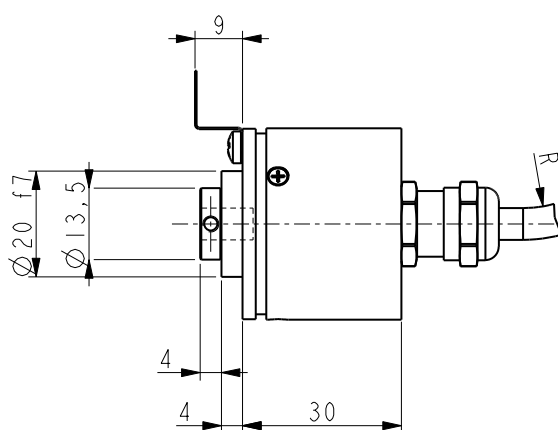
Flange:	AISI 303 stainless steel
Housing:	AISI 303 stainless steel
Bearings:	ABEC 5
Shaft:	AISI 303 stainless steel

ACCESSORIES

MST5-16-6-6:	Stainless steel coupling
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MI36K



MC36K

Order code

MI36K MC36K	-	X a	-	XXXX b	XXX c	X d	X e	X f	X g	XX h	/Sxxx i
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<p>a OUTPUT CIRCUITS</p> <p>N = NPN Y = Push Pull L = Line Driver (RS422)</p>	<p>c OUTPUT SIGNALS</p> <p>ZNF = ABO ZCU = ABO, /ABO</p>	<p>e SHAFT DIAMETER</p> <p>6 = 6 mm</p>	<p>h CABLE LENGTH</p> <p>L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p>
<p>b RESOLUTION (PPR)</p> <p>See electrical specifications</p>	<p>d SUPPLY VOLTAGE</p> <p>1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y or N output circuit)</p>	<p>f CONNECTION POSITION</p> <p>- = axial</p>	<p>i CUSTOM VERSION</p>
		<p>g PROTECTION</p> <p>- = IP65 J = IP67 with sealed circuits</p>	

ROTAPULS

Incremental encoders

Series

I40 • I41



- Compact industrial encoders
- Preferential versions with fast delivery
- Universal output circuit HTL/TTL
- High resolution up to 4096 PPR



I41 • I40

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP64
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• IP65, IP66 protection shaft end

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 6.35 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	0,1 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	1-2-5-8-10-15-20-30-32-40-50-56-60-72-84-90-100-120 125-127-150-176-180-200-250-256-300-314-320-360-400 500-512-540-600-625-635-720-900-1000-1024(*)-1080-1200 1250-1440-1500-1600-1800-2000-2048(*)-2400-2500-2880 3600-4000(*)-4096(*)
(*) not available for I40 series	
Counting frequency:	50 ÷ 100 kHz max.
Output circuits:	NPN, PNP, Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

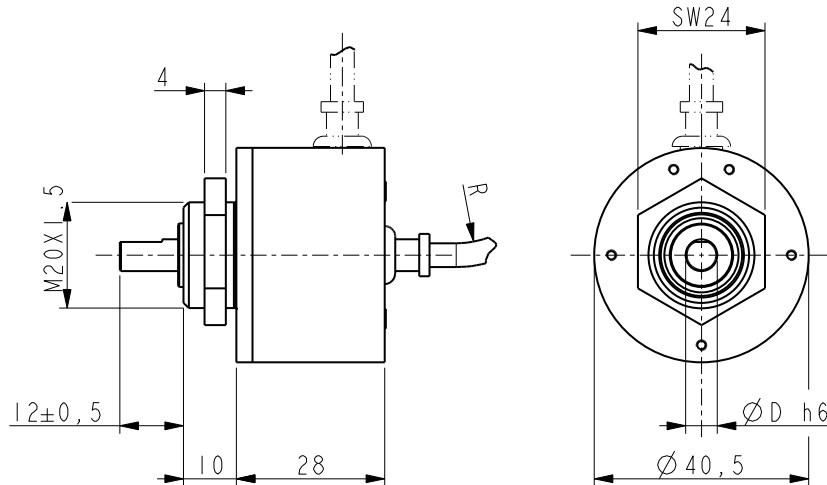
Flange:	anticorrosive, UNI EN AW-6082
Housing:	fibre glass epoxy resin
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

PREFERENTIAL MODELS

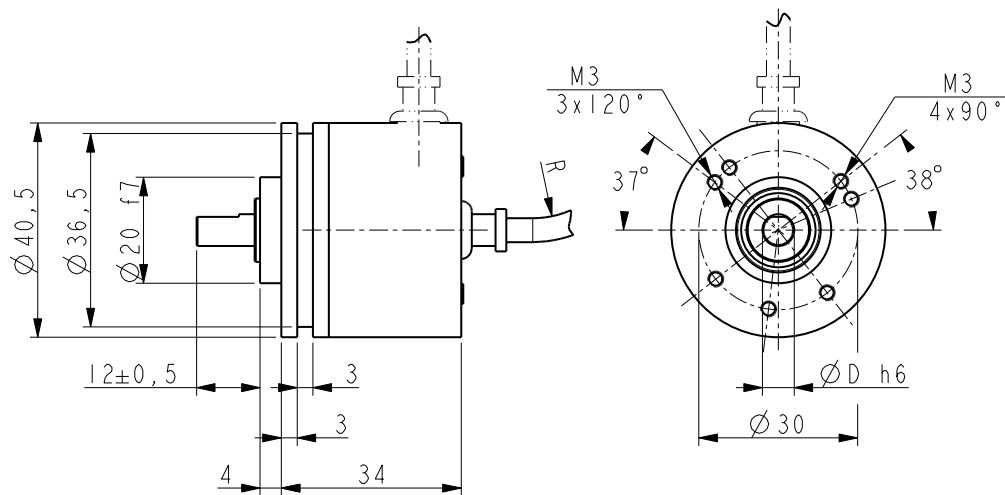
I41-H-100ZCU46L2	100 PPR, HTL/TTL output
I41-H-200ZCU46L2	200 PPR, HTL/TTL output
I41-H-360ZCU46L2	360 PPR, HTL/TTL output
I41-H-500ZCU46L2	500 PPR, HTL/TTL output
I41-H-1000ZCU46L2	1000 PPR, HTL/TTL output
I41-H-1024ZCU46L2	1024 PPR, HTL/TTL output

ACCESSORIES

EDE9S:	9 pin DSub mating connector
PAN/PGF:	flexible couplings
LKM-386:	fixing clamps



I40



I41

Order code

I40	-	X	-	XXXX	XXX	X	XX	X	X	XX	/Sxxx
I41		Ⓐ		Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ	Ⓘ

<p>Ⓐ OUTPUT CIRCUITS N = NPN o.c. P = PNP o.c. Y = Push Pull L = Line Driver (RS422) H = PP/LD universal circuit</p> <p>Ⓑ RESOLUTION (PPR) See electrical specifications</p>	<p>Ⓒ OUTPUT SIGNAL BNF = AB BCU = AB, /AB ZNF = ABO ZCU = ABO, /ABO</p> <p>Ⓓ POWER SUPPLY 1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y, N, P output circuit) 4 = +5V÷ +30V (H output circuit)</p>	<p>Ⓔ SHAFT DIAMETER 6 = 6 mm P6 = 6.35 mm - 1/4"</p> <p>Ⓕ PROTECTION - = IP64 P = IP65 Q = IP66 shaft side (only I41)</p>	<p>Ⓖ CONNECTION POSITION - = axial R = radial</p> <p>Ⓗ CABLE LENGTH - = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m CLx = x m cable with DSub 9 pin inline plug</p> <p>Ⓙ CUSTOM VERSION</p>
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ROTAPULS

Incremental encoders

Series

CK41 • CK46

- Compact hollow shaft encoders
- Preferential versions with fast delivery
- Universal output circuit
- Resolution up to 4096 PPR



CK46 • CK41

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Operating temperature range:	-25°C +85°C (-13°F, +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Protection:	IP64
Option:	• IP65 protection (3000 rpm max, torque 1 Ncm)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 6.35, 8 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	0,1 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Options:	• additional cable • DSub 9 pin inline connector

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	1-2-5-8-10-15-20-30-32-40-50-56-60-72-84-90-100-120 125-127-150-176-180-200-250-256-300-314-320-360-400 500-512-540-600-625-635-720-900-1000-1024-1080-1200 1250-1440-1500-1600-1800-2000-2048-2400-2500-2880 3600-4000-4096
Counting frequency:	50 ÷ 100 kHz max.
Output circuits:	NPN, PNP, Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	fibre glass epoxy resin
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

PREFERENTIAL MODELS

CK41-H-1000ZCU46L2	1000 PPR, HTL/TTL output
CK41-H-1024ZCU46L2	1024 PPR, HTL/TTL output
CK41-H-2000ZCU46L2	2000 PPR, HTL/TTL output
CK41-H-2048ZCU46L2	2048 PPR, HTL/TTL output

ACCESSORIES

EDE9S:	9 pin DSub mating connector
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ROTAPULS

Incremental encoder

Series

C50



- Best selling small size hollow shaft encoder
- Ideally suited for motor feedback applications
- Extended standard operating temperature from -40°C to 100°C
- Preferential versions with fast delivery
- Universal output circuit TTL/HTL 5-30Vdc



C50

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-40°C + 100°C (-40°F + 212°F)
Storage temperature range:	-40°C + 100°C (-40°F + 212°F) (98% R.H. without condensation)
Option:	<ul style="list-style-type: none"> • IP54 Protection (low inertia bearings, 10000 rpm for short periods)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	∅ 6, 6.35, 8, 9.52, 10 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	≤ 0,25 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Options:	<ul style="list-style-type: none"> • additional cable • DSub 9 pin inline connector

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	100-180-200-250-256-300-360-400-500-512-600 1000-1024-2000-2048-4096
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

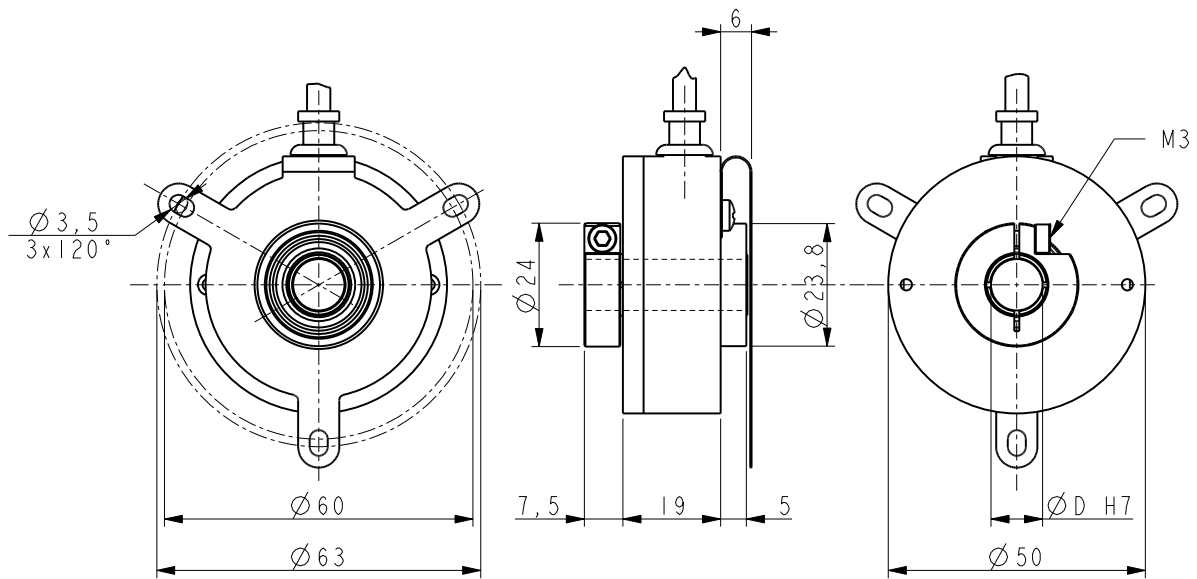
Flange:	zamac die cast
Housing:	zamac die cast
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

PREFERENTIAL MODELS

C50-H-100ZCU410	100 PPR, HTL/TTL output
C50-H-360ZCU410	360 PPR, HTL/TTL output
C50-H-500ZCU410	500 PPR, HTL/TTL output
C50-H-1000ZCU410L2	1000 PPR, HTL/TTL output
C50-H-1024ZCU410L2	1024 PPR, HTL/TTL output

ACCESSORIES

EDE9S:	9 pin DSub mating connector
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C50

Order code

C50	-	X (a)	-	XXXX (b)	XXX (c)	X (d)	XX (e)	X (f)	XX (g)	/Sxxx (h)
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Ⓐ OUTPUT CIRCUITS

Y = Push Pull
L = Line Driver (RS422)
H = PP/LD universal circuit

Ⓑ RESOLUTION (PPR)

See electrical specifications

Ⓒ OUTPUT SIGNALS

BNF = AB
BCU = AB, /AB
ZNF = ABO
ZCU = ABO, /ABO

Ⓓ SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
2 = +10V÷ +30V (Y output circuit)
4 = +5V÷ +30V (H output circuit)

Ⓔ SHAFT DIAMETER

6 = 6 mm
P6 = 6.35 mm - 1/4"
8 = 8 mm
P9 = 9.52 mm - 3/8"
10 = 10 mm

Ⓕ PROTECTION

- = IP65 (standard)
V = IP54 (low inertia bearings)

Ⓖ CABLE LENGTH

- = cable output 1 m (standard)
L2 = cable output 2 m
Lx = cable output x m
CLx = x m cable with DSub 9 pin inline plug

Ⓖ CUSTOM VERSION

ROTAPULS

Incremental encoder

Series

C51



- Small size incremental encoder with high resolution
- DC and AC motor feedback



C51

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP54
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• IP65 Protection

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 6, 6.35, 8, 9.52, 10 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	3000 rpm max.
Starting torque at 20°C:	≤ 1,5 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	cabl output 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

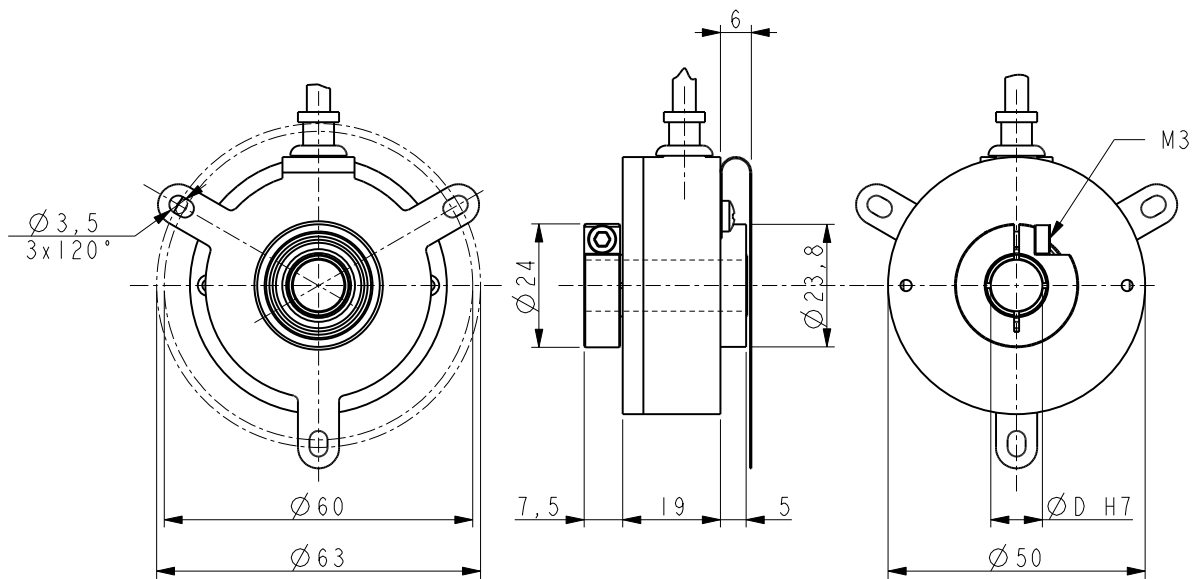
Resolution (PPR):	6-10-12-15-25-36-40-45-50-60-80-90-900 1500-2000-2048-2500
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V,+5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EDE9S:	9 pin DSub mating connector
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C51

Order code

C51	-	X a	-	XXXX b	XXX c	X d	XX e	X f	XX g	/Sxxx h
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a OUTPUT CIRCUITS

Y = Push Pull
L = Line Driver (RS422)
H = PP/LD universal circuit

b RESOLUTION (PPR)

See electrical specifications

c OUTPUT SIGNALS

BNF = AB
BCU = AB, /AB
ZNF = AB0
ZCU = AB0, /AB0

d SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
2 = +10V÷ +30V (Y output circuit)
4 = +5V÷ +30V (H output circuit)

e SHAFT DIAMETER

6 = 6 mm
P6 = 6.35 mm - 1/4"
8 = 8 mm
P9 = 9.52 mm - 3/8"
10 = 10 mm

f PROTECTION

- = IP54 (standard)
P = IP65

g CABLE LENGTH

- = cable output 1 m (standard)
L2 = cable output 2 m
Lx = cable output x m
CLx = x m cable with DSub 9 pin inline plug

h CUSTOM VERSION

ROTAPULS

Feedback encoder for brushless motors

Series

CB50



- Brushless motor (BLDC) feedback encoder
- UVW commutation signals
- Easy installation with PCB connector
- Compact through hollow shaft encoder



CB50

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP20
Operating temperature range:	-20°C +100°C (-4°F + 212°F)
Storage temperature range:	-20°C +100°C (-4°F + 212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 6, 6.35, 8, 9.52, 10 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	0,2 Ncm (typical)
Misalignment:	± 0,3 mm axial ± 0,06 mm radial ± 0,2° angular
Bearings life:	2 x 10 ⁹ rev. min.
Electrical connections:	pins or PCB connection cable
Weight:	~ 100 g (3,5 oz)

ELECTRICAL SPECIFICATIONS

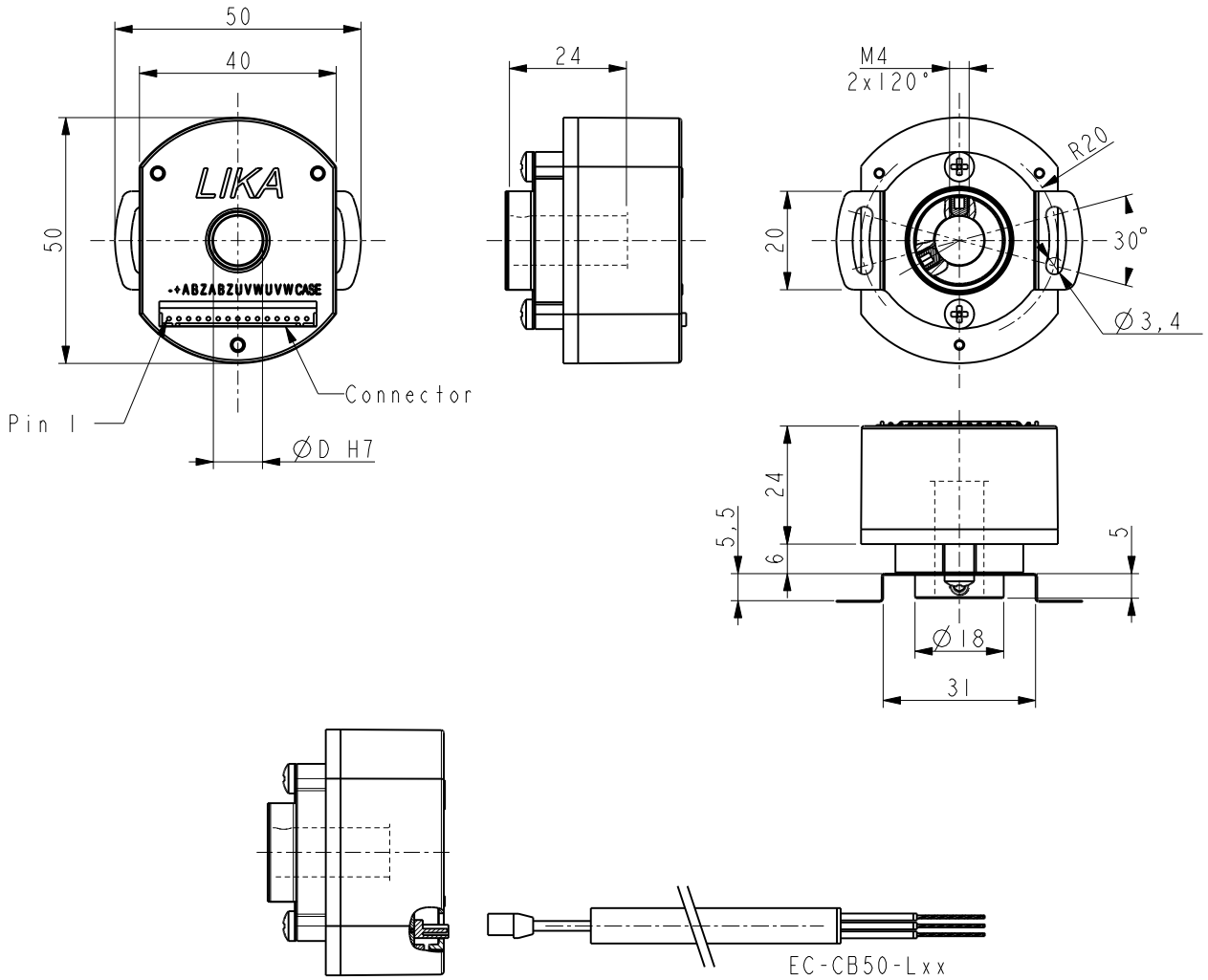
Pulse rate - Poles:	1000-1024-1250-2000-2048-2500
U, V, W commutations signals:	4 - 6 - 8 poles
Counting frequency:	100 ÷ 200 kHz max.
Output circuits:	Push-Pull, Line Driver
Power supply:	+5V±5%, +10V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	zamac die cast
Housing:	plastic, NYLON 6 FV 15%
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EC-CB50:	mating connector with cable (30 cm/11.8 in.)
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CB50

Order code

CB50	-	X a	-	XXXX b	/	X c	X d	XX e	/Sxxx f
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a OUTPUT CIRCUITS

Y = Push Pull
L = Line Driver (RS422)

b RESOLUTION (PPR)

1000, 1024, 1250, 2000, 2048, 2500

c N° POLES

4 = 4 poles
6 = 6 poles
8 = 8 poles

d SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
2 = +10V÷ +30V (Y output circuit)

e SHAFT DIAMETER

6 = 6 mm
P6 = 6.35 mm - 1/4"
8 = 8 mm
P9 = 9.52 mm - 3/8"
10 = 10 mm

f CUSTOM VERSION

ROTAPULS

Incremental encoders

Series

I58 • I58S



- Standard encoder for general industrial application
- Pulse rates up to 10000 PPR (real)
- Servo or clamp flange mounting
- High operating temperature range (optional)
- Line Driver, HTL and sine/cosine output circuits



I58 • I58S

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP64
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none"> • Operating temperature range: -40°C +100°C (-40°F +212°F) • IP65 Protection

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	∅ 6, 8, 9.52, 10, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	typ. 6000 rpm / 12000 temporary
Starting torque at 20°C:	I58: 0,15 Ncm / I58S: 0,4 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 1 m (3.3 ft)
Weight:	~ 200 g (7 oz)
Options:	<ul style="list-style-type: none"> • additional cable • DSub 9 pin inline plug

ELECTRICAL SPECIFICATIONS

Resolution (PPR): (output circuit N, P, Y, L, H)	2-4-5-8-10-12-15-16-20-24-25-30-35-36-40-50-60-64-70-80-90 100-120-127-142-150-160-180-200-216-230-236-240-250-254 256-267-270-300-314-360-375-400-410-435-471-500-512-600 635-720-750-800-900-1000-1024-1068-1200-1250-1270-1400 1440-1500-1800-2000-2048-2250-2400-2500-3000-3600-4000 4096-5000-6000-8192-9000-10000
Resolution (PPR): (output circuit V)	500-512-1000-1024-1250-2000-2048-2500
Counting frequency:	100 kHz max.
Output circuits:	NPN, PNP, Push-Pull, Line Driver, Universal circuit, Sine/cosine
Power supply:	+5V±5%, +10V +30V,+5V +30V (sine/cosine only +5V±5%)
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L and V circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	<ul style="list-style-type: none"> • Counting frequency up to 300 kHz • Line Driver 24/5V

MATERIALS

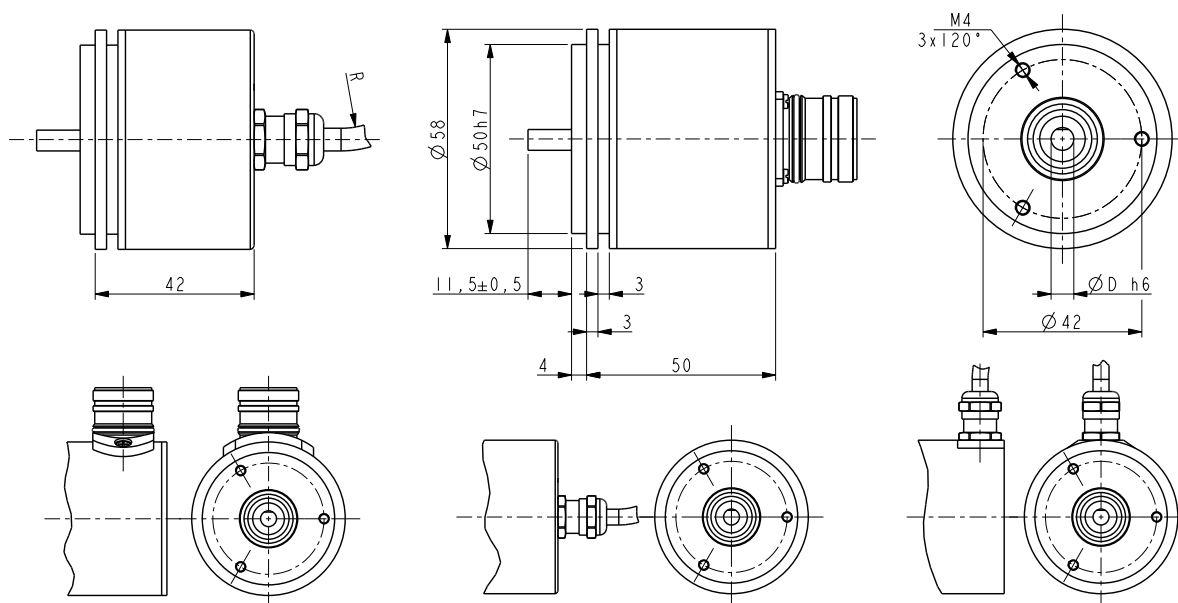
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

PREFERENTIAL MODELS

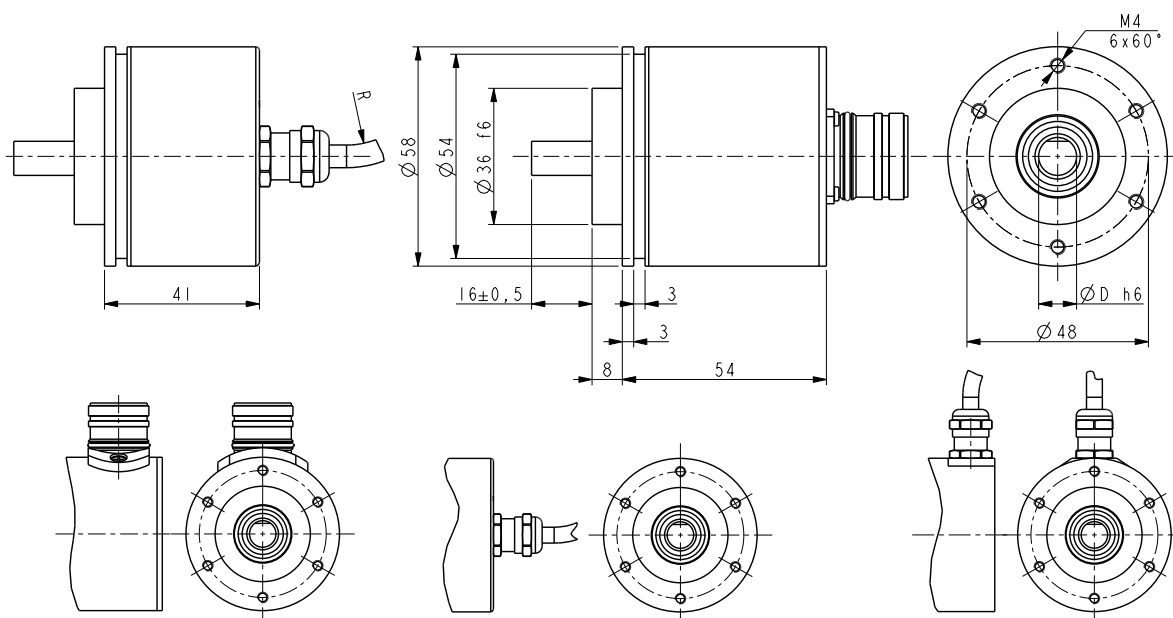
I58-H-500ZCU46RL2	I58-H-500ZCZ46R
I58-H-1000ZCU46RL2	I58-H-1000ZCZ46R
I58-H-1024ZCU46RL2	I58-H-1024ZCZ46R
I58-H-2048ZCU46RL2	I58-H-2048ZCZ46R
I58-H-2500ZCU46RL2	I58-H-2500ZCZ46R
I58-H-500ZCZ46	I58S-H-500ZCZ410R
I58-H-1000ZCZ46	I58S-H-1000ZCZ410R
I58-H-1024ZCZ46	I58S-H-1024ZCZ410R
I58-H-2048ZCZ46	I58S-H-2048ZCZ410R
I58-H-2500ZCZ46	I58S-H-2500ZCZ410R

ACCESSORIES

EPFL 121:	12 pin M23 mating connector
EC-C12F-LK-I8-x:	cordset x meter, M23 connector
EDE 9S:	9 pin DSub mating connector
PAN/PGF:	flexible couplings
LKM-386:	fixing clamps



158



158S

Order code

I58	-	X	-	XXXXX	XXX	X	XX	X	X	X	X	XX	/Sxxx
I58S		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)

(a) OUTPUT CIRCUITS

N = NPN o.c.
 P = PNP o.c.
 Y = Push Pull
 L = Line Driver (RS422)
 H = PP/LD universal circuit
 V = 1 V_{pp} sine/cosine

(b) RESOLUTION (PPR)

See electrical specifications

(c) OUTPUT SIGNALS / CONNECTIONS

BNF = AB, cable output (except V output)
 ZNF = ABO, cable output (except V output)
 BCU = AB /AB, cable output
 ZCU = ABO /ABO, cable output
 BCZ = AB /AB, M23 12 pin plug
 ZCZ = ABO /ABO, M23 12 pin plug
 ZCM = ABO /ABO, M12 8 pin plug

(d) SUPPLY VOLTAGE

1 = +5V±5% (L, V output circuit)
 2 = +10V÷ +30V (N, P, Y output circuit)
 4 = +5V÷ +30V (H output circuit)

(e) SHAFT DIAMETER

6 = 6 mm
 8 = 8 mm
 P9 = 9.52 mm - 3/8"
 10 = 10 mm
 12 = 12 mm

(f) CONNECTION POSITION

- = axial
 R = radial

(g) PROTECTION

- = IP64 (standard)
 P = IP65

(h) COUNTING FREQUENCY

- = 100 kHz (standard)
 W = 300 kHz

(i) OPERATING TEMPERATURE

- = -25°C +85°C (-13°F +185°F) standard
 K = -40°C +100°C (-40°F +212°F)

(j) CABLE LENGTH

- = cable output 1 m (standard)
 L2 = cable output 2 m
 Lx = cable output x m
 CLx = x m cable with DSub 9 pin inline plug

(k) CUSTOM VERSION

ROTAPULS

Incremental encoder

Series

I58SK



- Stainless steel encoder for the food industry
- IP67 washdown protection
- Clamp flange mounting
- Cable or M23 connector output
- HTL, TTL and sine/cosine output



I58SK

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Options:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	6000 rpm
Starting torque at 20°C:	0,4 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M23 nichel plated plug or axial cable 1 m (3.3 ft)
Weight:	~ 500 g (17,6 oz)
Options:	• additional cable

ELECTRICAL SPECIFICATIONS

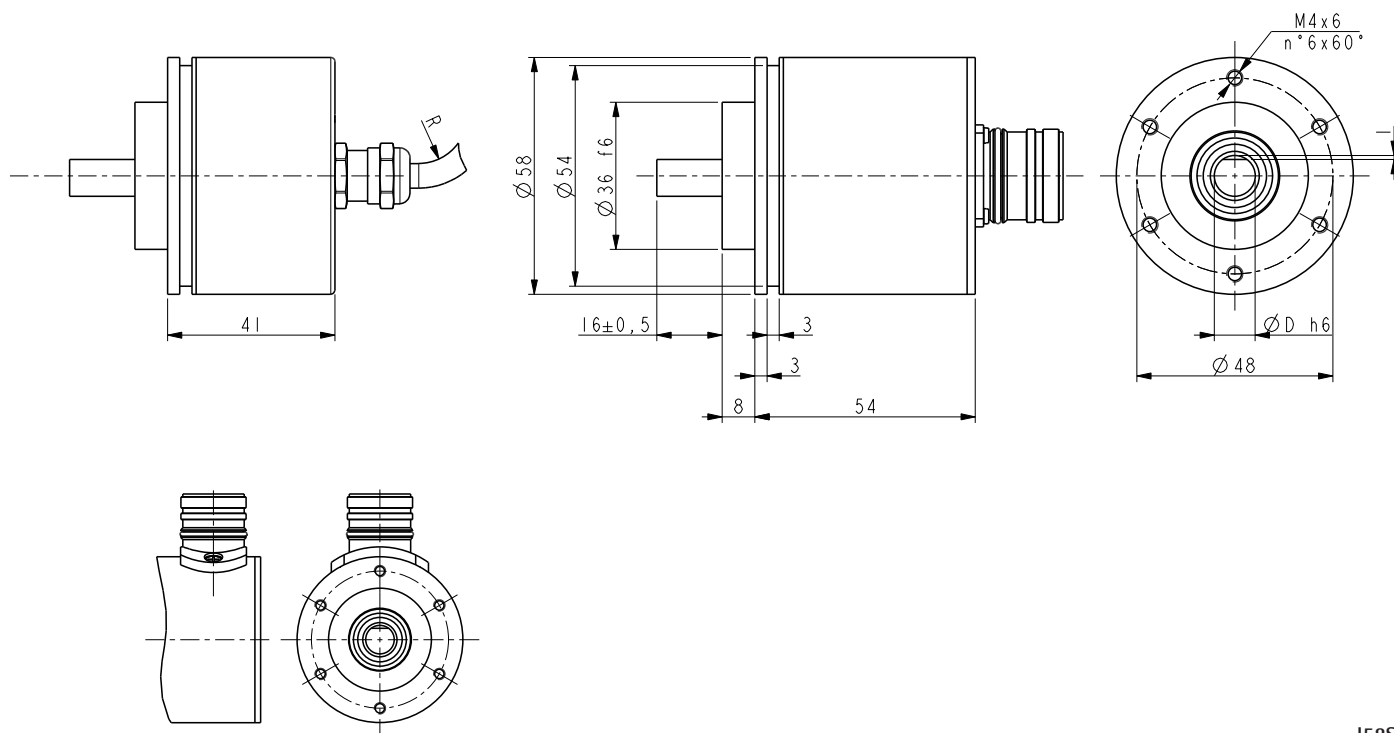
Resolution (PPR): (output circuit N, P, Y, L, H)	2-4-5-8-10-12-15-16-20-24-25-30-35-36-40-50-60-64-70-80-90 100-120-127-142-150-160-180-200-216-230-236-240-250-254 256-267-270-300-314-360-375-400-410-435-471-500-512-600 635-720-750-800-900-1000-1024-1068-1200-1250-1270-1400 1440-1500-1800-2000-2048-2250-2400-2500-3000-3600-4000 4096-5000-6000-8192-9000-10000
Resolution (PPR): (output circuit V)	500-512-1000-1024-1250-2000-2048-2500
Counting frequency:	100 kHz max.
Output circuits:	NPN o.c., PNP o.c., Push-Pull, Line Driver, Universal circuit, Sine/cosine
Power supply:	+5V±5%, +10V +30V,+5V +30V (sine/cosine only +5V±5%)
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L and V circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Options:	• Counting frequency up to 300 kHz • Line Driver 24/5V

MATERIALS

Flange:	AISI 410 stainless steel
Housing:	AISI 410 stainless steel
Bearings:	ABEC 5
Shaft:	AISI 303 stainless steel

ACCESSORIES

EPFL 121:	12 pin M23 mating connector
EC-C12F-LK-l8-x:	cordset x meter with M23 connector
MWSS, MSTs:	stainless steel flexible couplings



I58SK

Order code

I58SK	-	X	-	XXXXX	XXX	X	XX	X	X	X	XX	/Sxxx
		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

<p>(a) OUTPUT CIRCUITS N = NPN o.c. Y = Push Pull L = Line Driver (RS422) H = PP/LD universal circuit V = 1 Vpp (sine/cosine)</p> <p>(b) RESOLUTION (PPR) See electrical specifications</p> <p>(c) OUTPUT SIGNALS / CONNECTIONS ZCU = ABO /ABO, cable output ZCY = ABO /ABO, M23 12 pin plug</p>	<p>(d) SUPPLY VOLTAGE 1 = +5V±5% (L, V output circuit) 2 = +10V÷ +30V (N, P, Y output circuit) 4 = +5V÷ +30V (H output circuit)</p> <p>(e) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm - 3/8" 10 = 10 mm 12 = 12 mm</p>	<p>(f) CONNECTION POSITION - = axial (standard) R = radial (only with M23 connector)</p> <p>(g) COUNTING FREQUENCY - = 100 kHz standard W = 300 kHz</p> <p>(h) OPERATING TEMPERATURE - = -25°C +85°C (-13°F +185°F) standard K = -40°C +100°C (-40°F +212°F)</p>	<p>(i) CABLE LENGTH (not with ZCY) L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p>
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(j) CUSTOM VERSION

ROTAPULS

Programmable incremental encoder

Series

IP58 • IP58S • CKP58



- Programmable incremental encoder
- Resolution from 1 to 65536 PPR
- Freely programmable index (push-button)
- Counting direction cw, ccw
- Push-Pull + Line Driver compatible output
- Selectable output voltage 5Vdc or 10-30Vdc
- Programmable via USB cable



IP58

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	typ. 6000 rpm / 12000 temporary
Starting torque at 20°C:	IP58: 0,15 Ncm / IP58S, CKP58: 0,4 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 1 m (3.3 ft)
Weight:	~ 200 g (7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

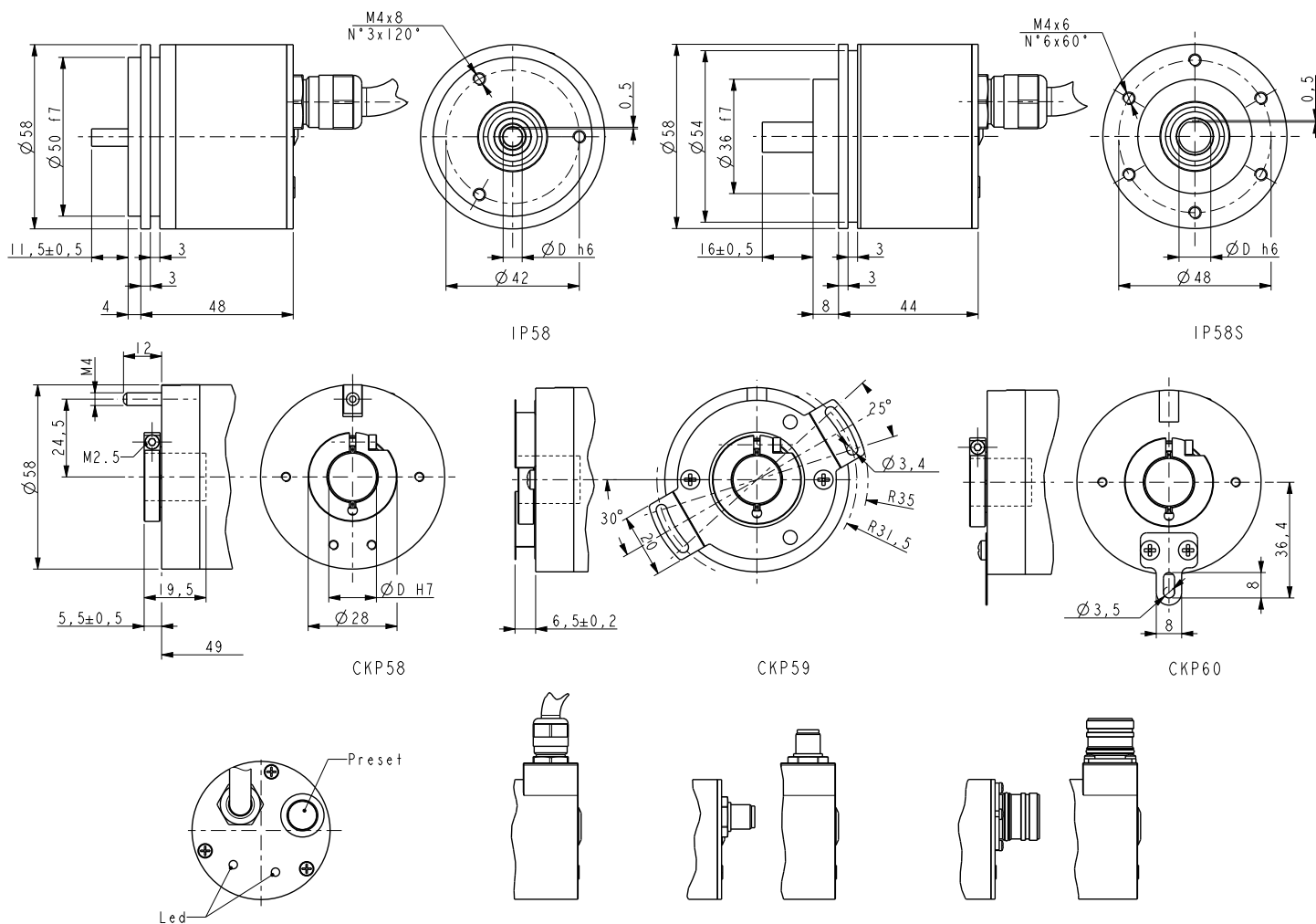
Resolution (PPR):	programmable from 1 to 65536
Counting frequency:	800 kHz max.
Output circuits:	Universal output (PP+LD compatible) 24/5V output programmable
Power supply:	+5V +30V
Consumption:	400 mW (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short cut
EMC:	electro-magnetic immunity, EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EPFL 121:	12 pin M23 mating connector
BR1-xx:	reducing sleeves
PAN/PGF:	flexible couplings
KIT IP58:	USB programming kit



Order code

IP58	-	X	-	XXXX	XXX	X	XX	X	XX	/Sxxx
IP58S		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)
CKP58										

<p>(a) OUTPUT CIRCUITS H = PP/LD universal circuit</p> <p>(b) RESOLUTION (PPR) PROG = programmable</p> <p>(c) OUTPUT SIGNALS / CONNECTIONS ZCU = ABO /ABO, cable output ZCZ = ABO /ABO, M23 12 pin plug ZCM = ABO /ABO, M12 8 pin plug</p>	<p>(d) SUPPLY VOLTAGE 4 = +5V ÷ +30V</p> <p>(e) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm - 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (only CKP58) 15 = 15 mm (only CKP58)</p>	<p>(f) CONNECTION POSITION - = axial R = radial</p> <p>(g) CABLE LENGTH - = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p> <p>(h) CUSTOM VERSION</p>
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ROTAPULS

Incremental encoders

Series

C58 • C59 • C60



- Compact through hollow shaft encoders
- M23, M12 connector or cable output
- Ø15 or Ø14 mm shaft, other diameters with reduction sleeves
- Universal output circuit PP/LD



C60 • C58 • C59

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP64
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none"> • Operating temperature range: -40°C +100°C (-40°F +212°F) • IP65 Protection (3000 rpm max, torque 1 Ncm)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 14, 15 mm
Shaft loading (axial, radial):	30 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	1 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 1 m (3.3 ft)
Weight:	~ 150 g (5,2 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

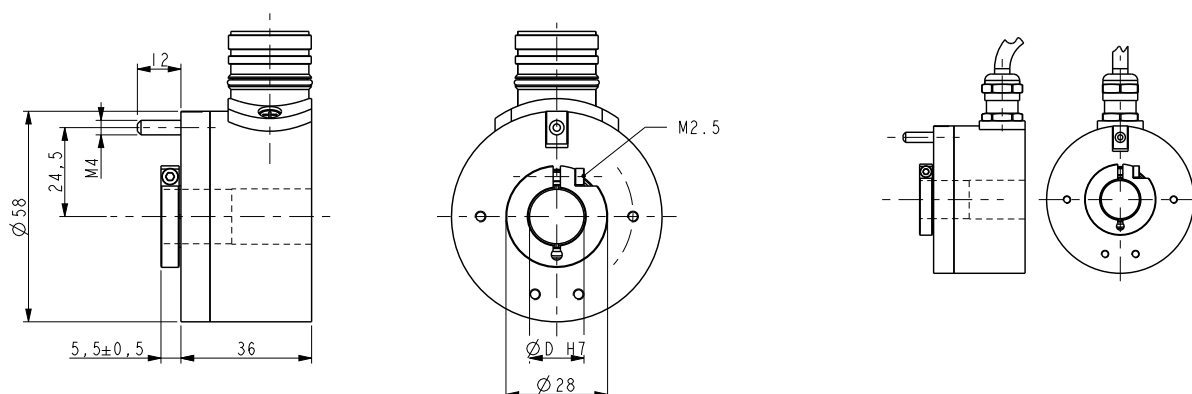
Resolution (PPR):	4-5-10-12-15-16-20-24-25-30-35-36-40-45-50-60-70 80-90-100-120-125-142-150-180-200-236-250-256 267-300-314-360-400-433-435-471-500-600-635-720 784-875-900-1000-1024-1250-1800-2000-2048-2500 3600-4000-4096-5000
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (per channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	counting frequency up to 300 kHz

MATERIALS

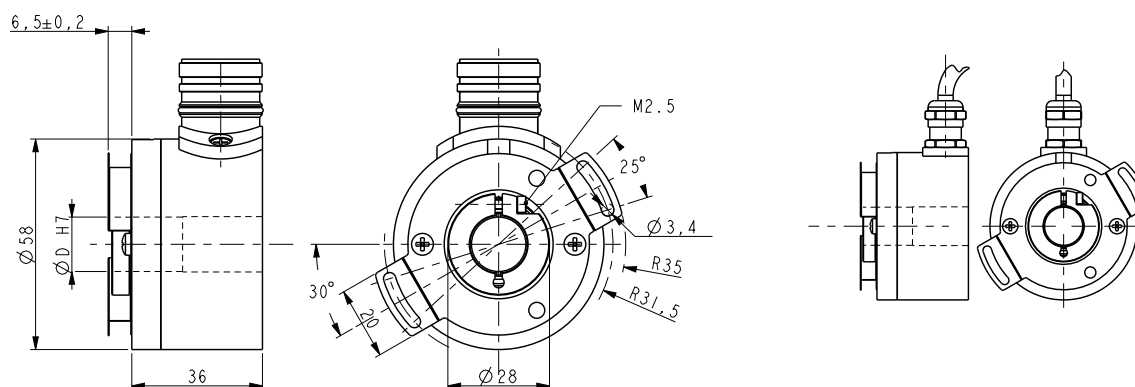
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

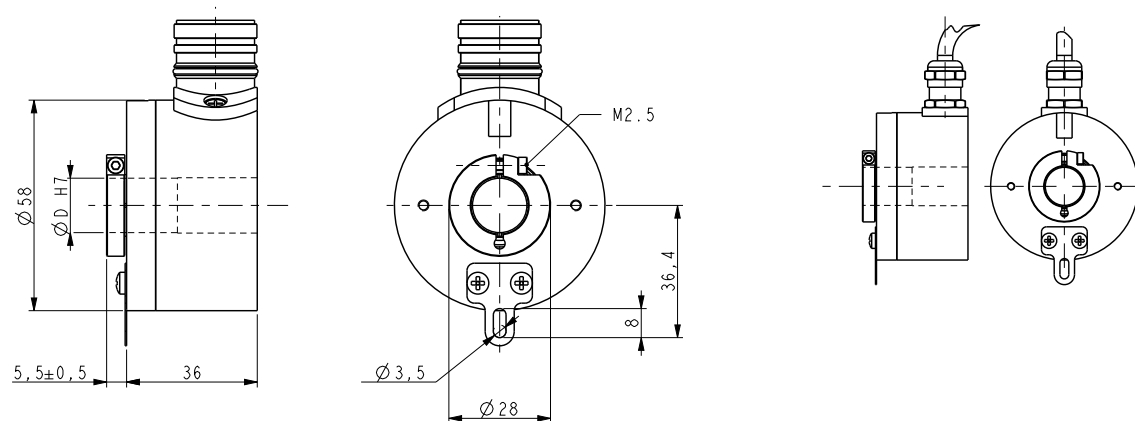
EPFL 121:	12 pin M23 mating connector
EC-C12F-LK-I8-x:	cordset x meter with M23 conn.
EC-M12F8-LK-M8-5:	cordset 5 meters with M12 conn.
EDE9S:	9 pin DSub mating connector
BR1:	Reducing sleeves



C58



C59



C60

Order code

C58	-	X	-	XXXXX	XXX	X	XX	X	X	X	XX	/Sxxx
C59		Ⓐ		Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ	Ⓘ	⓵
C60												

<p>Ⓐ OUTPUT CIRCUITS Y = Push Pull L = Line Driver (RS422) H = PP/LD universal circuit</p> <p>Ⓑ RESOLUTION (PPR) See electrical specifications</p>	<p>Ⓒ OUTPUT SIGNALS / CONNECTIONS BNF = AB cable output BCU = AB, /AB cable output ZNF = ABO cable output ZCU = ABO, /ABO cable output BCZ = AB /AB, M23 12 pin plug ZCZ = ABO /ABO, M23 12 pin plug ZCM = ABO /ABO, M12 8 pin plug</p> <p>Ⓓ SUPPLY VOLTAGE 1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y output circuit) 4 = +5V÷ +30V (H output circuit)</p>	<p>Ⓔ SHAFT DIAMETER 14 = 14 mm 15 = 15 mm</p> <p>Ⓕ PROTECTION - = IP64 (standard) P = IP65</p> <p>Ⓖ COUNTING FREQUENCY - = 100 kHz (standard) W = 300 kHz</p>	<p>Ⓗ OPERATING TEMPERATURE - = -25°C +85°C (-13°F +185°F) standard K = -40°C +100°C (-40°F +212°F)</p> <p>Ⓘ CABLE LENGTH (not with BCZ, ZCZ, ZCM) - = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m CLx = x m cable with DSub 9 pin inline plug</p> <p>⓵ CUSTOM VERSION</p>
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ROTAPULS

Incremental encoders

Series

C58A • C58R



- Compact design, Ø 58 mm
- Through hollow shaft encoder
- Resolution up to 5000 pulses/rev.
- Feedback encoder for DC / AC motors
- C58A: fixing collar on front side
- C58R: fixing collar on back side



C58R • C58A

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP64
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	<ul style="list-style-type: none"> • Operating temperature range: -40°C +100°C (-40°F +212°F) • IP65 Protection (3000 rpm max, torque 1 Ncm)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 14, 15 mm
Shaft loading (axial, radial):	30 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	1 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 1 m (3.3 ft)
Weight:	~ 150 g (5,2 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

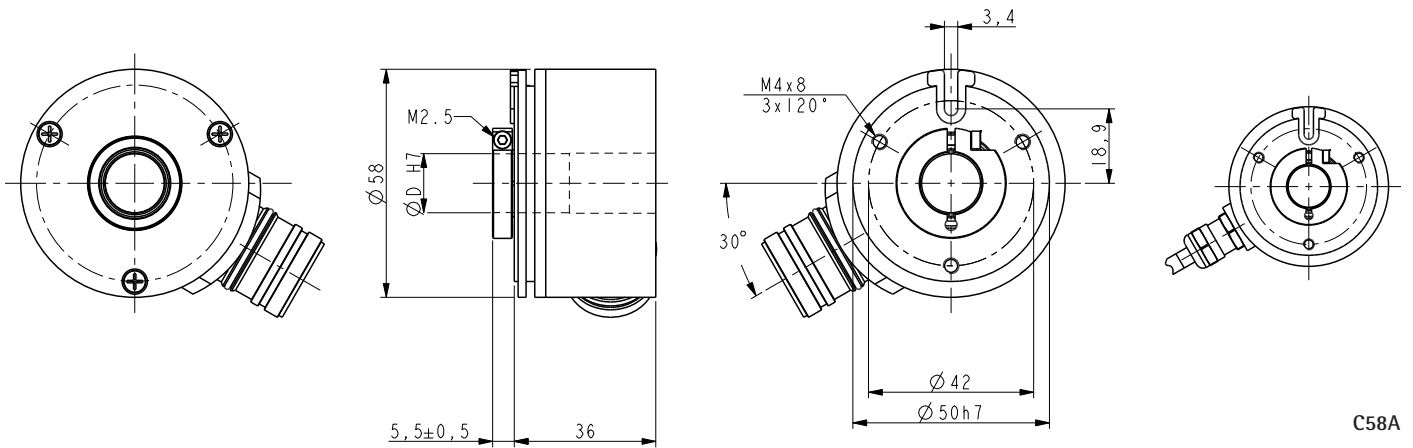
Resolution (PPR):	4-5-10-12-15-16-20-24-25-30-35-36-40-45-50-60-70 80-90-100-120-125-142-150-180-200-236-250-256 267-300-314-360-400-433-435-471-500-600-635-720 784-875-900-1000-1024-1250-1800-2000-2048-2500 3600-4000-4096-5000
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	counting frequency up to 300 KHz

MATERIALS

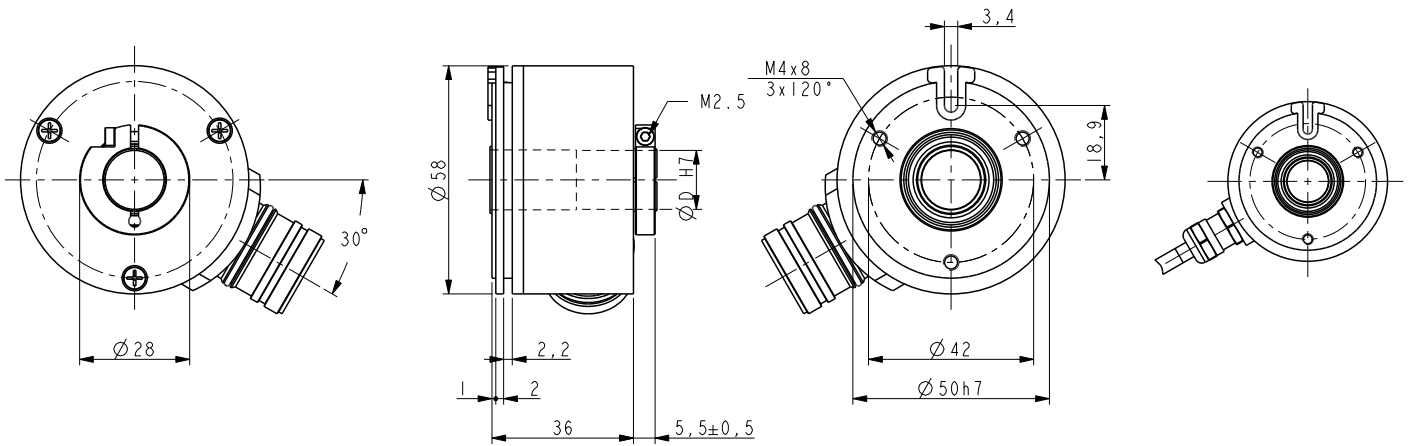
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EPFL 121:	12 pin M23 mating connector
EC-C12F-LK-I8-x:	cordset x meter with M23 conn.
EC-M12F8-LK-M8-5:	cordset 5 meters with M12 conn.
EDE9S:	9 pin DSub mating connector
BR1:	Reducing sleeves



C58A



C58R

Order code

C58A	-	X	-	XXXXX	XXX	X	XX	X	X	X	XX	/Sxxx
C58R		Ⓐ		Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ	Ⓘ	⓵

<p>Ⓐ OUTPUT CIRCUITS Y = Push Pull L = Line Driver (RS422) H = PP/LD universal circuit</p> <p>Ⓑ RESOLUTION (PPR) See electrical specifications</p>	<p>Ⓒ OUTPUT SIGNALS / CONNECTIONS BNF = AB cable output BCU = AB, /AB cable output ZNF = ABO cable output ZCU = ABO, /ABO cable output BCZ = AB /AB, M23 12 pin plug ZCZ = ABO /ABO, M23 12 pin plug ZCM = ABO /ABO, M12 8 pin plug</p> <p>Ⓓ SUPPLY VOLTAGE 1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y output circuit) 4 = +5V÷ +30V (H output circuit)</p>	<p>Ⓔ SHAFT DIAMETER 14 = 14 mm 15 = 15 mm</p> <p>Ⓕ PROTECTION - = IP64 (standard) P = IP65</p> <p>Ⓖ COUNTING FREQUENCY - = 100 kHz (standard) W = 300 kHz</p>	<p>Ⓗ OPERATING TEMPERATURE - = -25°C +85°C (-13°F +185°F) standard K = -40°C +100°C (-40°F +212°F)</p> <p>Ⓘ CABLE LENGTH (not with BCZ, ZCZ, ZCM) - = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m CLx = x m cable with DSub 9 pin inline plug</p> <p>⓵ CUSTOM VERSION</p>
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ROTAPULS

Incremental encoders

Series

CK58 • CK59 • CK60



- Standard encoder for heavy industrial applications
- Blind hollow shaft up to Ø 15 mm
- Connector or cable output
- ABO or sine/cosine signals



CK60 • CK58 • CK59

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP64
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none"> • Operating temperature range: -40°C +100°C (-40°F +212°F) • IP65 Protection (typ. 3000 rpm / 6000 temporary)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	14, 15 mm
Reducing sleeves from Ø 15 mm to:	Ø 6, 8, 9,52, 10, 11, 12 mm
Shaft loading (axial, radial):	50 N max.
Shaft rotational speed:	typ. 6000 rpm / 12000 temporary
Starting torque (at 20°C):	0,4 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 1 m (3.3 ft)
Weight:	~ 200 g (7 oz)
Options:	<ul style="list-style-type: none"> • additional cable • DSub 9 pin inline plug

ELECTRICAL SPECIFICATIONS

Resolution (PPR): (output circuit N, P, Y, L, H)	2-4-5-8-10-12-15-16-20-24-25-30-35-36-40-50-60-64-70-80 90-100-120-127-142-150160-180-200-216-230-236-240-250 254-256-267-270-300-314-360-375-400-410-435471-500-512 600-635-720-750-800-900-1000-1024-1068-1200-1250-1270 1400-1440-1500-1800-2000-2048-2250-2400-2500-3000-3600 4000-4096-5000-6000-8192-9000-10000
Resolution (PPR): (output circuit V)	500-512-1000-1024-1250-2000-2048-2500
Counting frequency:	100 kHz max.
Output circuits:	NPN, PNP, Push-Pull, Line Driver, Universal circuit, Sine/cosine
Power supply:	+5V±5%, +10V +30V,+5V +30V (sine/cosine only +5V±5%)
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L and V circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	<ul style="list-style-type: none"> • Counting frequency up to 300 kHz • Line Driver 24/5V

MATERIALS

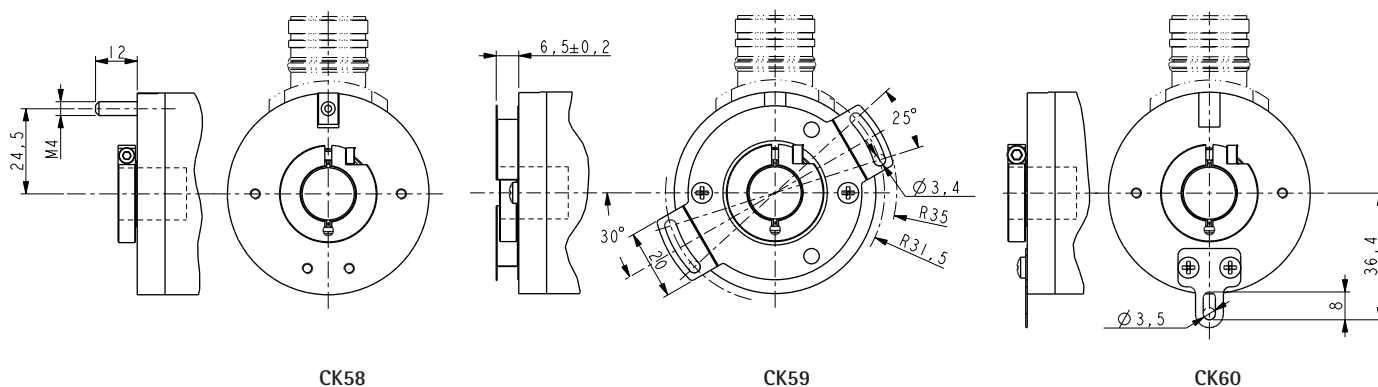
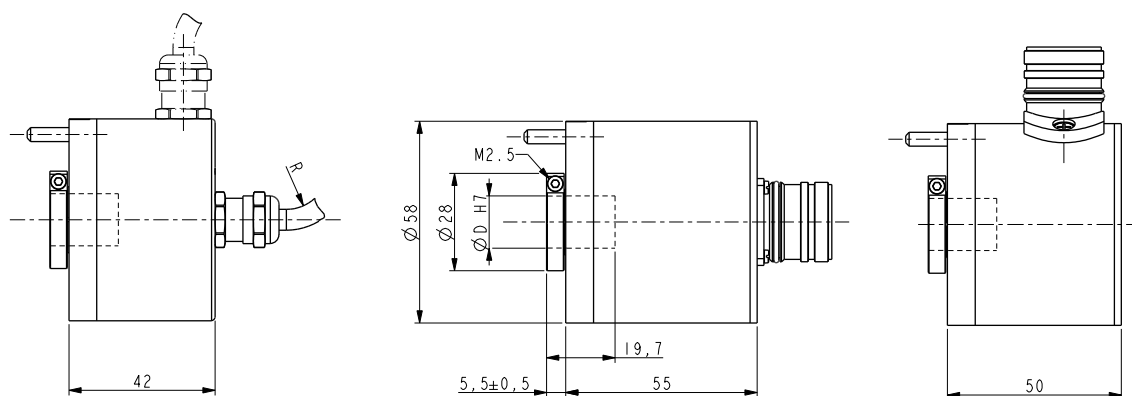
Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

PREFERENTIAL MODELS

CK58-H-500ZCU415R	500 PPR, HTL/TTL output
CK58-H-1000ZCU415R	1000 PPR, HTL/TTL output
CK58-H-1024ZCU415R	1024 PPR, HTL/TTL output
CK58-H-2048ZCU415R	2048 PPR, HTL/TTL output

ACCESSORIES

EPFL 121:	12 pin M23 mating connector
EC-C12F-LK-l8-x:	cordset x meter with M23 conn.
EC-M12F8-LK-M8-5:	cordset 5 meters with M12 conn.
EDE9S:	9 pin DSub mating connector
BR1:	Reducing sleeves



CK58

CK59

CK60

Order code

CK58	-	X	-	XXXXX	XXX	X	XX	X	X	X	X	XX	/Sxxx
CK59		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
CK60													

(a) OUTPUT CIRCUITS

N = NPN o.c.
 P = PNP o.c.
 Y = Push Pull
 L = Line Driver (RS422)
 H = PP/LD universal circuit
 V = 1 Vpp sine/cosine

(b) RESOLUTION (PPR)

See electrical specifications

(c) OUTPUT SIGNALS / CONNECTIONS

BNF = AB, cable output (except V output)
 ZNF = ABO, cable output (except V output)
 BCU = AB /AB, cable output
 ZCU = ABO /ABO, cable output
 BCZ = AB /AB, M23 12 pin plug
 ZCZ = ABO /ABO, M23 12 pin plug
 ZCM = ABO /ABO, M12 8 pin plug

(d) SUPPLY VOLTAGE

1 = +5V±5% (L, V output circuit)
 2 = +10V÷ +30V (N, P, Y output circuit)
 4 = +5V÷ +30V (H output circuit)

(e) SHAFT DIAMETER

6 = 6 mm
 8 = 8 mm
 P9 = 9.52 mm - 3/8"
 10 = 10 mm
 12 = 12 mm

(f) CONNECTION POSITION

- = axial
 R = radial

(g) PROTECTION

- = IP64 (standard)
 P = IP65

(h) COUNTING FREQUENCY

- = 100 kHz (standard)
 W = 300 kHz

(i) OPERATING TEMPERATURE

- = -25°C +85°C (-13°F +185°F) standard
 K = -40°C +100°C (-40°F +212°F)

(j) CABLE LENGTH

- = cable output 1 m (standard)
 L2 = cable output 2 m
 Lx = cable output x m
 CLx = x m cable with DSub 9 pin inline plug

(k) CUSTOM VERSION

ROTAPULS

Feedback encoder for servo & gearless motors

Series

CB59 • CB60



- Feedback encoder for servo & gearless motors
- 2048 PPR sine/cosine output
- Absolute track for rotor/stator position
- Hollow or tapered shaft design
- Pin compatible connector with market products



CB59 • CB60

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP40
Operating temperature range:	-20°C+100°C (-4°F +212°F)
Storage temperature range:	-20°C+100°C (-4°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	hollow, Ø 12.7, 15 mm solid, 1:10 taper
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	12000 rpm max.
Starting torque at 20°C:	0,15 Ncm (typical)
Bearings life:	10 ⁹ rev. min.
Electrical connections:	PCB connector (connection cable to be ordered separately)
Weight:	~ 200 g (7 oz)

ELECTRICAL SPECIFICATIONS

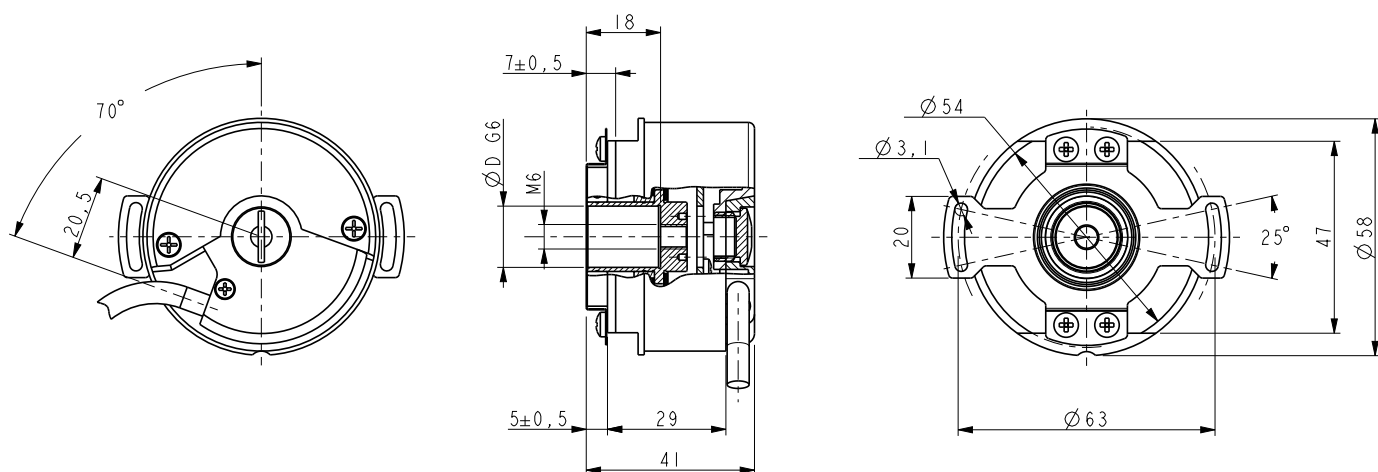
Resolution (PPR):	2048 + absolute Z-track
Counting frequency:	300 kHz max.
Output circuits:	1Vpp
Power supply:	+5V±5%
Consumption:	130 mA max.
Output current (each channel):	40 mA max.
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

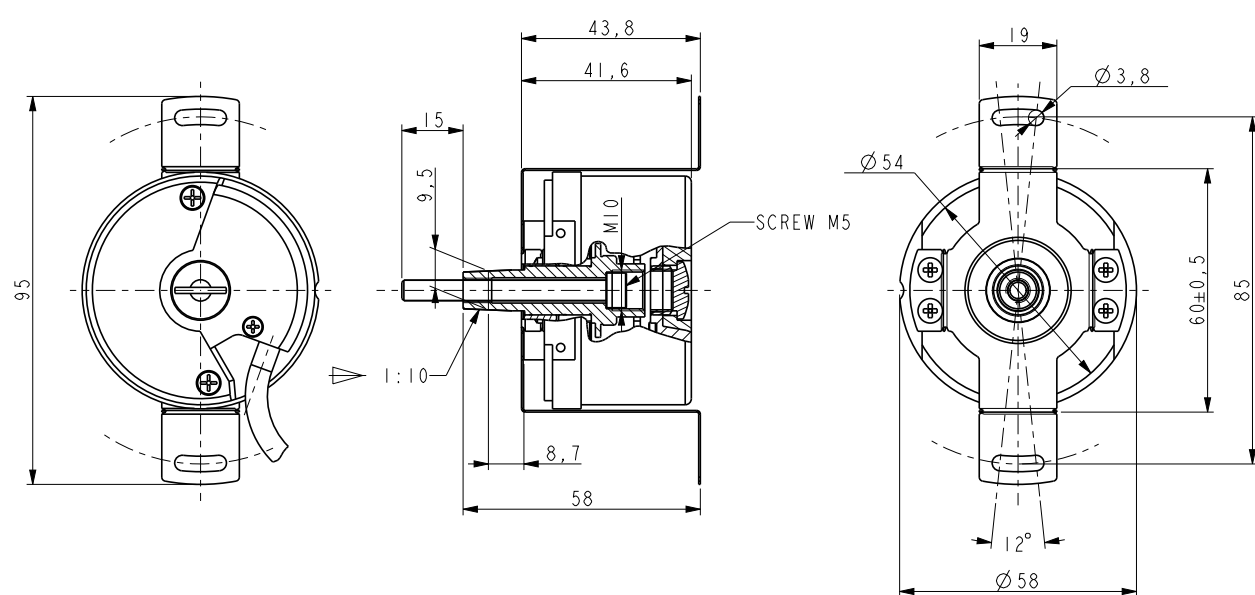
Flange:	aluminium, anticorodal, UNI EN AW-6082
Housing:	aluminium, anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EC-CB61-1:	Connection cable 1 m
EC-CB61-4:	Connection cable 4 m
EC-CB61-7:	Connection cable 7 m



CB59



CB60

Order code

CB59	-	X	-	XXXX/X	X	XXX	/Sxxx
CB60		(a)		(b)	(c)	(d)	(e)

Accessories order code

EC-CB61-1
EC-CB61-4
EC-CB61-7

<p>(a) OUTPUT CIRCUIT V = 1 Vpp sine/cosine + Z track</p>	<p>(c) SUPPLY VOLTAGE 1 = +5V ±5%</p>
<p>(b) RESOLUTION (PPR) 2048/1</p>	<p>(d) SHAFT DIAMETER P12 = 12,7 mm - 1/2" 15 = 15 mm C10 = 1:10 taper</p>
<p>(e) CUSTOM VERSION</p>	

Connection cable 1 m
Connection cable 4 m
Connection cable 7 m

ROTAMAG

Magnetic incremental encoders

Series

MI58 • MI58S • MC58 • MC59 • MC60



- Magnetic sensing technology
- Solid and through hollow shaft design
- Resolution up to 10000 PPR (others on request)
- High protection degree with sealed circuits



MI58 • MI58S

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• IP67 protection (with sealed circuits)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	MI58, MI58S: 12000 rpm max. MC58, MC59, MC60: 3000 rpm (typ), 6000 rpm max.
Starting torque at 20°C:	MI58, MI58S: ≤ 0,4 Ncm (typical) MC58, MC59, MC60: 1 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M23 plug or cable output 1 m (3.3 ft)
Weight:	~ 300 g (10,6 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

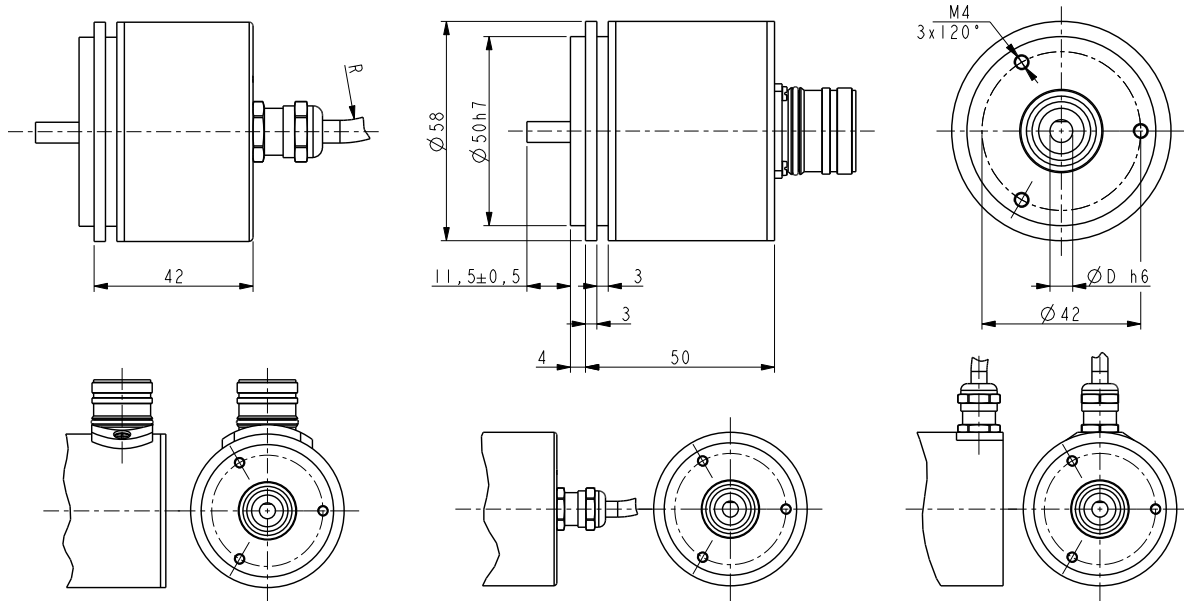
Resolution (PPR):	20-40-80-160-200-320-400-500-640-800-1000 1280-1600-2000-2500-2560-5000-10000
Accuracy:	± 0,5°
Counting frequency:	500 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V, +5V +30V
Consumption:	60 mA max.
Output current (per channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4

MATERIALS

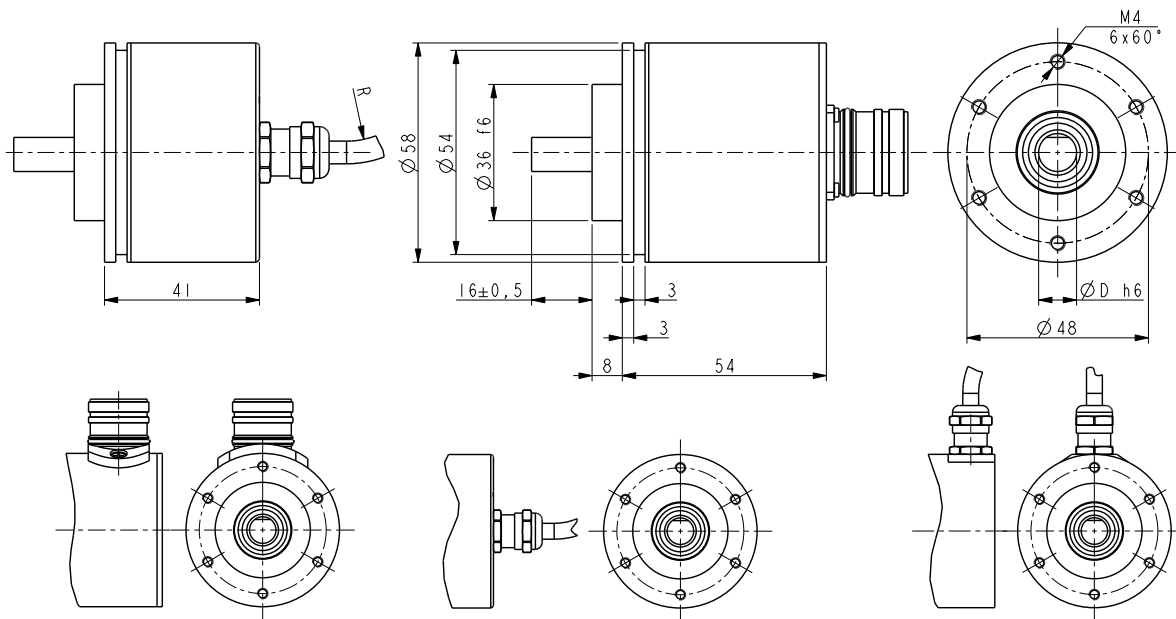
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305

ACCESSORIES

EPFL 121:	12 pin M23 mating connector
EC-C12F-LK-I8-x:	cordset x meter with M23 conn.
PAN/PFG:	flexible couplings
LKM-386:	fixing clamps
BR1:	Reducing sleeves



MI58



MI58S

Order code

MI58	-	X	-	XXXXX	XXX	X	XX	X	X	X	/Sxxx
MI58S		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)

(a) OUTPUT CIRCUITS

Y = Push Pull
L = Line Driver (RS422)
H = PP/LD universal circuit

(b) RESOLUTION (PPR)

See electrical specifications

(c) OUTPUT SIGNALS / CONNECTIONS

BNF = AB, cable output
BCU = AB /AB, cable output
BCZ = AB /AB, M23 12 pin plug
ZNF = ABO, cable output
ZCU = ABO /ABO, cable output
ZCZ = ABO /ABO, M23 12 pin plug

(d) SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
2 = +10V÷ +30V (Y output circuit)
4 = +5V÷ +30V (H output circuit)

(e) SHAFT DIAMETER

6 = 6 mm
8 = 8 mm
P9 = 9.52 mm - 3/8"
10 = 10 mm
12 = 12 mm

(f) CONNECTION POSITION

- = axial
R = radial

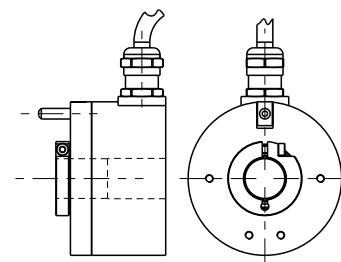
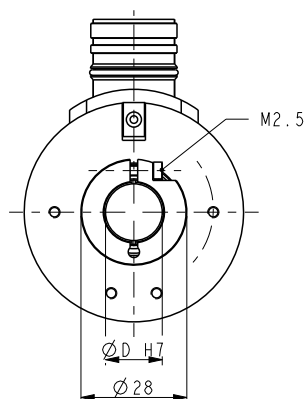
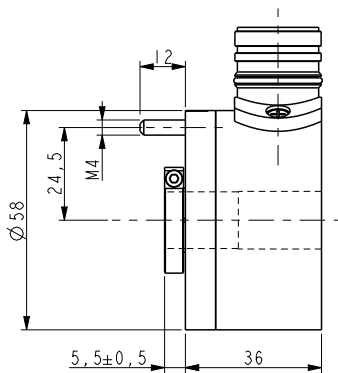
(g) PROTECTION

- = IP65 (standard)
J = IP67 (only with cable output)

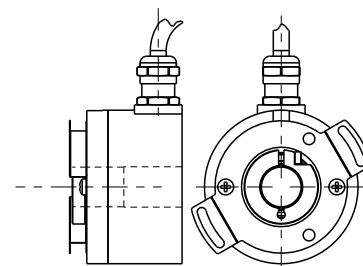
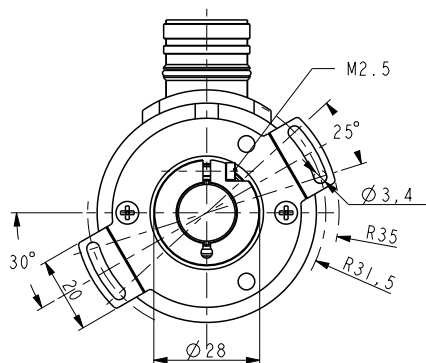
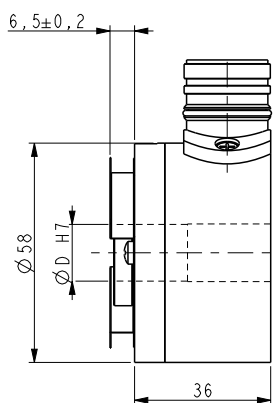
(h) CABLE LENGTH

(not with BCZ, ZCZ)
- = cable output 1 m (standard)
L2 = cable output 2 m
Lx = cable output x m

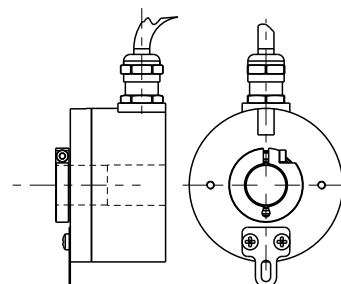
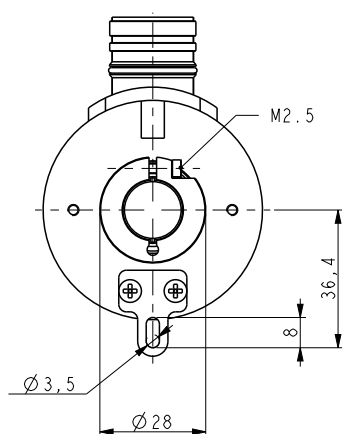
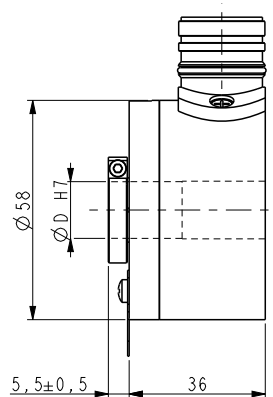
(i) CUSTOM VERSION



MC58



MC59

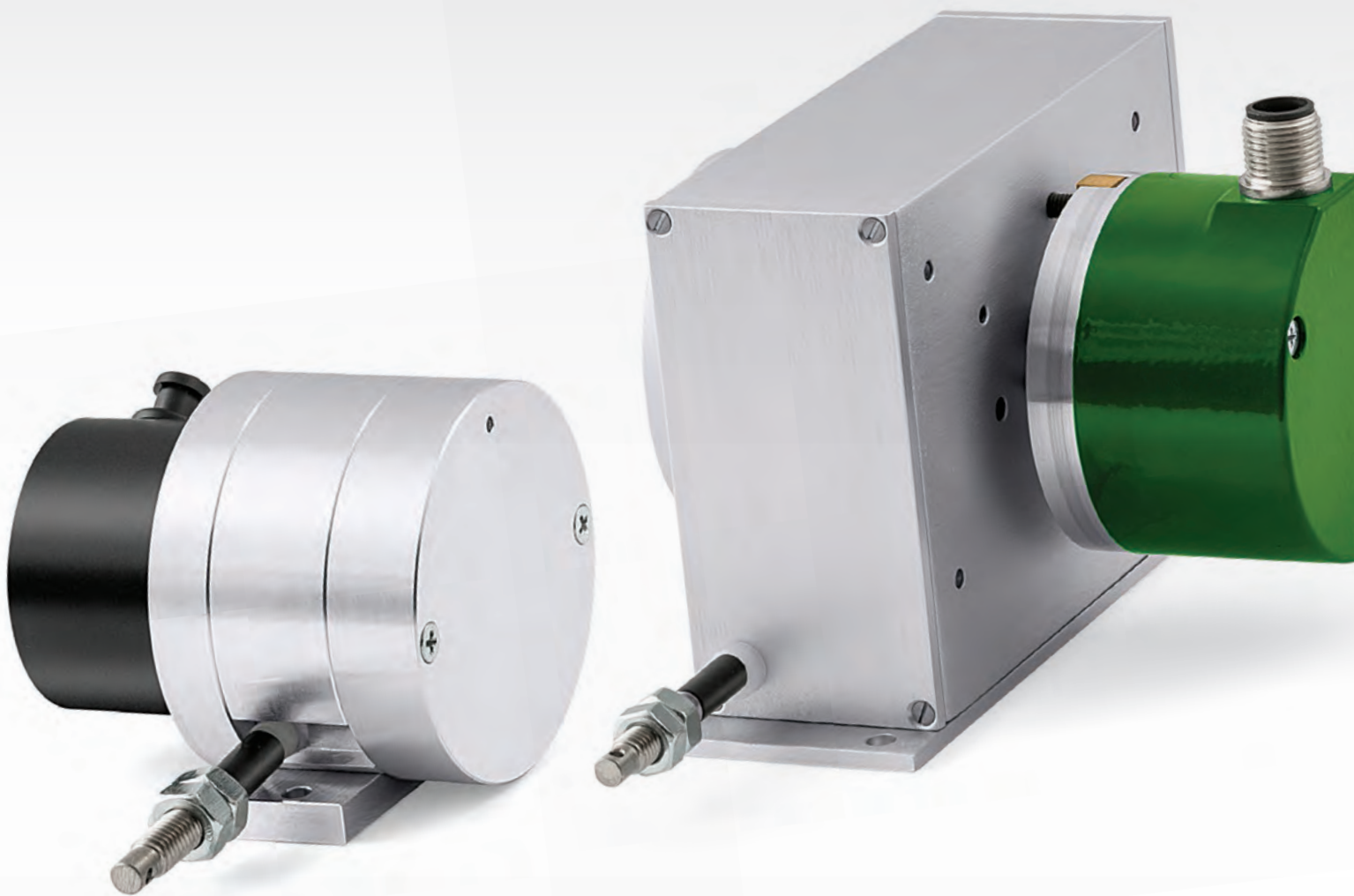


MC60

Order code

MC58	-	X	-	XXXXX	XXX	X	XX	X	X	X	/Sxxx
MC59		Ⓐ		Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ	Ⓘ
MC60											

<p>Ⓐ OUTPUT CIRCUITS</p> <p>Y = Push Pull L = Line Driver (RS422) H = PP/LD universal circuit</p> <p>Ⓑ RESOLUTION (PPR)</p> <p>See electrical specifications</p>	<p>Ⓒ OUTPUT SIGNALS / CONNECTIONS</p> <p>BNF = AB, cable output BCU = AB /AB, cable output BCZ = AB /AB, M23 12 pin plug ZNF = ABO, cable output ZCU = ABO /ABO, cable output ZCZ = ABO /ABO, M23 12 pin plug</p>	<p>Ⓓ SUPPLY VOLTAGE</p> <p>1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y output circuit) 4 = +5V÷ +30V (H output circuit)</p> <p>Ⓔ SHAFT DIAMETER</p> <p>14 = 14 mm 15 = 15 mm</p> <p>Ⓕ CONNECTION POSITION</p> <p>- = axial R = radial</p>	<p>Ⓖ PROTECTION</p> <p>- = IP65 (standard) J = IP67 (only with cable output)</p> <p>Ⓗ CABLE LENGTH (not with BCZ, ZCZ)</p> <p>- = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p> <p>Ⓘ CUSTOM VERSION</p>
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ROTAPULS

Incremental encoders

Series

I65 • IT65



- Robust die cast housing
- High shaft load
- Protection up to IP66 (shaft side)
- Clamp flange
- Square flange, US size
- Preferential versions available



I65 • IT65

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none"> • Operating temperature range: -40°C +100°C (-40°F +212°F) • IP66 Protection shaft end (torque 2,5 Ncm and 3000 rpm max.)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	0,4 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	MIL 7 pin, MIL 10 pin plug or cable output 1 m (3.3 ft)
Weight:	~ 400 g (14,1 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	2-4-5-8-10-12-15-16-20-24-25-30-35-36-40-50-60-64-70-80 90-100-120-127-142-150-160-180-200-216-230-236-240-250 254-256-267-270-300-314-360-375-400-410-435-471-500-512 600-635-720-750-800-900-1000-1024-1068-1200-1250-1270 1400-1440-1500-1800-2000-2048-2250-2400-2500-3000 3600-4000-4096-5000-6000-8192-9000-10000
Counting frequency:	100 kHz max.
Output circuits:	NPN, PNP, Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V,+5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	• Output frequency up to 300 kHz

MATERIALS

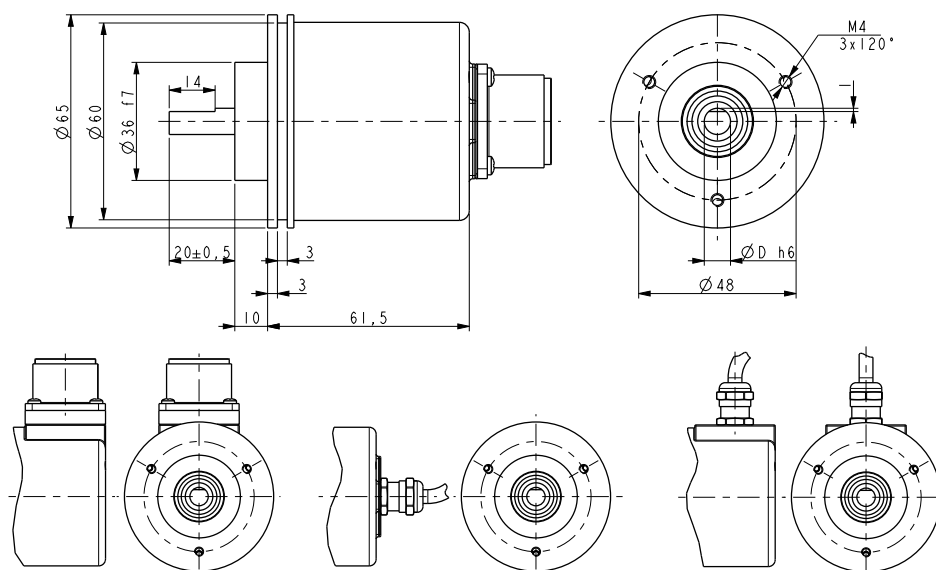
Flange:	anticorrosional, UNI EN AW-6082
Housing:	zamac die cast
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

PREFERENTIAL MODELS

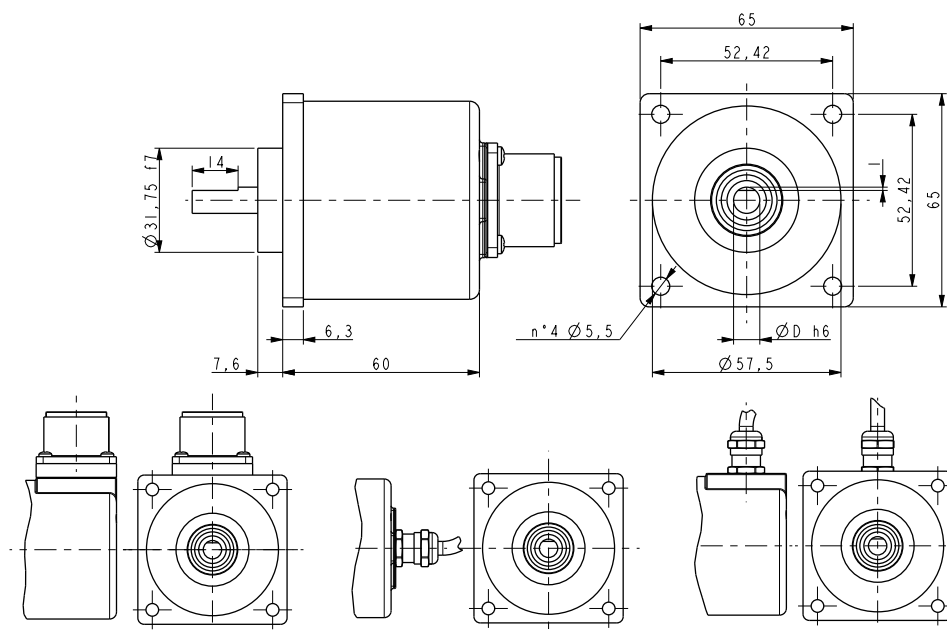
IT65-H-100ZCP4CR	100 PPR, HTL/TTL output
IT65-H-500ZCP4CR	500 PPR, HTL/TTL output
IT65-H-1000ZCP4CR	1000 PPR, HTL/TTL output
IT65-H-1024ZCP4CR	1024 PPR, HTL/TTL output
IT65-H-2500ZCP4CR	2500 PPR, HTL/TTL output
IT65-H-5000ZCP4CR	5000 PPR, HTL/TTL output

ACCESSORIES

E7MLS:	7 pin MIL mating connector
E10MLS:	10 pin MIL mating connector
PAN/PGF:	flexible couplings
LKM-386:	fixing clamps



I65



IT65

Order code

I65	-	X	-	XXXXX	XXX	X	X	X	X	X	X	XX	/Sxxx
IT65		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)

<p>(a) OUTPUT CIRCUITS N = NPN o.c. P = PNP o.c. Y = Push Pull L = Line Driver (RS422) H = PP/LD universal circuit</p> <p>(b) RESOLUTION (PPR) See electrical specifications</p>	<p>(c) OUTPUT SIGNALS / CONNECTIONS BNF = AB, cable output ZNF = AB0, cable output BND= AB, MIL 7 pin plug ZND= AB0, MIL 7 pin plug BCU = AB /AB, cable output ZCU = AB0 /AB0, cable output BCP = AB /AB, MIL 10 pin plug ZCP = AB0 /AB0, MIL 10 pin plug</p> <p>(d) SUPPLY VOLTAGE 1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y output circuit) 4 = +5V÷ +30V (H output circuit)</p>	<p>(e) SHAFT DIAMETER B = 6 mm C = 8 mm D = 9.52 mm - 3/8" E = 10 mm F = 12 mm</p> <p>(f) CONNECTION POSITION - = axial R = radial</p> <p>(g) PROTECTION - = IP65 (standard) Q = IP66 protection shaft side</p>	<p>(h) COUNTING FREQUENCY - = 100 kHz (standard) W = 300 kHz</p> <p>(i) OPERATING TEMPERATURE - = -25°C +85°C (-13°F +185°F) standard K = -40°C +100°C (-40°F +212°F)</p> <p>(j) CABLE LENGTH - = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p> <p>(k) CUSTOM VERSION</p>
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ROTAPULS

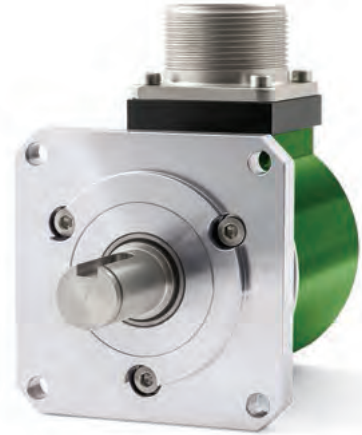
Incremental encoder

Series

IT68



- Popular machine tool encoder with increased reliability and performance
- Resolution up to 10000 PPR
- NPN, Push-Pull, Line Driver or Universal circuit
- Extended temperature range -40°C +100°C & IP66



IT68

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-40°C +100°C (-40°F +212°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Option:	• IP66 Protection shaft end (torque 2,5 Ncm and 3000 rpm max.)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 15 mm with keyway
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	0,4 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	MIL 10 pin, MIL 17 pin plug or cable output 1 m (3.3 ft)
Weight:	~ 500 g (17,6 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

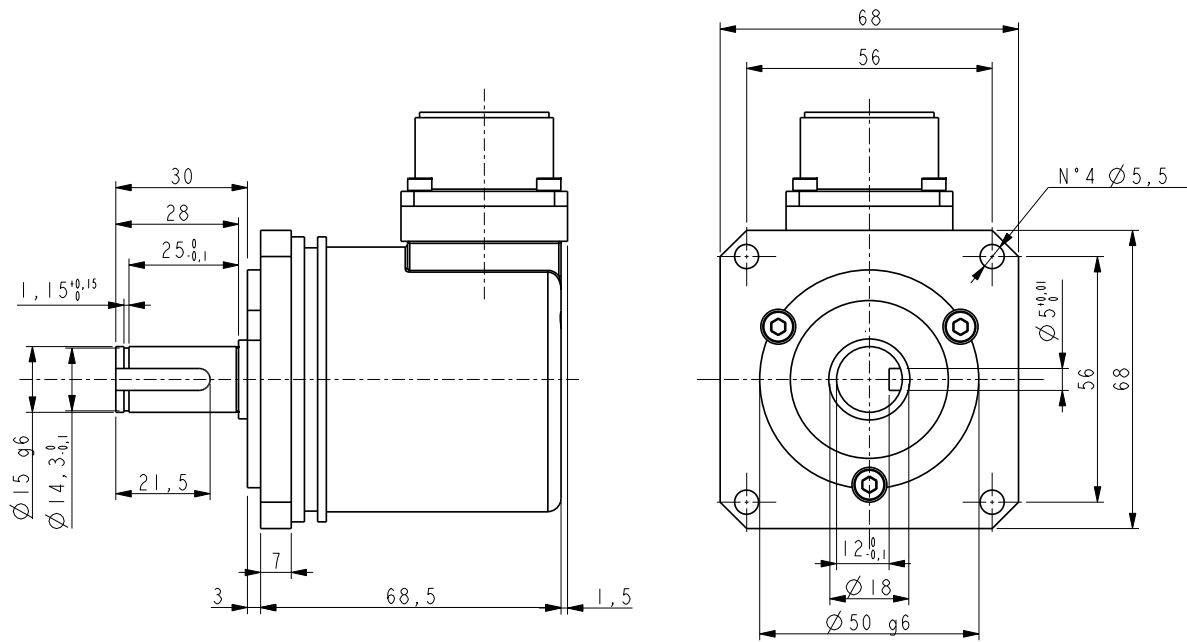
Resolution (PPR):	2-4-5-8-10-12-15-16-20-24-25-30-35-36-40-50-60-64-70-80 90-100-120-127-142-150-160-180-200-216-230-236-240-250 254-256-267-270-300-314-360-375-400-410-435-471-500 512-600-635-720-750-800-900-1000-1024-1068-1200-1250 1270-1400-1440-1500-1800-2000-2048-2250-2400-2500 3000-3600-4000-4096-5000-6000-8192-9000-10000
Counting frequency:	100 kHz max.
Output circuits:	NPN, PNP, Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V,+5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	• Output frequency up to 300 kHz

MATERIALS

Flange:	anticorodal, UNI EN AW-6082
Housing:	zamac die cast
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

E17MLS:	17 pin MIL mating connector
E10MLS:	10 pin MIL mating connector



IT68

Order code

IT68	-	X (a)	-	XXXXX (b)	XXX (c)	X (d)	G (e)	X (f)	X (g)	X (h)	K (i)	XX (j)	/Sxxx (k)
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(a) OUTPUT CIRCUITS

N = NPN o.c.
 P = PNP o.c.
 Y = Push Pull
 L = Line Driver (RS422)
 H = PP/LD universal circuit

(b) RESOLUTION (PPR)

See electrical specifications

(c) OUTPUT SIGNALS / CONNECTIONS

ZCU = ABO /ABO, cable output
 ZCP = ABO /ABO, MIL 10 pin plug
 ZCQ = ABO /ABO, MIL 17 pin plug

(d) SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
 2 = +10V± 30V (N, P and Y output circuit)
 4 = +5V± 30V (H output circuit)

(e) SHAFT DIAMETER

G = 15 mm

(f) CONNECTION POSITION

- = axial
 R = radial

(g) PROTECTION

- = IP65 (standard)
 Q = IP66 protection shaft side

(h) COUNTING FREQUENCY

- = 100 kHz (standard)
 W = 300 kHz

(i) OPERATING TEMPERATURE

K = -40°C +100°C (-40°F +212°F) standard

(j) CABLE LENGTH (only with ZCU)

L1 = cable output 1 m (standard)
 L2 = cable output 2 m
 Lx = cable output x m

(k) CUSTOM VERSION

ROTAPULS

ATEX incremental encoder

Series

XC77



- Encoder with ATEX II 2GD Ex d IIC T6 certification
- Suitable for ATEX zones 1, 2, 21 and 22
- Compact & robust construction with axial/radial cable outlet
- Ø 14 mm hollow shaft
- Resolution up to 10000 PPR



XC77

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP66
Environmental temperature at max. speed:	40°C max
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Protection mode:	EEx d IIC T6
Dimensions:	see drawing
Hollow shaft diameter:	Ø 14 mm
Shaft loading (axial, radial):	60 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	≤ 5 Ncm
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 750 g (26,4 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

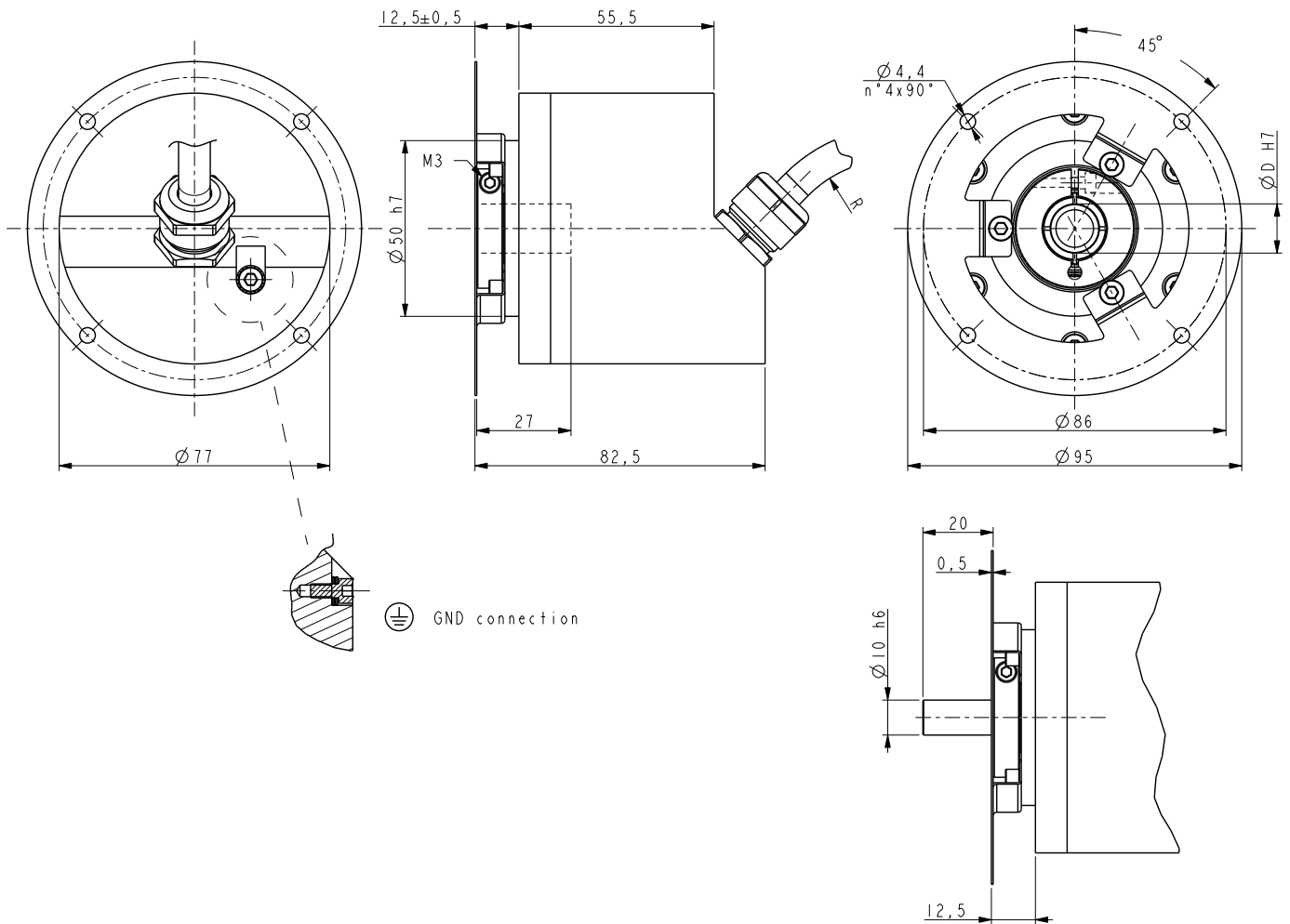
Resolution (PPR):	2-4-5-8-10-12-15-16-20-24-25-30-35-36-40-50-60-64-70-80 90-100-120-127-142-150-160-180-200-216-230-236-240-250 254-256-267-270-300-314-360-375-400-410-435-471-500-512 600-635-720-750-800-900-1000-1024-1068-1200-1250-1270 1400-1440-1500-1800-2000-2048-2250-2400-2500-3000-3600 4000-4096-5000-6000-8192-9000-10000
Counting frequency:	100 kHz max.
Output circuits:	NPN, Push-Pull, Line Driver, Universal circuit
Power supply:	+5Vdc ± 5%, +10Vdc +30Vdc, +5Vdc +30Vdc
Consumption:	70 mA (typical)
Output current (per channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorodal, UNI EN AW-6082 (UNI EN 573)
Housing:	anticorodal, UNI EN AW-6082 (UNI EN 573)
Bearings:	ABEC 5
Shaft and clamping ring:	1.4305 (UNI EN 10088-1)

ACCESSORIES

LKM-1578:	Ø 10 mm shaft extension
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XC77

Order code

XC77	-	X a	-	XXXXX b	XXX c	X d	XX e	XX f	/Sxxx g
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a OUTPUT CIRCUITS

N = NPN o.c.
Y = Push Pull
L = Line Driver (RS422)
H = PP/LD universal circuit

b RESOLUTION (PPR)

See electrical specifications

c OUTPUT SIGNALS / CONNECTION

ZCU = ABO /ABO, cable output

d SUPPLY VOLTAGE

1 = +5Vdc $\pm 5\%$ (L output circuit)
2 = +10Vdc \div +30Vdc (N and Y output circuits)
4 = +5Vdc \div +30Vdc (H output circuit)

e SHAFT DIAMETER

14 = 14 mm

f CABLE LENGTH

- = cable output 1 m cable
L2 = cable output 2 m
L7 = cable output 7 m
Lx = cable output x m

g CUSTOM VERSION

ROTAPULS

Incremental encoder

Series

C80



- Feedback encoder with for big size motors
- Precise optical sensing
- Very flat design
- Through hollow shaft up to Ø 30 mm
- Robust die cast housing with IP65 protection



C80

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP64
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none"> • Operating temperature range: -40°C +100°C (-40°F +212°F) • IP65 Protection (3000 rpm max, torque 2 Ncm)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 25, 30 mm
Reducing sleeves, BR2-xx from Ø 30 mm to:	Ø 15, 5/8" (15,875), 16, 17, 18, 19, 20 22, 23, 24, 1" (25,4), 28 mm
Shaft loading (axial and radial):	30 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	≤ 1,5 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M23 12 pin plug or cable output 1 m (3.3 ft)
Weight:	~ 300 g (10,6 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	12-100-200-360-400-500-1000-1024-2000-2048
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V ±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

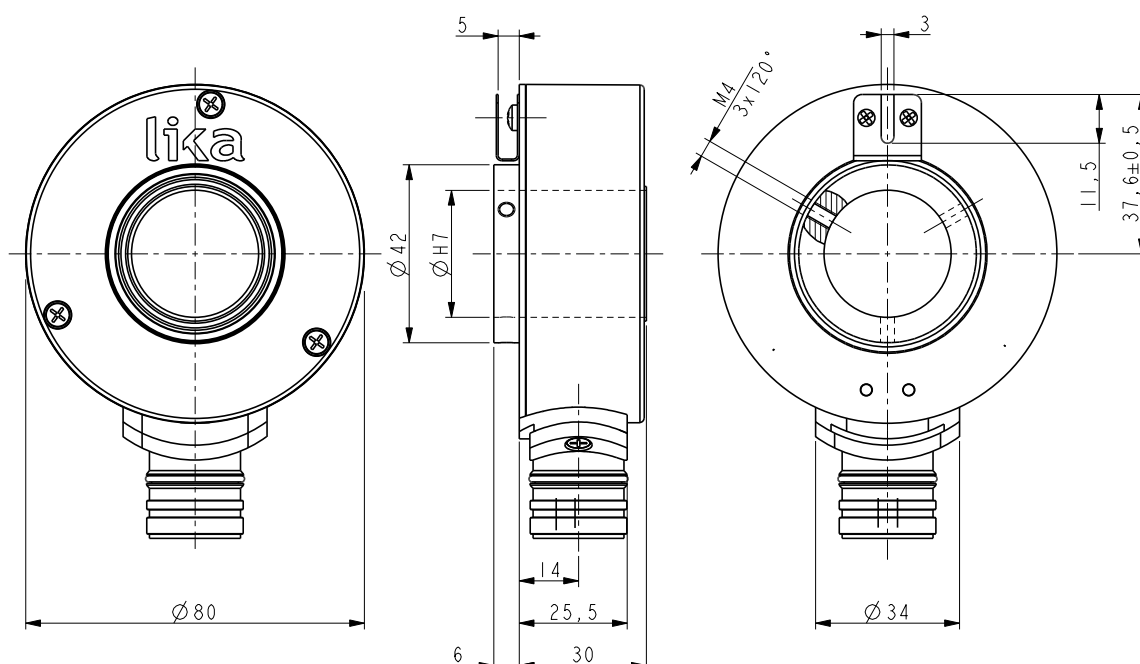
Flange:	die cast aluminium, UNI EN AC-46100
Housing:	die cast aluminium, UNI EN AC-46100
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic 1.4305 (UNI EN 10088-1)
Light source:	GaAl diodes

PREFERENTIAL MODELS

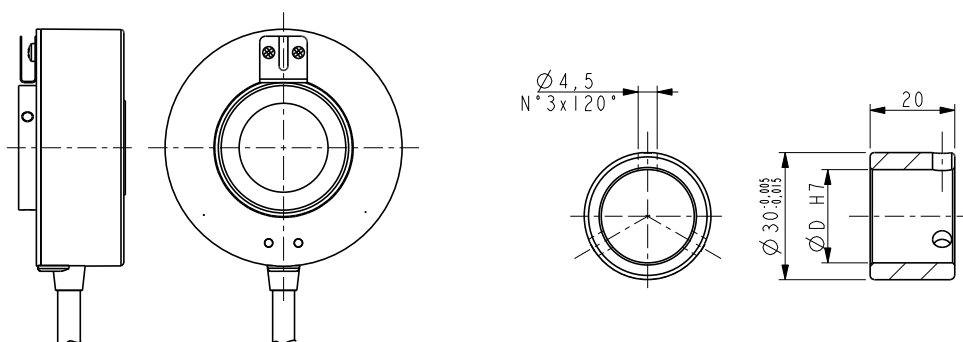
C80-H-1024ZCU430L2	1024 PPR, HTL/TTL output
C80-H-2048ZCU430L2	2048 PPR, HTL/TTL output

ACCESSORIES

EDE9S:	9 pin DSub mating connector
BR2-xx:	reducing sleeves
EPFL121:	12 pin M23 mating connector



C80



BR2-xx

Order code

C80	-	X	-	XXXXX	XXX	X	XX	X	X	XX	/Sxxx
		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)

<p>(a) OUTPUT CIRCUITS Y = Push Pull L = Line Driver (RS422) H = PP/LD universal circuit</p> <p>(b) RESOLUTION (PPR) See electrical specifications</p>	<p>(c) OUTPUT SIGNALS / CONNECTIONS BNF = AB, cable output ZNF = ABO, cable output BCU = AB /AB, cable output ZCU = ABO /ABO, cable output BCZ = AB /AB, M23 12 pin plug ZCZ = ABO /ABO, M23 12 pin plug</p> <p>(d) SUPPLY VOLTAGE 1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y output circuit) 4 = +5V÷ +30V (H output circuit)</p>	<p>(e) SHAFT DIAMETER 25 = 25 mm 30 = 30 mm</p> <p>(f) PROTECTION - = IP64 (standard) P = IP65</p> <p>(g) OPERATING TEMPERATURE - = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)</p>	<p>(h) CABLE LENGTH - = cable output 1 m L2 = cable output 2 m L7 = cable output 7 m Lx = cable output x m CLx = x m cable with DSub 9 pin inline plug</p> <p>(i) CUSTOM VERSION</p>
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ROTAPULS

Incremental encoder

Series

C81



- Encoder for lift traction machines and big size motors
- Precise optical sensing
- Internal structure in stainless steel
- Hollow shaft from Ø 30 to Ø 44 mm



C81

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP54
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none">• Operating temperature range: -40°C +100°C (-40°F +212°F)• IP65 Protection (2000 rpm max, torque 2 Ncm)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 30, 34, 35, 38, 40, 42, 44 mm
Reducing sleeves, BR2-xx from Ø 30 mm to:	Ø 15, 5/8" (15,875), 16, 17, 18, 19, 20 22, 23, 24, 1" (25,4), 28 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	max. 2000 rpm@70°C (158°F)/IP54, 3000 rpm@100°C (212°F)/IP54 max. 1500 rpm@70°C (158°F)/IP65, 2000 rpm@100°C (212°F)/IP65
Starting torque (at 20°C):	4 ÷ 12 Ncm (typical)
Misalignment:	± 0,3 mm radial ± 0,2 mm axial
Bearing life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	cabl e output 1 m (3.3 ft)
Weight:	~ 300 g (10,6 oz)
Option:	<ul style="list-style-type: none">• additional cable

ELECTRICAL SPECIFICATIONS

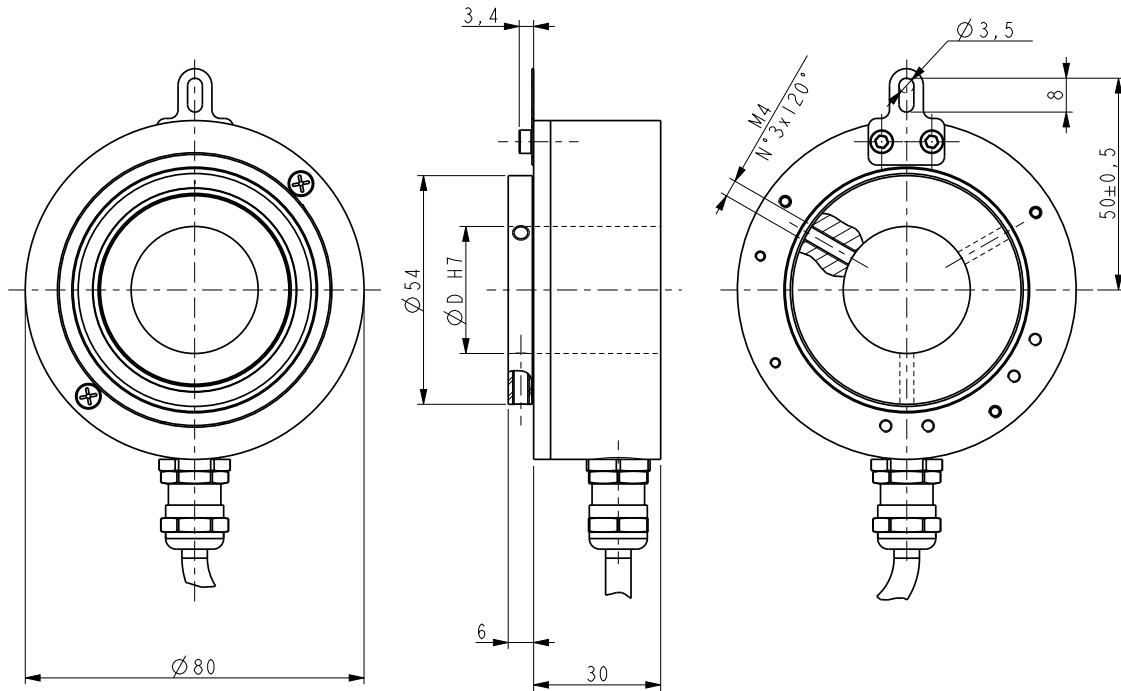
Resolution (PPR):	12-100-300-400-500-1024-2000-2048-2500-4096
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V ±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	<ul style="list-style-type: none">• Output freq. 200 kHz max.

MATERIALS

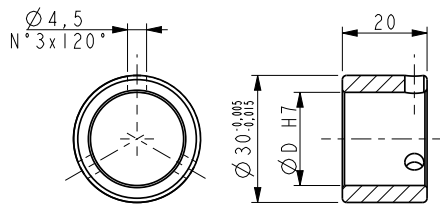
Flange:	steel, UNI EN 4305
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EDE9S:	9 pin DSub mating connector
BR2-xx:	reducing sleeves



C81



BR2-xx

Order code

C81	-	X Ⓐ	-	XXXXX Ⓑ	XXX Ⓒ	XX Ⓔ	X Ⓕ	X Ⓖ	X Ⓗ	XX Ⓘ	/Sxxx Ⓚ
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Ⓐ OUTPUT CIRCUITS

Y = Push Pull
L = Line Driver (RS422)
H = PP/LD universal circuit

Ⓑ RESOLUTION (PPR)

See electrical specifications

Ⓒ OUTPUT SIGNALS / CONNECTIONS

BNF = AB, cable output
ZNF = ABO, cable output
BCU = AB /AB, cable output
ZCU = ABO /ABO, cable output

Ⓓ SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
2 = +10V÷ +30V (Y output circuit)
4 = +5V÷ +30V (H output circuit)

Ⓔ SHAFT DIAMETER

30 = 30 mm
34 = 34 mm
35 = 35 mm
38 = 38 mm
40 = 40 mm
42 = 42 mm
44 = 44 mm (43,97)

Ⓕ PROTECTION

- = IP64 (standard)
P = IP65

Ⓖ COUNTING FREQUENCY

- = 100 kHz standard
W = 200 kHz

Ⓗ OPERATING TEMPERATURE

- = -25°C +85°C (-13°F +185°F)
K = -40°C +100°C (-40°F +212°F)

Ⓘ CABLE LENGTH

- = cable output 1 m
L2 = cable output 2 m
L7 = cable output 7 m
Lx = cable output x m
CLx = x m cable with DSub 9 pin inline plug

Ⓚ CUSTOM VERSION

ROTAPULS

Incremental encoder

Series

C82



- Encoder for elevator motors
- Precise optical sensing
- Operating temperature up to -40°C $+100^{\circ}\text{C}$
- Resolution from 12 to 4096 PPR
- Hollow shaft from \varnothing 30 to \varnothing 44 mm



C82

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP54
Operating temperature range:	-25°C $+85^{\circ}\text{C}$ (-13°F $+185^{\circ}\text{F}$)
Storage temperature range:	-25°C $+85^{\circ}\text{C}$ (-13°F $+185^{\circ}\text{F}$) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none">• Operating temperature range: -40°C $+100^{\circ}\text{C}$ (-40°F $+212^{\circ}\text{F}$)• IP65 Protection (2000 rpm max, torque 2 Ncm)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft hollow:	\varnothing 30, 34, 35, 38, 40, 42, 44 mm
Reducing sleeves, BR2-xx from \varnothing 30 mm to:	\varnothing 15, 5/8" (15,875), 16, 17, 18, 19, 20, 22, 23, 24, 1" (25,4), 28 mm
Shaft loading:	axial: 100 N max. radial: 200 N max.
Shaft rotational speed:	max. 2000 rpm@ 70°C (158°F)/IP54, 3000 rpm@ 100°C (212°F)/IP54 max. 1500 rpm@ 70°C (158°F)/IP65, 2000 rpm@ 100°C (212°F)/IP65
Starting torque at 20°C :	$4 \div 12$ Ncm (typical)
Misalignment:	$\pm 0,3$ mm radial $\pm 0,2$ mm axial
Bearings life:	400×10^6 rev. min. (10^9 rev. min. with 20 N shaft loading max.)
Electrical connections:	M23 12 pin plug or cable output 1 m (3.3 ft)
Weight:	$\sim 0,3$ g (10,6 oz)
Option:	<ul style="list-style-type: none">• additional cable

ELECTRICAL SPECIFICATIONS

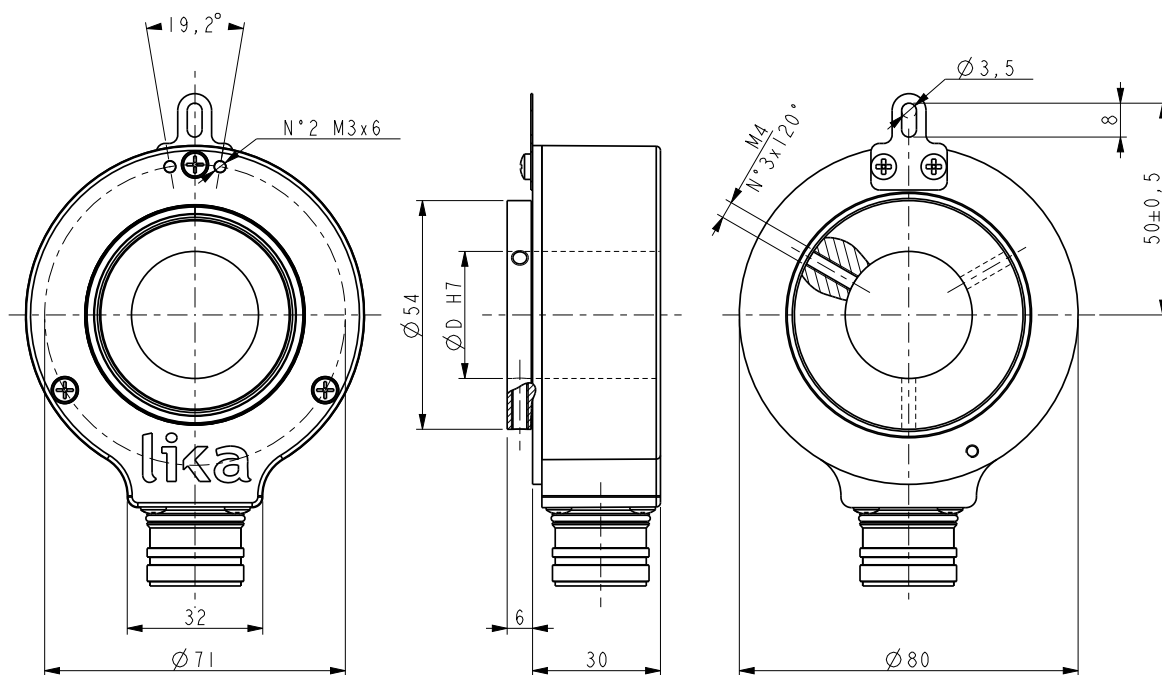
Resolution (PPR):	12-100-300-400-500-1024-2000-2048-2500-4096
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	$+5\text{V} \pm 5\%$, $+10\text{V} +30\text{V}$, $+5\text{V} +30\text{V}$
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	<ul style="list-style-type: none">• Output freq. 200 kHz max.

MATERIALS

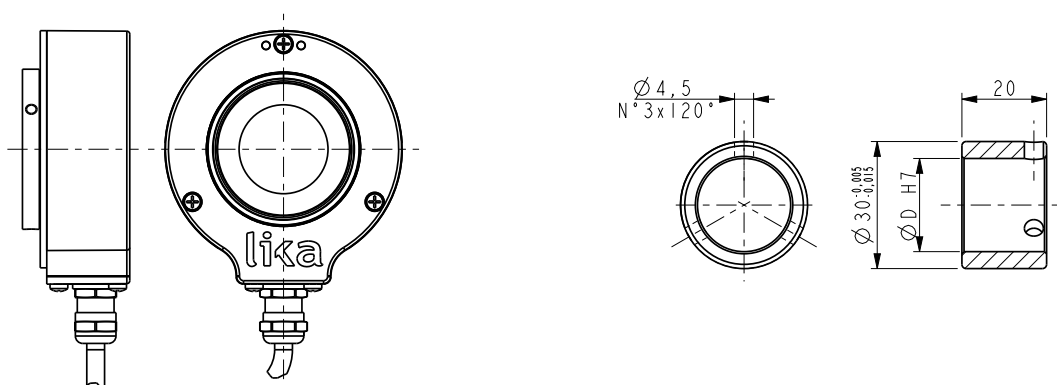
Flange:	anticorrosive, UNI EN AW-6082
Housing:	die cast aluminium, UNI EN AC-46100
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EPFL121:	M23 12 pin mating connector
BR2-xx:	reducing sleeves



C82



BR2-xx

Order code

C82	-	X a	-	XXXXX b	XXX c	XX d	XX e	X f	X g	X h	XX i	/Sxxx j
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a OUTPUT CIRCUITS

Y = Push Pull
L = Line Driver (RS422)
H = PP/LD universal circuit

b RESOLUTION (PPR)

See electrical specifications

c OUTPUT SIGNALS / CONNECTIONS

BNF = AB, cable output
ZNF = ABO, cable output
BCU = AB /AB, cable output
ZCU = ABO /ABO, cable output
BCZ = AB /AB, M23 12 pin plug
ZCZ = ABO /ABO, M23 12 pin plug

d SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
2 = +10V÷ +30V (Y output circuit)
4 = +5V÷ +30V (H output circuit)

e SHAFT DIAMETER

30 = 30 mm
34 = 34 mm
35 = 35 mm
38 = 38 mm
40 = 40 mm
42 = 42 mm
44 = 44 mm (43,97)

f PROTECTION

- = IP64 protection (standard)
P = IP65 protection

g COUNTING FREQUENCY

- = 100 kHz (standard)
W = 200 kHz

h OPERATING TEMPERATURE

- = -25°C +85°C (-13°F +185°F)
K = -40°C +100°C (-40°F +212°F)

i CABLE LENGTH

- = cable output 1 m
L2 = cable output 2 m
L7 = cable output 7 m
Lx = cable output x m
CLx = x m cable with DSub 9 pin inline plug

① CUSTOM VERSION

ROTAPULS

Incremental encoder

Series

I115



- Heavy-duty encoder for harsh environments
- "Tachogenerator" design, B10 Euro-flange
- Rotatable connection with screw terminals
- High shaft load
- Power output circuit for long distance transmissions
- Corrosion and salt mist resistant housing



I115

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP66
Operating temperature range:	-40°C + 100°C (-40°F + 212°F)
Storage temperature range:	-40°C + 100°C (-40°F + 212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 11 mm
Shaft loading:	axial: 250 N radial: 350 N
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	1 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Weight:	~ 1 kg (35 oz)

ELECTRICAL SPECIFICATIONS

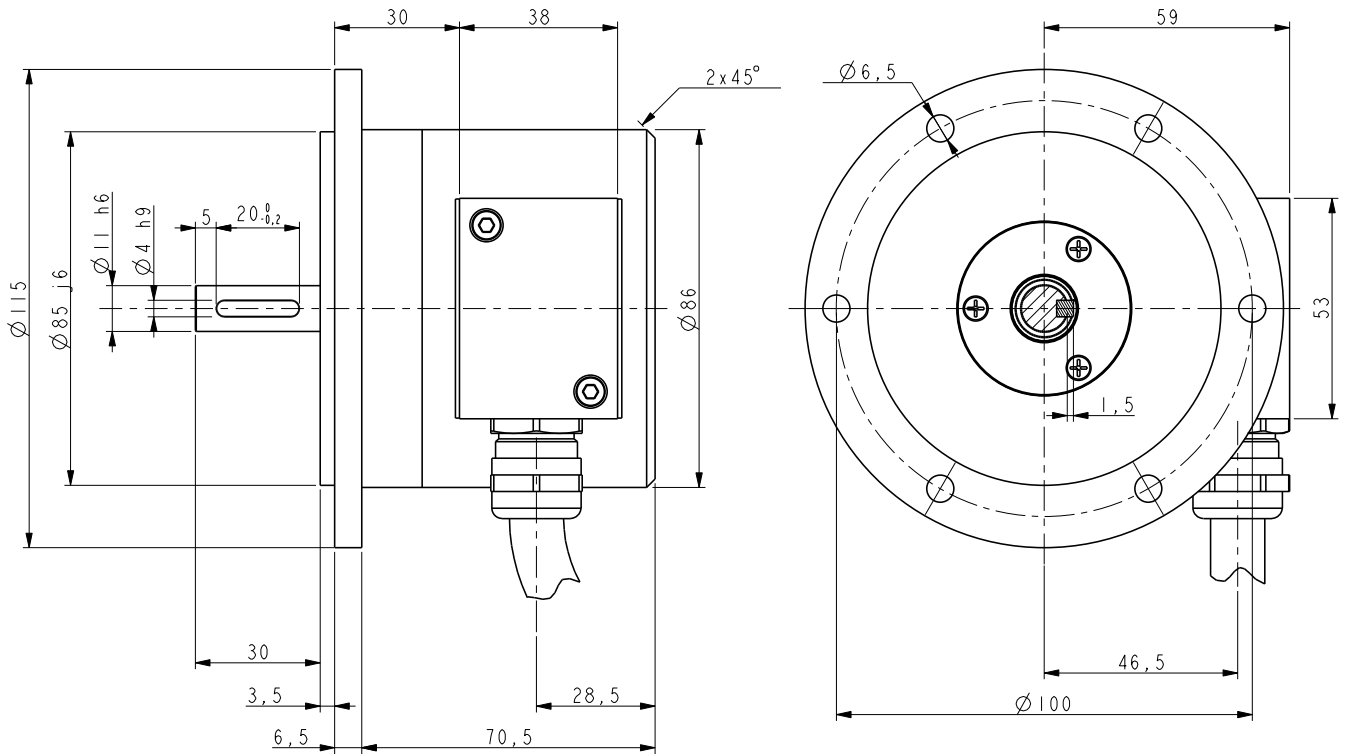
Resolution (PPR):	100-200-250-256-360-500-512-1000-1024-1250 1800-2000-2500
Counting frequency:	100 kHz max.
Output circuits:	NPN, Push-Pull, Line Driver, Universal circuit, Power Push-Pull
Power supply:	+5V ±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Connections:	via terminal box, cable Ø 4 ÷ 10 mm

MATERIALS

Flange:	anticorodal, UNI EN AW-6082, anodized
Housing:	anticorodal, UNI EN AW-6082, anodized
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

MOL-32C-11K-11K:	flex. coupling with electric ins.
MSTS-32K-11-11:	stainless steel coupling
MDW-25C-11K-11K:	disk coupling



I115

Order code

I115	-	X Ⓐ	-	XXXXX Ⓑ	XXX Ⓒ	X Ⓓ	XX Ⓔ	/Sxxx Ⓕ
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Ⓐ **OUTPUT CIRCUITS**
 N = NPN o.c.
 Y = Push-Pull
 L = Line Driver (RS422)
 H = PP/LD universal circuit
 T = Power Push-Pull

Ⓑ **RESOLUTION (PPR)**
 See electrical specifications

Ⓒ **OUTPUT SIGNAL / CONNECTION**
 ZCT = ABO /ABO, terminal blocks

Ⓓ **SUPPLY VOLTAGE**
 1 = $+5V \pm 5\%$ (L output circuit)
 2 = $+10V \div +30V$ (N, Y and T output circuits)
 4 = $+5V \div +30V$ (H output circuit)

Ⓔ **SHAFT DIAMETER**
 11 = 11 mm

Ⓕ **CUSTOM VERSION**

ROTAPULS

Incremental encoder

Series

I116



- Double encoder with single housing design
- Heavy-duty construction for harsh environments
- Rotatable connections with screw terminals
- High shaft load
- Power output circuit for long distance transmissions
- Corrosion and salt mist resistant housing
- Two different resolutions or output circuits on request



I116

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP66
Operating temperature range:	-40°C + 100°C (-40°F + 212°F)
Storage temperature range:	-40°C + 100°C (-40°F + 212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 11 mm
Shaft loading:	axial: 250 N radial: 350 N
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	≤ 1 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Weight:	1,6 kg (56,4 oz)

ELECTRICAL SPECIFICATIONS

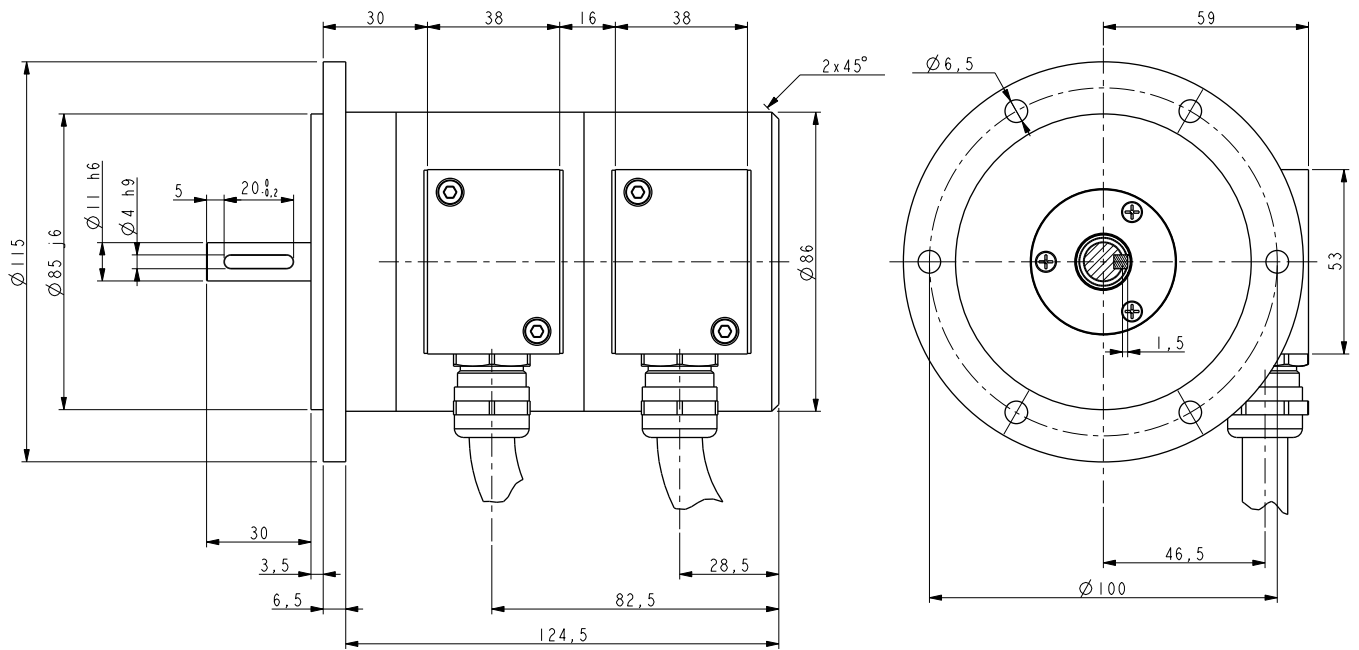
Resolution (PPR):	100-200-250-256-360-500-512-1000-1024-1250 1800-2000-2500
Counting frequency:	100 kHz max.
Output circuits:	NPN, Push-Pull, Line Driver, Universal circuit, Power Push-Pull
Power supply:	+5V ±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Connections:	via terminal box, cable Ø 4 ÷ 10 mm

MATERIALS

Flange:	anticorodal, UNI EN AW-6082, anodized
Housing:	anticorodal, UNI EN AW-6082, anodized
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

MOL-32C-11K-11K:	flex. coupling with electric ins.
MSTS-32K-11-11:	stainless steel coupling
MDW-25C-11K-11K:	disk coupling



I116

Order code

I116	-	X Ⓐ	-	XXXXX Ⓑ	XXX Ⓒ	X Ⓓ	XX Ⓔ	/Sxxx Ⓕ
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Ⓐ OUTPUT CIRCUITS
 N = NPN o.c.
 Y = Push-Pull
 L = Line Driver (RS422)
 H = PP/LD universal circuit
 T = Power Push-Pull

Ⓑ RESOLUTION (PPR)
 See electrical specifications

Ⓒ OUTPUT SIGNAL / CONNECTION
 ZCT = ABO /ABO, terminal blocks

Ⓓ SUPPLY VOLTAGE
 1 = +5V±5% (L output circuit)
 2 = +10V÷ +30V (N, Y and T output circuits)
 4 = +5V÷ +30V (H output circuit)

Ⓔ SHAFT DIAMETER
 11 = 11 mm

Ⓕ CUSTOM VERSION

ROTAPULS

Incremental heavy-duty encoder

Series

C100



- Heavy-duty hollow shaft encoder
- Corrosion resistant, robust housing
- High shaft load and environmental protection
- Power outputs for long distance transmission
- M23 connector or screw terminals
- Electrical shaft insulation



C100

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 16 mm 17 mm tapered
Shaft loading:	axial: 140 N radial: 350 N
Shaft rotational speed:	6000 rpm max. (short periods)
Electrical shaft insulation:	10 kV max.
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M23 plug, screw terminals or cable output 1 m (3.3 ft)
Weight:	~ 1 kg (35 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

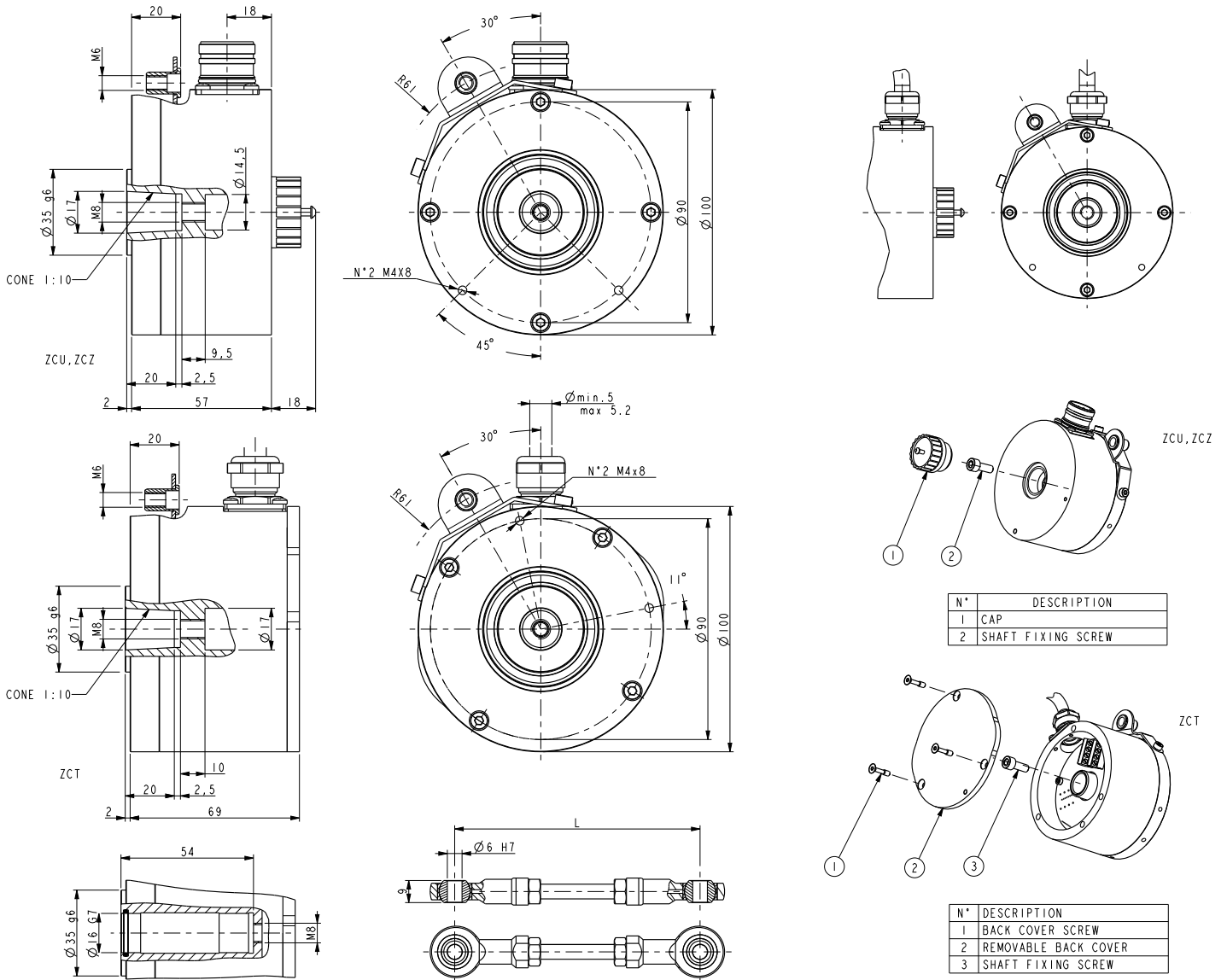
Resolution (PPR):	1024-2048-2500
Counting frequency:	100 kHz max.
Output circuits:	Power Push-Pull, Line Driver, Power Line Driver, Universal circuit
Power supply:	+5V ±5%, +10V +30V, +5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	100 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorodal, UNI EN AW-6082, anodized
Housing:	anticorodal, UNI EN AW-6082, anodized
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EPFL121:	12 pin M23 mating connector
EC-C12F-S19-M8-xx:	cordset x m with M23 connector
PF4284/xx:	torque arm



PF4284/XXX

C100

Order code

C100	-	X	-	XXXX	XXX	X	XXX	X	XX	/Sxxx
		(a)		(b)	(c)	(d)	(e)	(f)	(g)	(h)

(a) OUTPUT CIRCUITS

L = Line Driver (RS422)
 H = PP/LD universal circuit
 K = Power Line Driver
 T = Power Push Pull

(b) RESOLUTION (PPR)

1024, 2048, 2500

(c) OUTPUT SIGNALS / CONNECTIONS

ZCZ = ABO /ABO, M23 12 pin plug
 ZCT = ABO /ABO, screw terminals
 ZCU = ABO /ABO, cable output

(d) SUPPLY VOLTAGE

1 = +5V±5% (L, K output circuit)
 2 = +10V÷ +30V (T output circuit)
 4 = +5V÷ +30V (H output circuit)

(e) SHAFT DIAMETER

C17 = 17 mm tapered 1:10
 16 = 16 mm

(f) OPERATING TEMPERATURE RANGE

- = -25°C +85°C (-13°F +185°F)
 K = -40°C +100°C (-40°F +212°F)

(g) CABLE LENGTH (only with ZCU)

L1 = cable output 1 m
 Lx = cable output x m

(h) CUSTOM VERSION

ROTAPULS

Incremental heavy-duty encoder

Series

C101



- Heavy industry & wind generator applications
- Redundant version with 2 galvanically separated outputs
- Electrical shaft insulation (10 kV) for bearing protection
- Power output for long distance transmission
- M23 connectors or terminal blocks
- Corrosion resistant housing
- High shaft load



C101

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP54
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft hollow:	Ø 16 mm
Shaft loading:	axial: 140 N radial: 350 N
Shaft rotational speed:	6000 rpm max. (short periods)
Electrical shaft insulation:	10 kV max.
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	2 x M23 plug terminal blocks (max. cable Ø 9,5 mm)
Weight:	~ 1 kg (35 oz)

ELECTRICAL SPECIFICATIONS

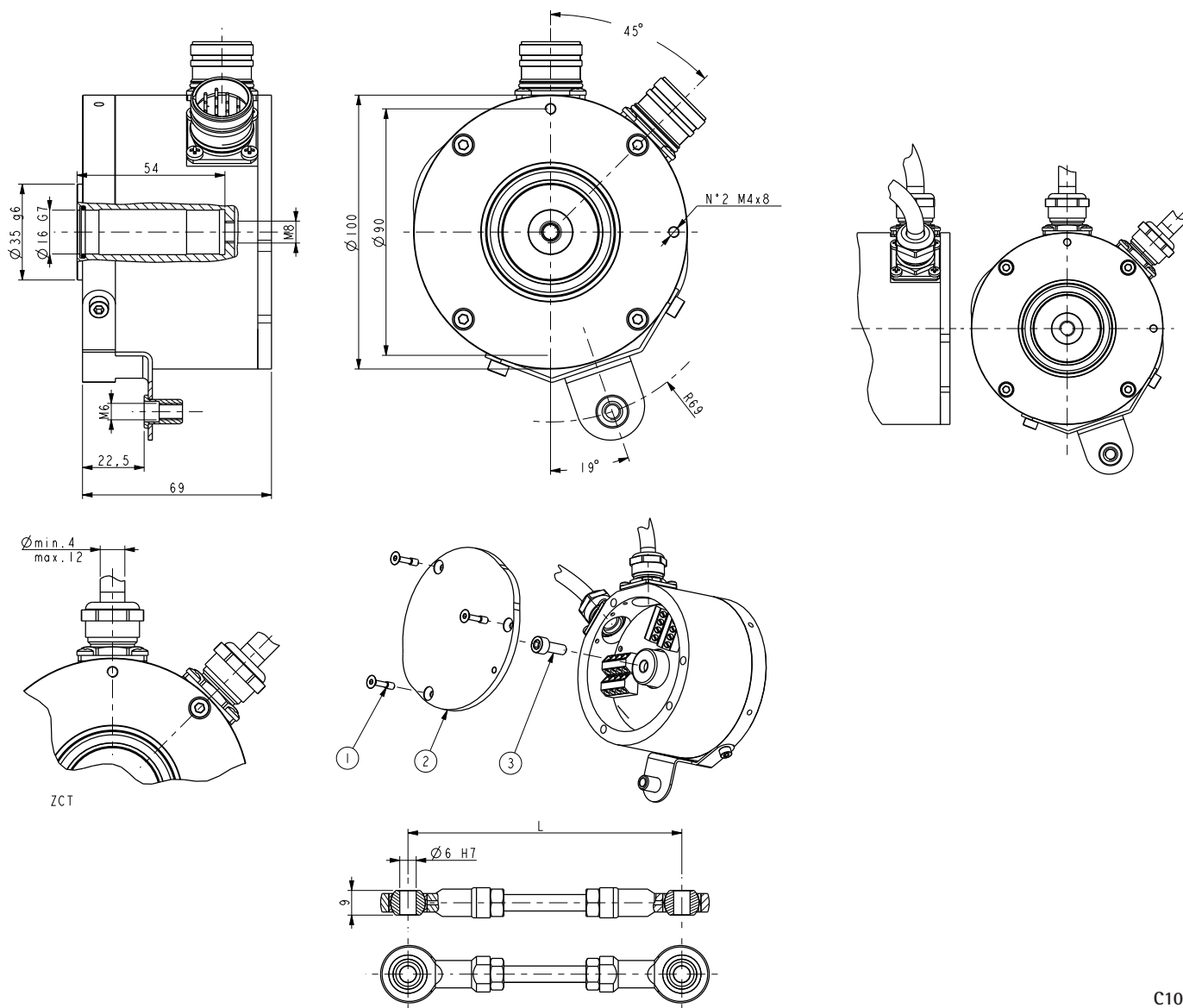
Resolution (PPR):	1024-2048
Counting frequency:	100 kHz max.
Output circuits:	Power Push-Pull, Power Line Driver
Power supply:	+5V ±5%, +10V +30V
Consumption:	70 mA (typical)
Output current (per channel):	100 mA max.
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorodal, UNI EN AW-6082, anodized
Housing:	anticorodal, UNI EN AW-6082, anodized
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EPFL121:	12 pin M23 mating connector
EC-C12F-S19-M8-xx:	cordset x m with M23 connector
PF4284/xx:	torque arm



C101

Order code

C101	-	X a	-	XXXXX b	XXX c	X d	XX e	/Sxxx f
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a OUTPUT CIRCUITS

K = Power Line Driver
T = Power Push Pull

b RESOLUTION (PPR)

1024, 2048

c OUTPUT SIGNALS / CONNECTIONS

ZCZ = AB0 /AB0, M23 12 pin plug
ZCT = AB0 /AB0, screw terminals
ZCU = AB0 /AB0, cable output

d SUPPLY VOLTAGE

1 = +5V±5% (T output circuit)
2 = +10V±30V (K output circuit)

e SHAFT DIAMETER

16 = 16 mm

f CUSTOM VERSION

ROTAPULS

Timing belt pulley with integrated encoder

Series

I70



- Integrated pulley encoder with 500 pulses/turn
- HTD type pulley for 20 mm belts
- Extremely robust construction, 1000 N shaft load
- Silent running & long life-time
- Easy assembly by M12 screw and size 21 wrench key



I70

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-20°C +85°C (-4°F +185°F)
Storage temperature range:	-20°C +85°C (-4°F +185°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

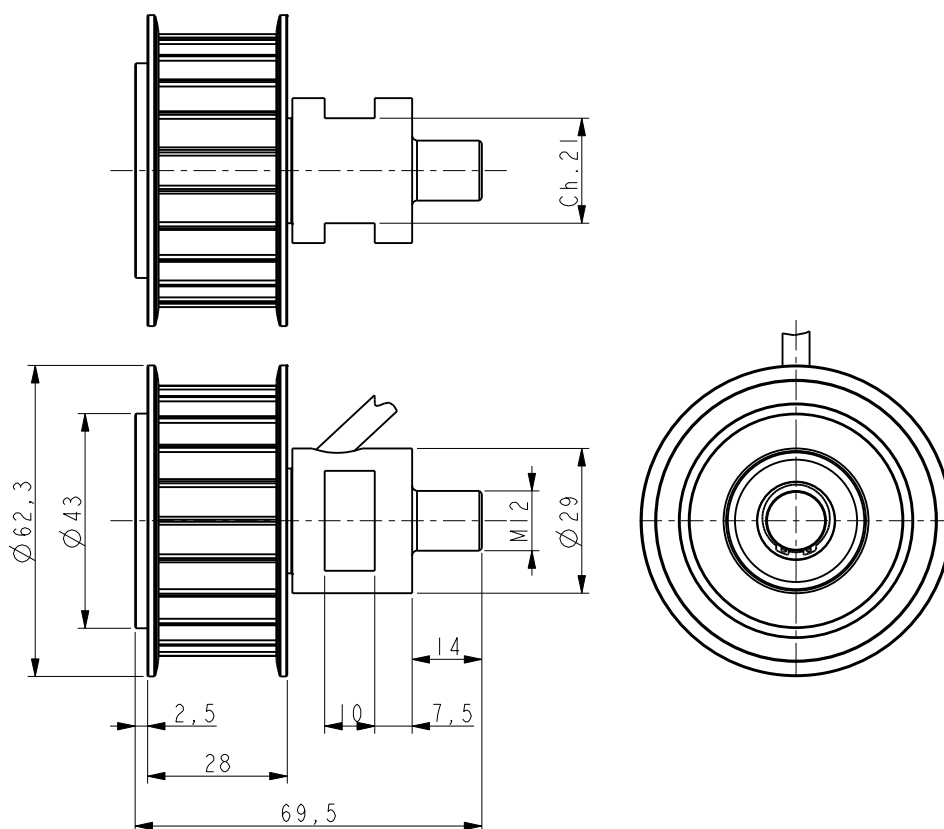
Dimensions:	see drawing
Pulley type:	HTD, 8 mm pitch, 22 teeth, belt width 20 mm
Shaft loading (axial and radial):	1000 N max.
Shaft rotational speed:	5000 rpm max.
Starting torque (at 20°C):	≤ 1,5 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	cabl e output 1 m (3.3 ft)
Weight:	~ 350 g (12,3 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	500
Counting frequency:	30 kHz max.
Output circuit:	Push-Pull
Power supply:	+10V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

Pulley:	Aluminium
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, AISI 303



170

Order code

170	-	X Ⓐ	-	XXX Ⓑ	XXX Ⓒ	X Ⓓ	XX Ⓔ	XX Ⓕ	/Sxxx Ⓖ
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Ⓐ OUTPUT CIRCUITS
Y = Push Pull

Ⓑ RESOLUTION (PPR)
500

Ⓒ OUTPUT SIGNALS
BNF = AB

Ⓓ SUPPLY VOLTAGE
2 = +10V ÷ +30V

Ⓔ SHAFT FIXING
12 = M12

Ⓕ CABLE LENGTH
L1 = cable output 1 m
Lx = cable output x m

Ⓖ CUSTOM VERSION

ROTAPULS

Incremental encoder

Series

ICS



- Robust & corrosion resistant housing
- For linear measurements with pinion + rack or metric wheel
- Movable shaft absorbs mounting misalignments
- Absolute version on request



ICS

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H.without condensation)
Protection:	IP67, connector IP65

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft hollow:	∅ 12 mm
Shaft loading (axial and radial):	100 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	≤ 3 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max)
Weight:	~ 1,2 kg (42,3 oz)

ELECTRICAL SPECIFICATIONS

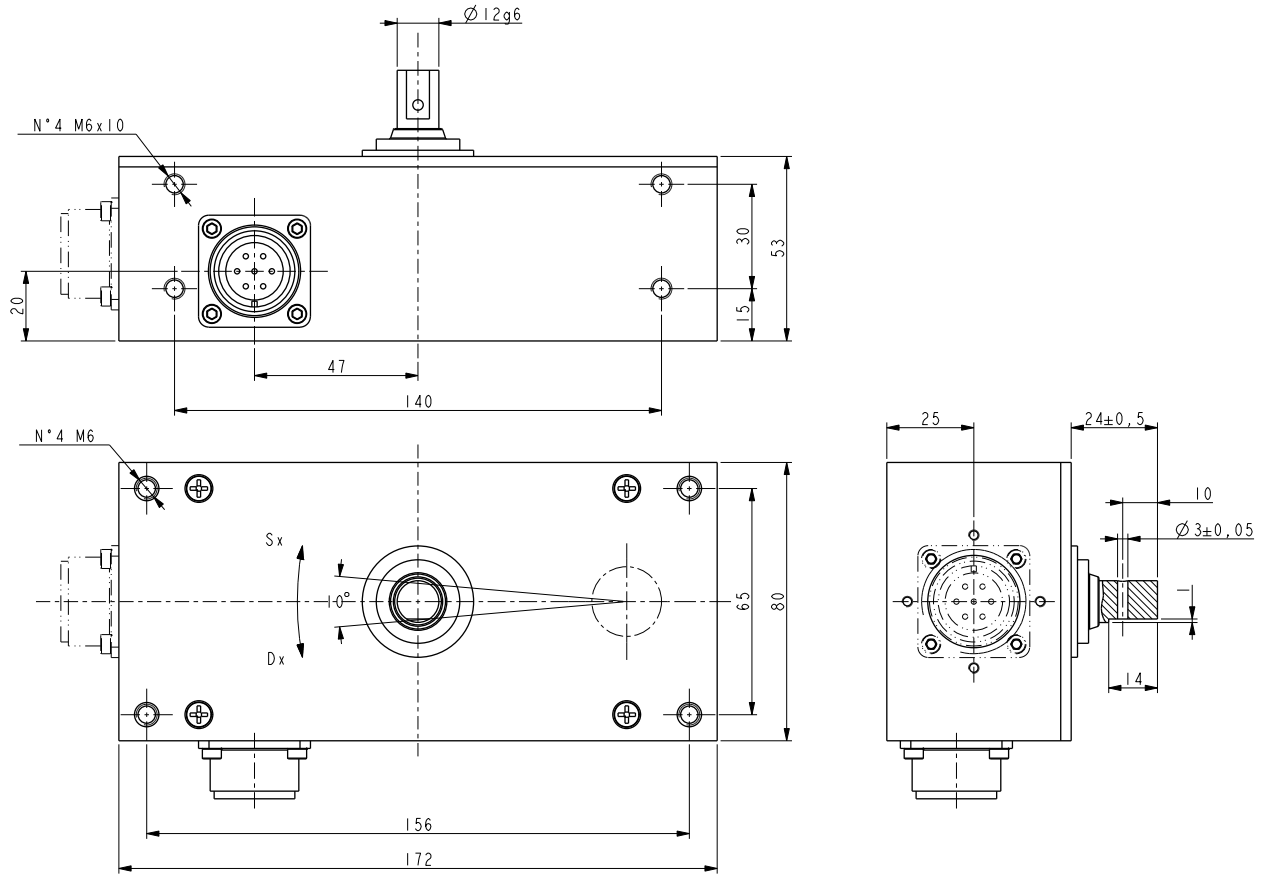
Resolution (PPR):	2-4-5-8-10-12-15-16-20-24-25-30-35-36-40-50-60-64-70-80 90-100-120-127-142-150-160-180-200-216-230-236-240-250 254-256-267-270-300-314-360-375-400-410-435-471-500 512-600-635-720-750-800-900-1000-1024-1068-1200-1250 1270-1400-1440-1500-1800-2000-2048-2250-2400-2500
Pulses/mm:	to be result of pinion and rack ratio
Counting frequency:	60 kHz max.
Output circuit:	NPN, PNP, Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V,+5V +30V
Consumption:	70 mA (typical)
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.

MATERIALS

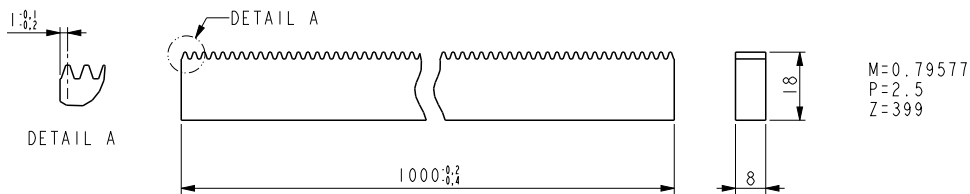
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

E7MLS:	7 pin MIL mating connector
E10MLS:	10 pin MIL mating connector
LKM-1225:	Z40 pinion
LKM-1224:	M0,79 rack



ICS



LKM-1224 (rack)

Order code

ICS	-	X	-	XXXXX	XXX	X	X	XX	X	/Sxxx
		Ⓐ		Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ

Ⓐ OUTPUT CIRCUITS

N = NPN o.c.
 P = PNP o.c.
 Y = Push Pull
 L = Line Driver (RS422)
 H = PP/LD universal circuit

Ⓑ RESOLUTION (PPR)

See electrical specifications

Ⓒ OUTPUT SIGNALS / CONNECTIONS

BND = AB, MIL 7 pin plug
 BCP = AB /AB, MIL 10 pin plug (only radial)
 ZND = AB0, MIL 7 pin plug
 ZCP = AB0 /AB0, MIL 10 pin plug (only radial)

Ⓓ SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
 2 = +10V÷ +30V (Y output circuit)
 4 = +5V÷ +30V (H output circuit)

Ⓔ SHAFT DIAMETER

F = 12 mm

Ⓕ SHAFT REST POSITION

DX = right (see drawing)
 SX = left (see drawing)

Ⓖ CONNECTION POSITION

- = axial
 R = radial (with BCP, ZCP)

Ⓗ CUSTOM VERSION

ROTAPULS

Incremental encoder

Series

I105



- High resolution encoder for rotary & index tables
- 18000 PPR without interpolation
- Robust construction with IP65 protection
- Large operating temperature range



I105

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP64
Operating temperature range:	-20°C+70°C (-4°F +158°F) - only for 16384 PPR +10°C +60°C (50°F +140°F) - only for 18000 PPR
Storage temperature range:	-20°C+80°C (-4°F +176°F) (98% R.H. without condensation)
Options:	• Operating temp. range: -40°C +100°C (only for 16384 PPR) • IP65 protection

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft hollow:	Ø 10 mm
Shaft loading (axial and radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque at 20°C:	≤ 1 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	cable output 2 m (6.56 ft)
Weight:	~ 900 g (31,7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

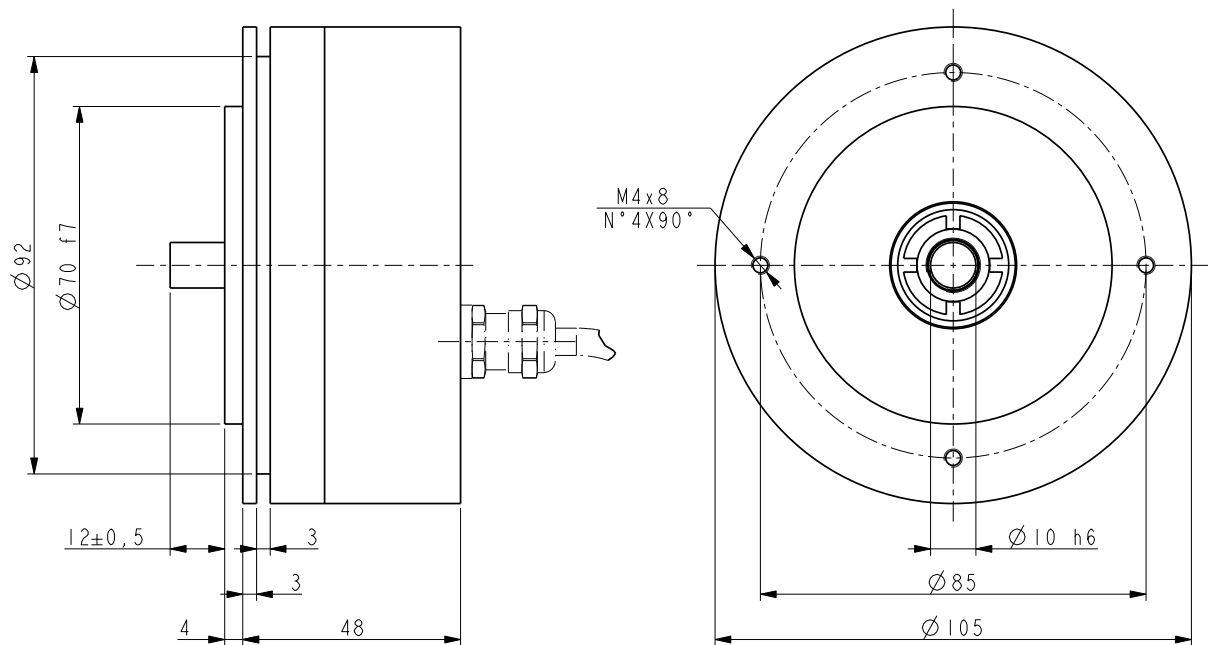
Resolution (PPR):	16384-18000
Counting frequency:	100 kHz max.
Output circuits:	Push-Pull, Line Driver, Universal circuit
Power supply:	+5V±5%, +10V +30V,+5V +30V
Consumption:	100 mA max.
Output current (per channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 hrs min.
Option:	• Output frequency up to 300 kHz max. (only for 16384 PPR; not in combination with K option)

MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EPFL 121:	12 pin M23 mating connector
PAN/PGF:	flexible couplings
LKM-386:	fixing clamps



I105

Order code

I105	-	X Ⓐ	-	XXXXX Ⓑ	XXX Ⓒ	X Ⓓ	XX Ⓔ	X Ⓕ	X Ⓖ	X Ⓗ	XX Ⓘ	/Sxxx ⓵
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Ⓐ OUTPUT CIRCUITS

Y = Push Pull
L = Line Driver (RS422)
H = PP/LD universal circuit

Ⓑ RESOLUTION (PPR)

See electrical specifications

Ⓒ OUTPUT SIGNALS / CONNECTIONS

BCU = AB /AB, cable output
BCZ = AB /AB, M23 connector output
ZCU = ABO /ABO, cable output
ZCZ = ABO /ABO, M23 connector output

Ⓓ SUPPLY VOLTAGE

1 = +5V±5% (L output circuit)
2 = +10V÷ +30V (Y output circuit)
4 = +5V÷ +30V (H output circuit)

Ⓔ SHAFT DIAMETER

10 = 10 mm

Ⓕ PROTECTION

- = IP64 (standard)
P = IP65

Ⓖ COUNTING FREQUENCY

- = 100 kHz (standard)
W = 300 kHz
(only for 16384 PPR, not in combination with K option)

Ⓗ OPERATING TEMPERATURE RANGE

- = standard (see specifications)
K = -40°C +100°C (-40°F +212°F)
(only for 16384 PPR, not in combination with W option)

⓵ CABLE LENGTH

L2 = cable output 2 m
L7 = cable output 7 m
Lx = cable output x m

⓵ CUSTOM VERSION

ROTAMAG

Magnetic absolute encoders

Series

MS36 • MSC36



- Magnetic sensing
- Absolute single-turn encoder
- Resolution 8192 counts/rev, SSI interface
- Protection up to IP67 with sealed circuit
- MS36: solid shaft version
- MSC36: blind hollow shaft version, Ø 6mm



MS36 • MSC36

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibration:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-20°C +85°C (-4°F +185°F)
Storage temperature range:	-20°C +85°C (-4°F +185°F) (98% R.H. without condensation)
Option:	• Protection IP67

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	12000 rpm max.
Starting torque (at 20°C):	0,1 Ncm
Bearings life:	10 ⁹ rev. min.
Electrical connections:	M12 8 pin inline plug or cable output 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

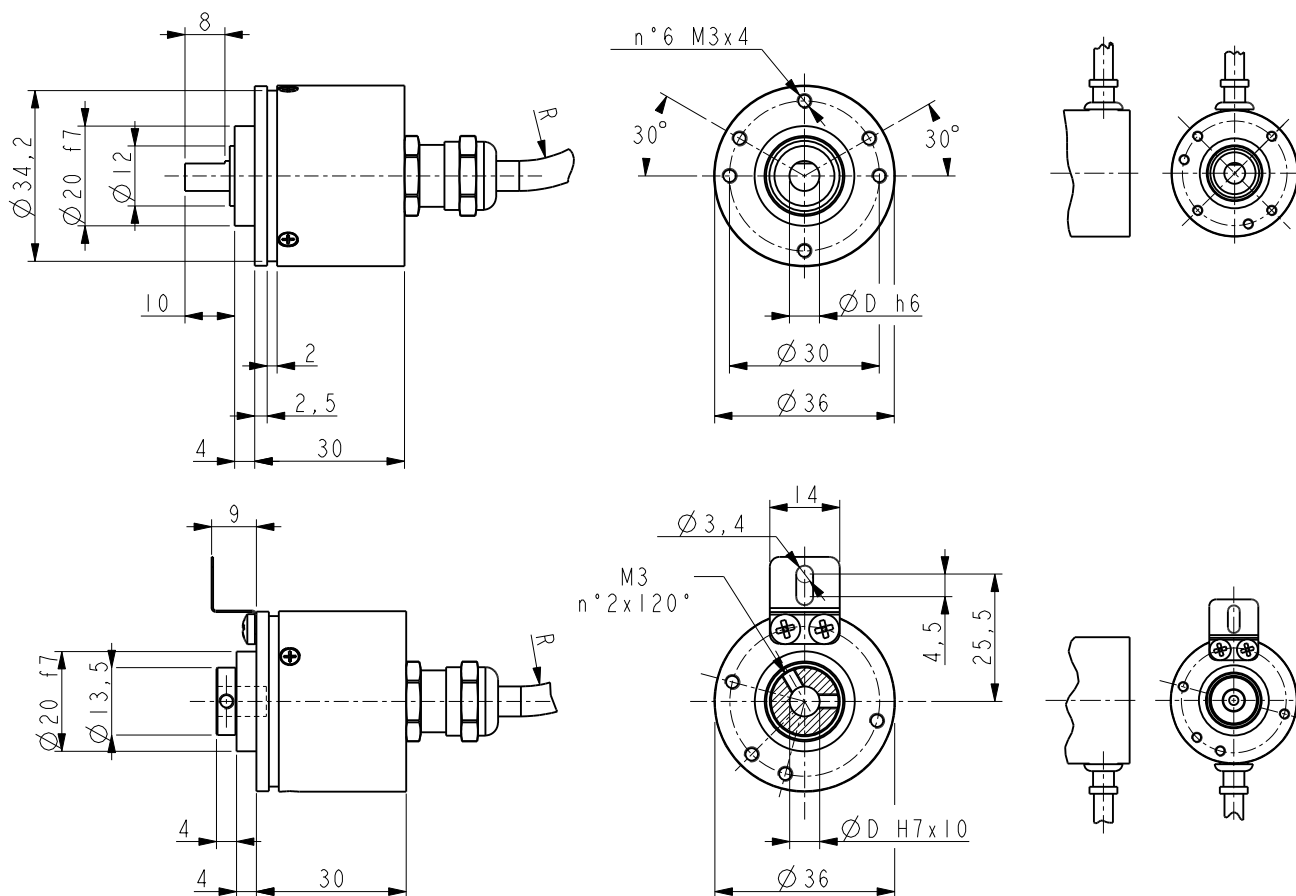
Resolution:	8192 counts/rev.
Accuracy:	± 0,9°
Output circuit:	SSI, 13 bit
Output code:	Binary
Power supply:	+10Vdc +30Vdc
Power consumption:	65 mA max.
Protection:	protected against inversion of polarity
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4

MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

PAN/PGF:	Flexible couplings
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MS36

MSC36

Order code

MS36 MSC36	XX ⓐ	/	XX ⓑ	-	X ⓒ	-	X ⓓ	X ⓔ	XXX ⓕ	/Sxxx ⓖ
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ⓐ RESOLUTIONS

13 = 8192 counts/rev.

ⓑ OUTPUT

BR = Binary, SSI (tree format)

ⓒ SHAFT DIAMETER

6 = 6 mm

ⓓ CONNECTION POSITION

- = axial
R = radial

ⓒ PROTECTION

- = IP65 (standard)
J = IP67 (with sealed circuit)

ⓕ CONNECTIONS

L1 = cable output 1 m cable (standard)
L2 = cable output 2 m
Lx = cable output x m
M0,5 = 0,5 m cable + M12 8 pin inline plug
M2 = 2 m cable + M12 8 pin inline plug

ⓖ CUSTOM VERSION

ROTAMAG

Magnetic absolute encoder

Series

MM36 • MMC36



- Absolute multi-turn magnetic encoder
- Very compact and robust housing
- Outer diameter 36mm
- Resolution up to 4096 counts/rev and up to 32768 rev, SSI interface
- Zero setting and counting direction function
- Axial cable output
- MM36: solid shaft version
- MMC36: blind hollow shaft version, Ø 6mm



MMC36 • MM36

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-20°C +85°C (-4°F +185°F)
Storage temperature range:	-20°C +85°C (-4°F +185°F) (98% R.H. without condensation)
Option:	• protection IP67

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	12000 rpm max.
Starting torque (at 20°C):	0,1 Ncm
Bearing life:	10 ⁹ rev.min
Electrical connections:	M12 8 pin inline plug or cable output 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

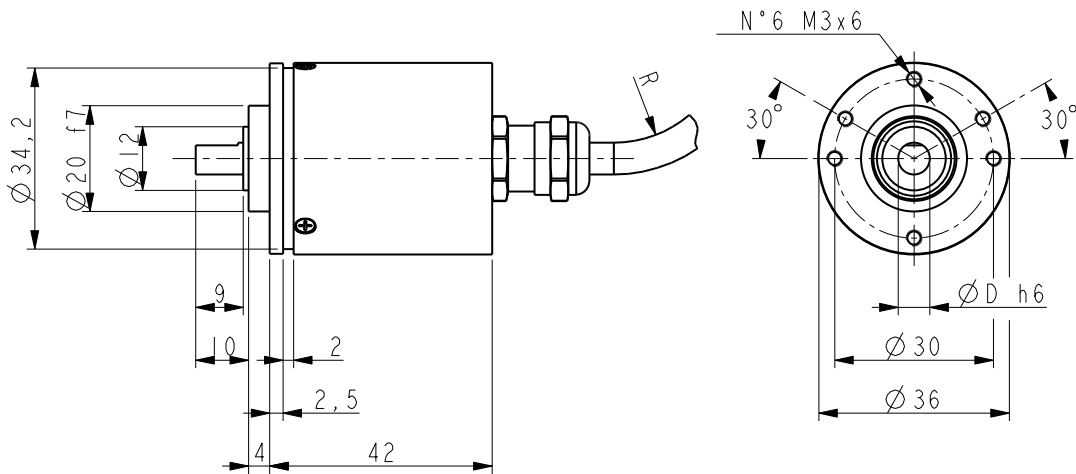
Resolution:	1024 counts/rev. x 32768 rev. 2048 cpr x 16384 rev. 4096 cpr x 8192 rev.
Accuracy:	± 1°
Output circuit:	SSI (25 bit, LSB aligned, clock 300 kHz max., T _p =64 µsec.)
Output codes:	Gray, Binary
Counting frequency:	10 kHz max.
Start-up time:	~ 200 msec.
Power supply:	+10Vdc +30Vdc
Power consumption:	25 mA max.
Protection:	protected against inversion of polarity
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Battery life:	10 years min.
Functions:	• Counting direction (input) • Electronic zero setting (input)

MATERIALS

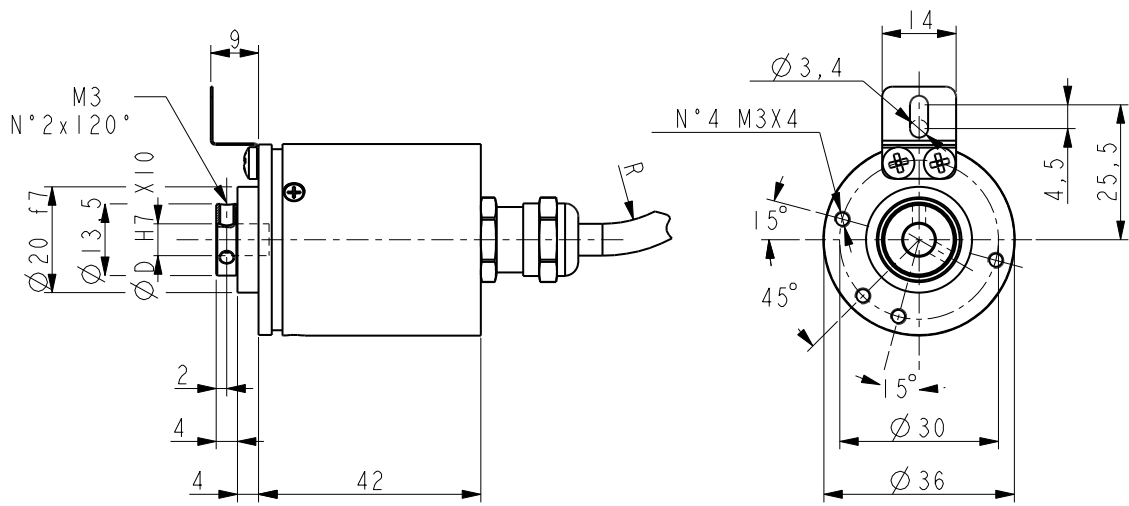
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

PAN/PGF:	Flexible couplings
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MM36



MMC36

Order code

MM36 MMC36	XX/XXXXX Ⓐ	XX Ⓑ	-	X Ⓒ	-	X Ⓓ	X Ⓔ	/Sxxx Ⓕ
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Ⓐ RESOLUTIONS

10/32768 = 1024 CPR x 32768 rev.
11/16384 = 2048 CPR x 16384 rev.
12/8192 = 4096 CPR x 8192 rev.

Ⓑ OUTPUT

BB = Binary, SSI (LSB aligned)
GB = Gray, SSI (LSB aligned)

Ⓒ SHAFT DIAMETER

6 = 6 mm

Ⓓ PROTECTION

- = IP65 (standard)
J = IP67 (with sealed circuit)

Ⓔ CONNECTIONS

L1 = cable output 1 m cable (standard)
L2 = cable output 2 m
Lx = cable output x m
M0,5 = 0,5 m cable + M12 8 pin inline plug
M2 = 2 m cable + M12 8 pin inline plug

Ⓕ CUSTOM VERSION

ROTACOD

Absolute single turn encoders

Series

AS36 • ASC36



- Miniature optical single turn encoder for industrial applications
- Resolution up to 524288 cpr (19 bit)
- High degree of protection, IP67
- Cable output or M12 inline plug



ASC36 • AS36

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)
Option:	• Operating temperature range: -40°C + 100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft:	Ø 6 mm
Hollow shaft:	Ø 6 mm
Shaft loading (axial and radial):	20 N max.
Shaft rotational speed:	6000 rpm
Starting torque (at 20°C):	0,1 Ncm
Bearing life:	10 ⁹ rev. min.
Electrical connections:	M12 8 pin inline plug or cable 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

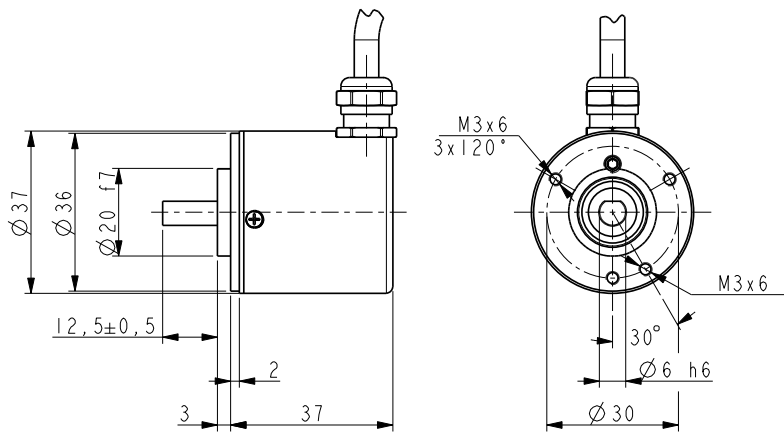
Resolution:	65536, 131072, 524288 cpr
Accuracy:	± 0,01° @ 16 bit resolution
Output circuits:	SSI (RS422), clock rate < 4 MHz BiSS-C, clock rate < 10 MHz
Output code:	Gray, Binary
Counting frequency:	> 100 kHz
Power supply:	+10V +30V
Power consumption:	0,5 W
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h min.
Functions:	• Counting direction (input) • Zero setting/Preset (input)

MATERIALS

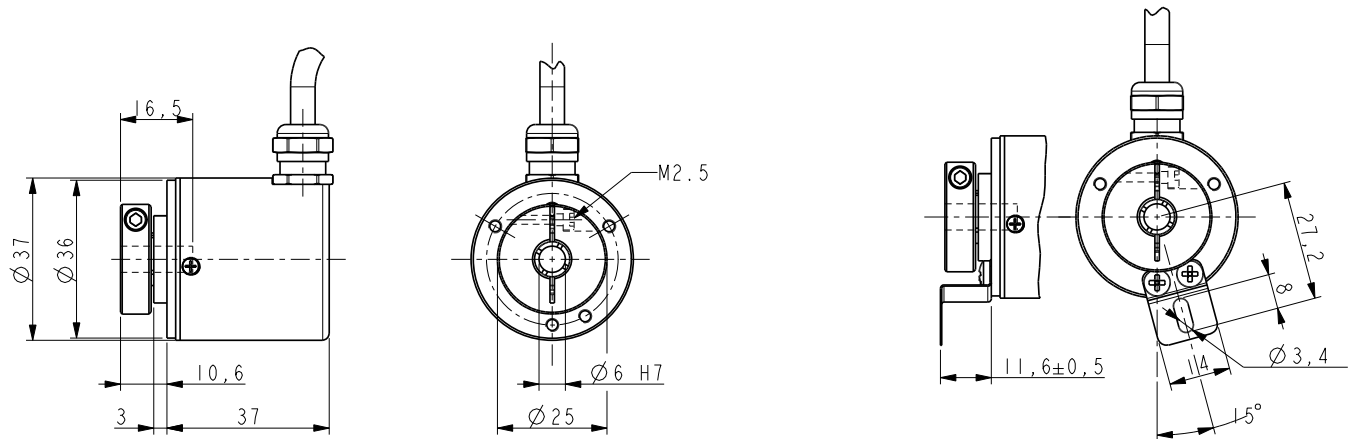
Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

PAN:	flexible couplings
EM12F8:	M12 8 pin mating connector



AS36



ASC36

Order code

AS36	XX	/	XX	-	X	-	X	XXX	/Sxxx
ASC36	(a)		(b)		(c)		(d)	(e)	(f)

(a) RESOLUTIONS

16 = 65536 cpr
 17 = 131072 cpr
 19 = 524288 cpr

(b) OUTPUT

BG = Binary, SSI MSB aligned
 GG = Gray, SSI MSB aligned
 I7 = BiSS C-mode

(c) SHAFT DIAMETER

6 = 6 mm

(d) OPERATING TEMPERATURE RANGE

- = -25°C +85°C (-13°F +185°F) standard
 K = -40°C +100°C (-40°F +212°F)

(e) CONNECTIONS

L1 = cable output 1 m
 L2 = cable output 2 m
 Lx = cable output x m
 M0,5 = 0,5 m cable + M12 8 pin inline plug
 M2 = 2 m cable + M12 8 pin inline plug

(f) CUSTOM VERSION

ROTACOD

Absolute multi turn encoders

Series

AM36 • AMC36



- Miniature optical multi turn encoder
- Resolution up to 524288 cpr (19 bit) x 4096 turns (12 bit)
- High degree of protection, IP67
- Cable output or M12 inline plug



AMC36 • AM36

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)
Option:	• Operating temperature range: -40°C + 100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6 mm
Hollow shaft diameter:	Ø 6 mm
Shaft loading (axial, radial):	20 N max.
Shaft rotational speed:	6000 rpm
Starting torque (at 20°C):	0,1 Ncm
Bearings life:	10 ⁹ rev. min.
Electrical connections:	M12 inline plug or cable output 1 m (3.3 ft)
Weight:	~ 100 g (3,5 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

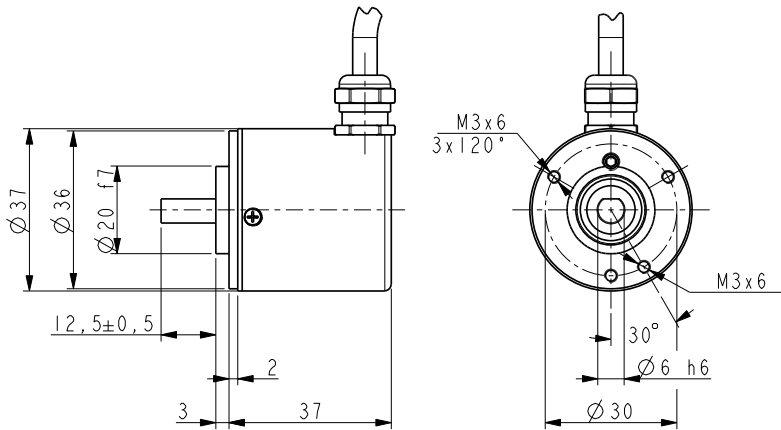
Resolution:	65536 cpr x 4096 turns, 524288 cpr x 4096 turns
Accuracy:	± 0,01° @ 16 bit resolution
Output circuits:	SSI (RS422), clock rate < 4 MHz BiSS-C, clock rate < 10 MHz
Output code:	Gray, Binary
Counting frequency:	> 100 kHz
Power supply:	+10V +30V
Power consumption:	0,5 W
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h min.
Functions:	• Counting direction (input) • Zero setting/Preset (input)

MATERIALS

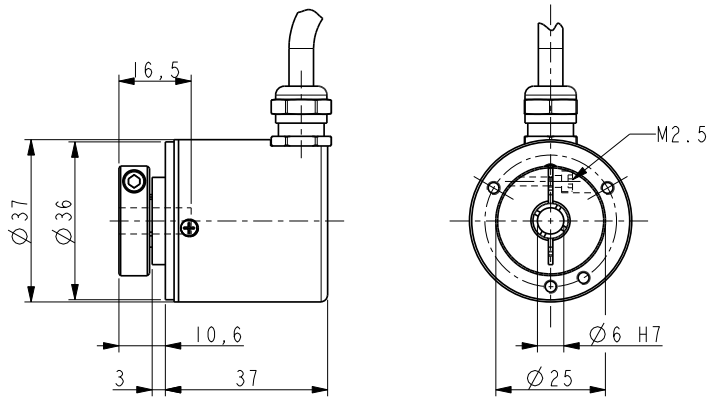
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

PAN:	flexible couplings
EM12F8:	M12 8 pin mating connector



AM36



AMC36

Order code

AM36 AMC36	XX/XXXX (a)	XX (b)	-	X (c)	-	X (d)	XXX (e)	/Sxxx (f)
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(a) RESOLUTIONS

16/4096 = 65536 cpr x 4096 turns
19/4096 = 524288 cpr x 4096 turns

(b) OUTPUT

BG = Binary, SSI MSB aligned
GG = Gray, SSI MSB aligned
I7 = BiSS C-mode

(c) SHAFT DIAMETER

6 = 6 mm

(d) OPERATING TEMPERATURE RANGE

- = -25°C +85°C (-13°F +185°F) standard
K = -40°C +100°C (-40°F +212°F)

(e) CONNECTIONS

L1 = cable output 1 m
L2 = cable output 2 m
Lx = cable output x m
M0,5 = 0,5 m cable + M12 8 pin inline plug
M2 = 2 m cable + M12 8 pin inline plug

(f) CUSTOM VERSION

ROTACOD

Absolute single turn encoders

Series

ES58 • ES58S • ESC58



- Compact single turn encoder
- Precise and fast optical sensing
- Resolution up to 8192 cpr
- Additional incremental track with 1024 PPR
- High degree of protection, IP67



ES58 • ES58S • ESC58

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Starting torque (at 20°C):	ES58: 0,15 Ncm (typ.) ES58S, ESCxx: 0,4 Ncm (typ.)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 2 m (6.56 ft)
Weight:	~ 200 g (7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

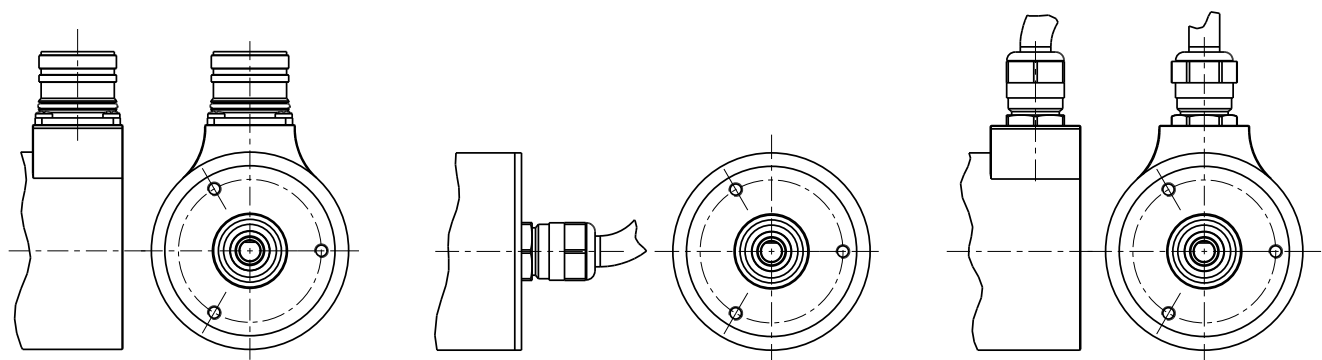
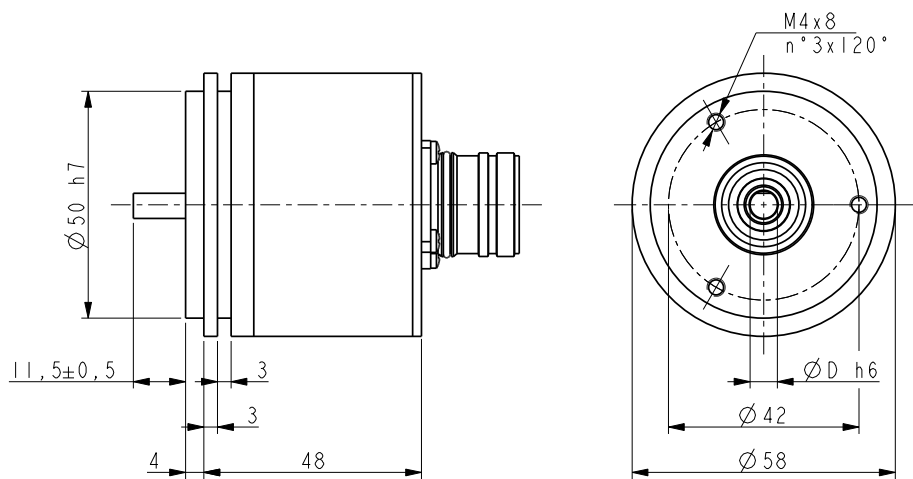
Resolution:	360, 720, 1024, 4096, 8192 cpr
Accuracy:	± 0,02°
Output circuits:	SSI (RS422), Bit parallel Push-Pull, NPN
Output code:	Gray, Binary
Counting frequency:	SSI: 150 kHz, Bit parallel: 50 kHz
Power supply:	+7,5Vdc ÷ 34Vdc
Power consumption:	SSI: 0,9 W Bit parallel: 1,6 W
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	• counting direction (input) • Zero setting/Preset (input)

MATERIALS

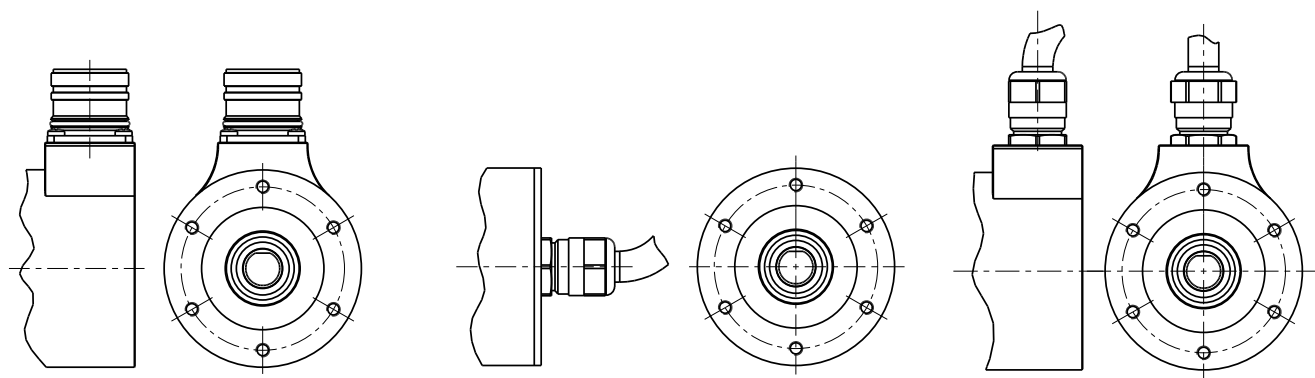
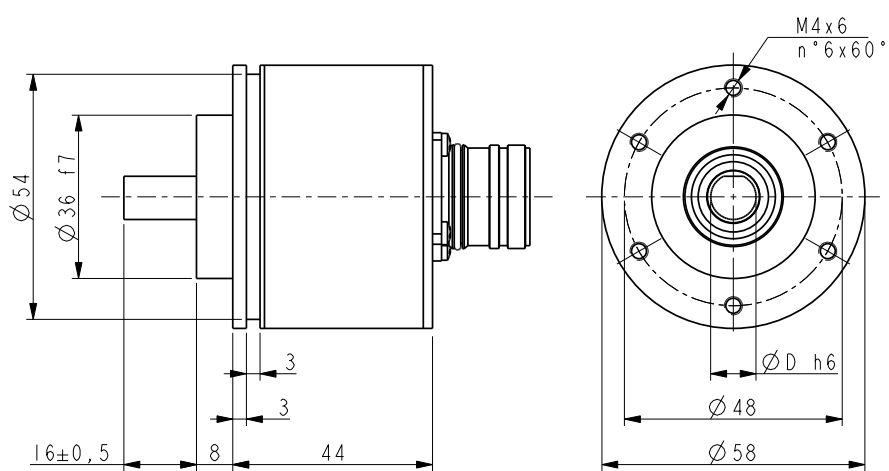
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

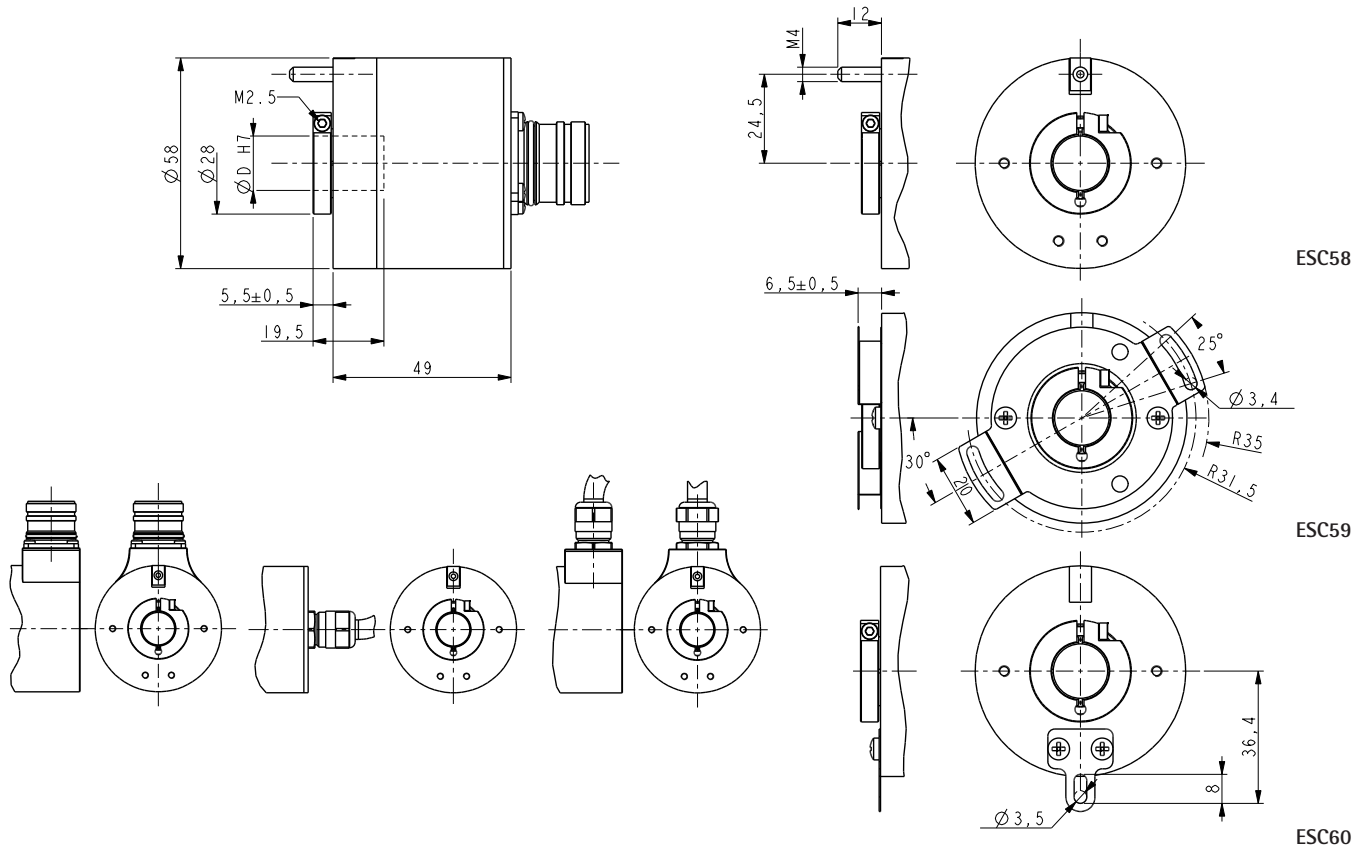
EPFL121H:	M23 12 pin mating connector
EM12F8:	M12 8 pin mating connector
EM12F12:	M12 12 pin mating connector
EPFL171H:	M23 17 pin mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
EC-CR12F-S28-T12-xx:	cordset xx m, M23 connector
EC-M12F8-LK-M8-xx:	cordset xx m, M12 8 pin connector
EC-M12F12-LK-T12-xx:	cordset xx m, M12 12 pin conn.
LKM-386:	fixing clamps



ES58



ES58S



Order code - Bit parallel output

ES58	XX	/	XX	-	XX	-	X	X	XXX	/Sxxx
ES58S	Ⓐ		Ⓑ		Ⓒ		Ⓓ	Ⓔ	Ⓕ	Ⓖ
ESC58										
ESC59										
ESC60										

Ⓐ RESOLUTION 36 = 360 cpr 72 = 720 cpr 10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr	Ⓑ OUTPUT BY = Binary, Push-Pull GY = Gray, Push-Pull BN = Binary, NPN GN = Gray, NPN	Ⓒ SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (ESCxx) 15 = 15 mm (ESCxx)	Ⓓ OPERATING TEMPERATURE RANGE - = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)	Ⓔ CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m L10 = cable output 10 m M2 = M23 17 pin plug	Ⓕ CUSTOM VERSION
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Order code - SSI output

ES58	XX	/	XX	-	XX	-	X	X	XXX	/Sxxx
ES58S	Ⓐ		Ⓑ		Ⓒ		Ⓓ	Ⓔ	Ⓕ	Ⓖ
ESC58										
ESC59										
ESC60										

Ⓐ RESOLUTION 36 = 360 cpr 72 = 720 cpr 10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr	Ⓑ OUTPUT BS = Binary, SSI tree format BA = Binary, SSI LSB aligned GS = Gray, SSI tree format GA = Gray, SSI LSB aligned G5 = Gray, SSI tree format + 1024 PPR AB /AB Push-Pull	Ⓒ SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (ESCxx) 15 = 15 mm (ESCxx)	Ⓓ OPERATING TEMPERATURE RANGE - = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)	Ⓔ CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m L10 = cable output 10 m M2 = M23 12 pin plug M = M12 8 pin plug M1 = M12 12 pin plug (only with output G5)	Ⓕ CUSTOM VERSION
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ROTACOD

Absolute multi turn encoders

Series

EM58 • EM58S • EMC58



- Compact multi turn encoder
- Precise and fast optical sensing
- Resolution up to 8192 cpr and 16384 turns
- Additional incremental track with 1024 PPR
- High degree of protection, IP67



EM58 • EM58S • EMC58

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Starting torque (at 20°C):	EM58: 0,15 Ncm (typ.) EM58S, EMCxx: 0,4 Ncm (typ.)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable 2 m (6.56 ft), MIL 32 pin inline plug
Weight:	~ 250 g (8,8 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution:	single turn = 1024, 4096, 8192 cpr multi turn = 4096, 16384 turns
Accuracy:	± 0,02°
Output circuits:	SSI (RS422), Bit parallel Push-Pull, NPN
Output code:	Gray, Binary
Counting frequency:	SSI: 150 kHz, Bit Parallel: 30 kHz
Power supply:	+7,5Vdc ÷ 34Vdc
Power consumption:	SSI: 1 W Bit parallel: 1,7 W
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	• counting direction (input) • Zero setting/Preset (input)

MATERIALS

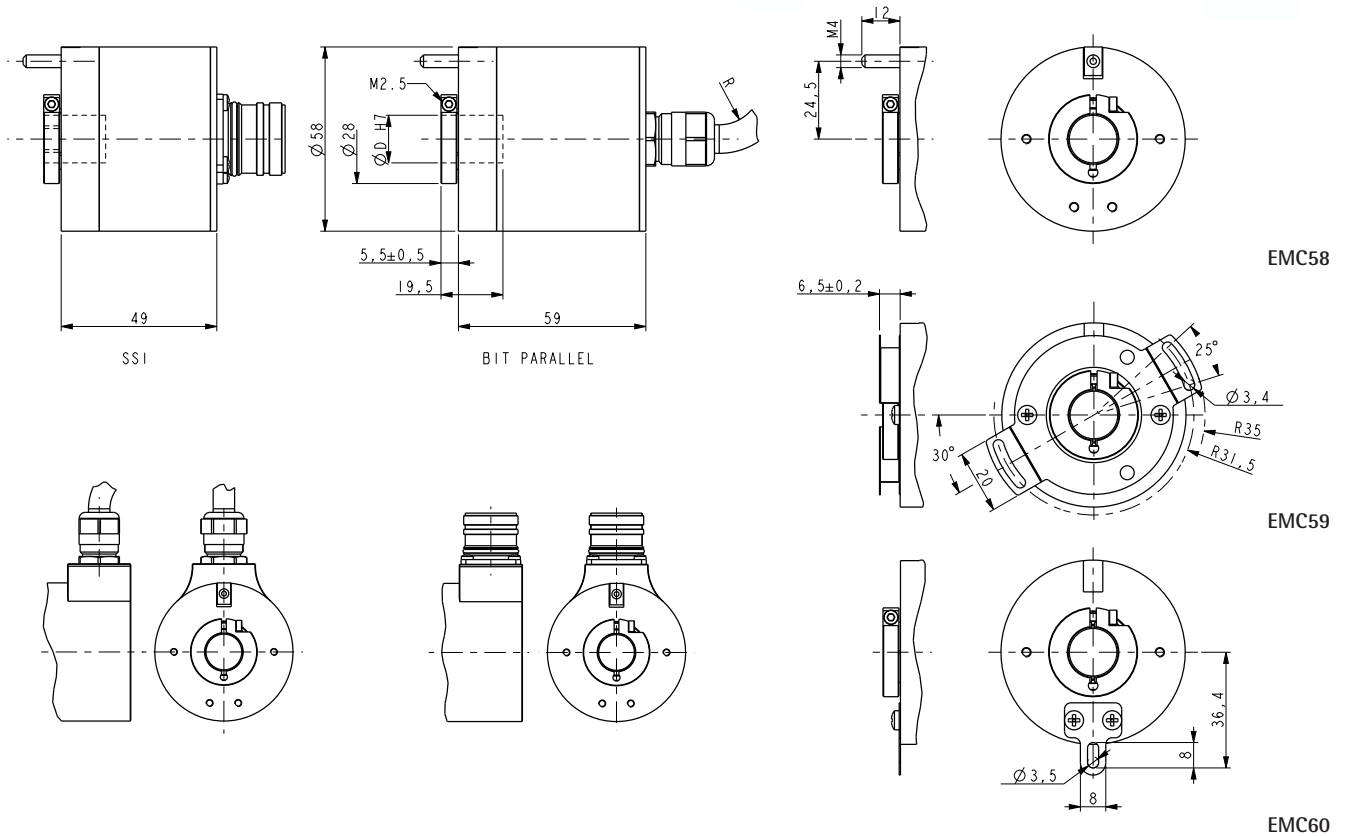
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

PREFERENTIAL MODELS

EM5812/4096GS-6-RM2	SSI, 24 Bit
EM58S12/4096GS-10-RM2	SSI, 24 Bit

ACCESSORIES

EPFL121H:	M23 12 pin connector
EM12F8:	M12 8 pin mating connector
EM12F12:	M12 12 pin mating connector
E32MLS:	32 pin MIL mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
EC-CR12F-S28-T12-xx:	cordset xx m, M23 connector
EC-M12F8-LK-M8-xx:	cordset xx m, M12 8 pin connector
EC-M12F12-LK-T12-xx:	cordset xx m, M12 12 pin conn.
LKM-386:	fixing clamps



Order code - Bit parallel output

EM58	XX	/	XXXX	XX	-	XX	-	X	X	XXX	/Sxxx
EM58S	(a)		(b)	(c)		(d)		(e)	(f)	(g)	(h)
EMC58											
EMC59											
EMC60											

<p>(a) RESOLUTION 10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>(b) REVOLUTIONS 4096 = 4096 turns 16384 = 16384 turns</p>	<p>(c) OUTPUT BY = Binary, Push-Pull GY = Gray, Push-Pull BN = Binary, NPN GN = Gray, NPN</p>	<p>(d) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (EMCxx) 15 = 15 mm (EMCxx)</p>	<p>(e) OPERATING TEMPERATURE RANGE - = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)</p> <p>(f) CONNECTION POSITION - = axial R = radial</p>	<p>(g) CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m L10 = cable output 10 m V1 = 1 m cable + MIL inline plug</p> <p>(h) CUSTOM VERSION</p>
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Order code - SSI output

EM58	XX	/	XXXX	XX	-	XX	-	X	X	XXX	/Sxxx
EM58S	(a)		(b)	(c)		(d)		(e)	(f)	(g)	(h)
EMC58											
EMC59											
EMC60											

<p>(a) RESOLUTION 10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>(b) REVOLUTIONS 4096 = 4096 turns 16384 = 16384 turns (16384 only with SSI LSB aligned)</p>	<p>(c) OUTPUT BS = Binary, SSI tree format BA = Binary, SSI LSB aligned GS = Gray, SSI tree format GA = Gray, SSI LSB aligned G5 = Gray, SSI tree format + 1024 PPR AB /AB Push-Pull</p>	<p>(d) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (EMCxx) 15 = 15 mm (EMCxx)</p>	<p>(e) OPERATING TEMP. RANGE - = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)</p> <p>(f) CONNECTION POSITION - = axial R = radial</p>	<p>(g) CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m L10 = cable output 10 m M2 = M23 plug M = M12 8 pin plug M1 = M12 12 pin plug (only with output G5)</p> <p>(h) CUSTOM VERSION</p>
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ROTACOD

Absolute multi turn encoders with RS485 Modbus interface

Series

EM58 • EM58S • EMC58



- Compact optical multi turn encoder
- Modbus RTU RS485 protocol
- Resolution 4096 cpr x 16384 turns
- Freely programmable via RS485
- Diagnostic LEDs
- High degree of protection, IP67



EM58 • EM58S • EMC59

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Starting torque (at 20°C):	EM58: 0,15 Ncm (typ.) EM58S, EMCxx: 0,4 Ncm (typ.)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12 plug or cable output 2 m (6.56 ft)
Weight:	~ 300 g (10,6 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

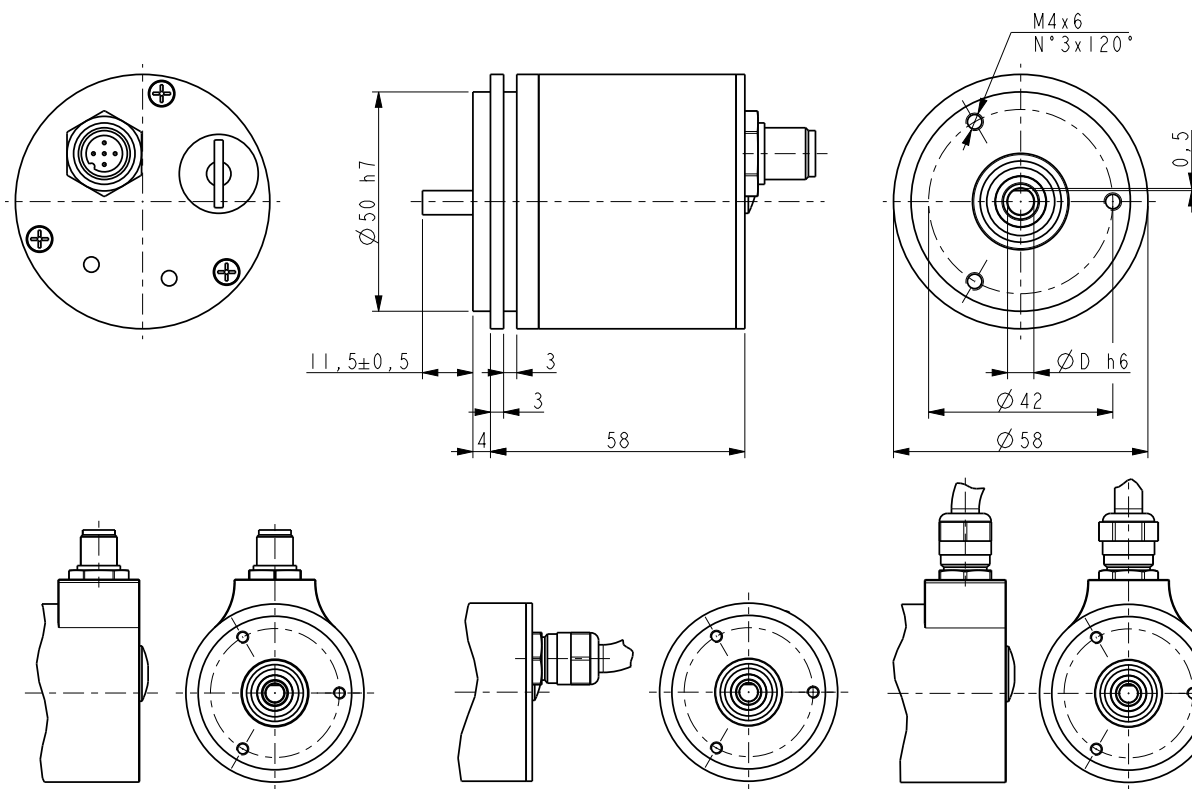
Resolution:	4096 cpr x 16384 turns
Accuracy:	± 0,02°
Output circuits:	Modbus RTU RS485
Output code:	according to: Modbus RTU specifications
Counting frequency:	> 150 kHz
Power supply:	+7,5Vdc ÷ 34Vdc
Power consumption:	1,7 W
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	<ul style="list-style-type: none">• Counting direction• Zero setting/Preset<ul style="list-style-type: none">• Resolution• Reset to default parameters<ul style="list-style-type: none">• Firmware update• Saving parameters

MATERIALS

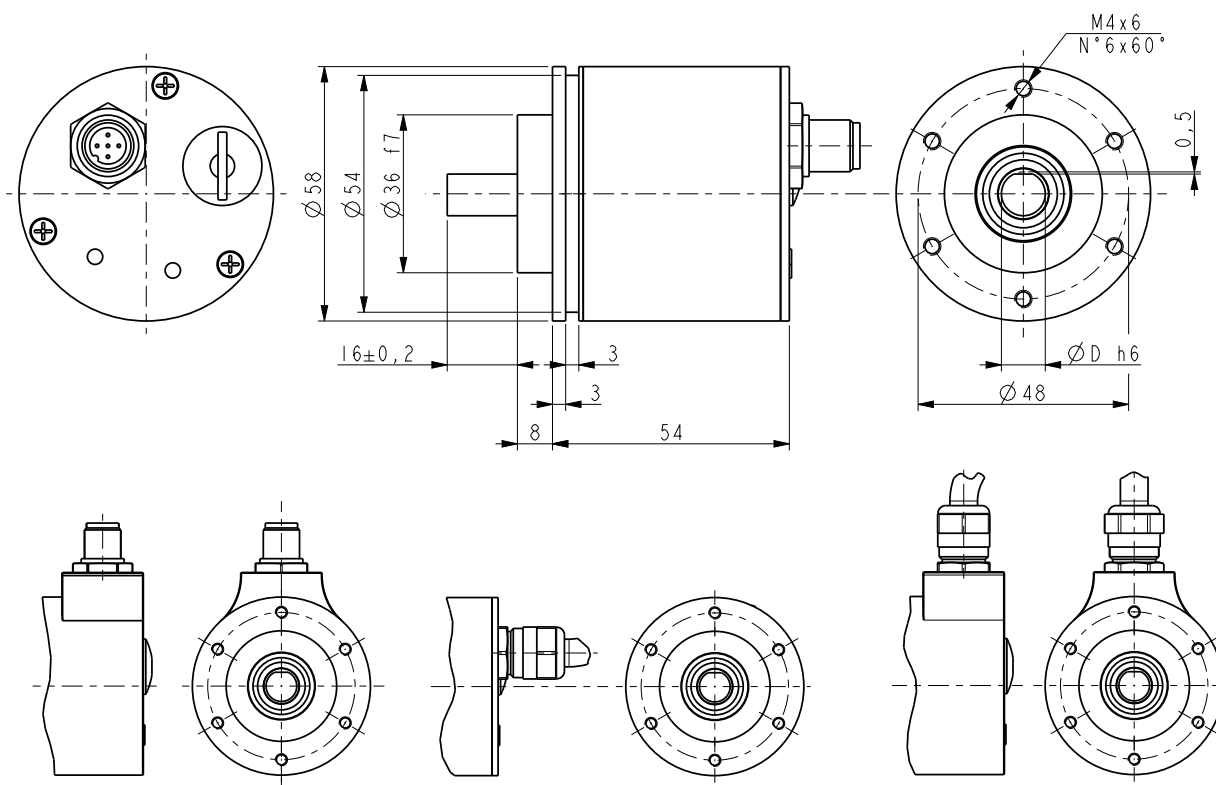
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

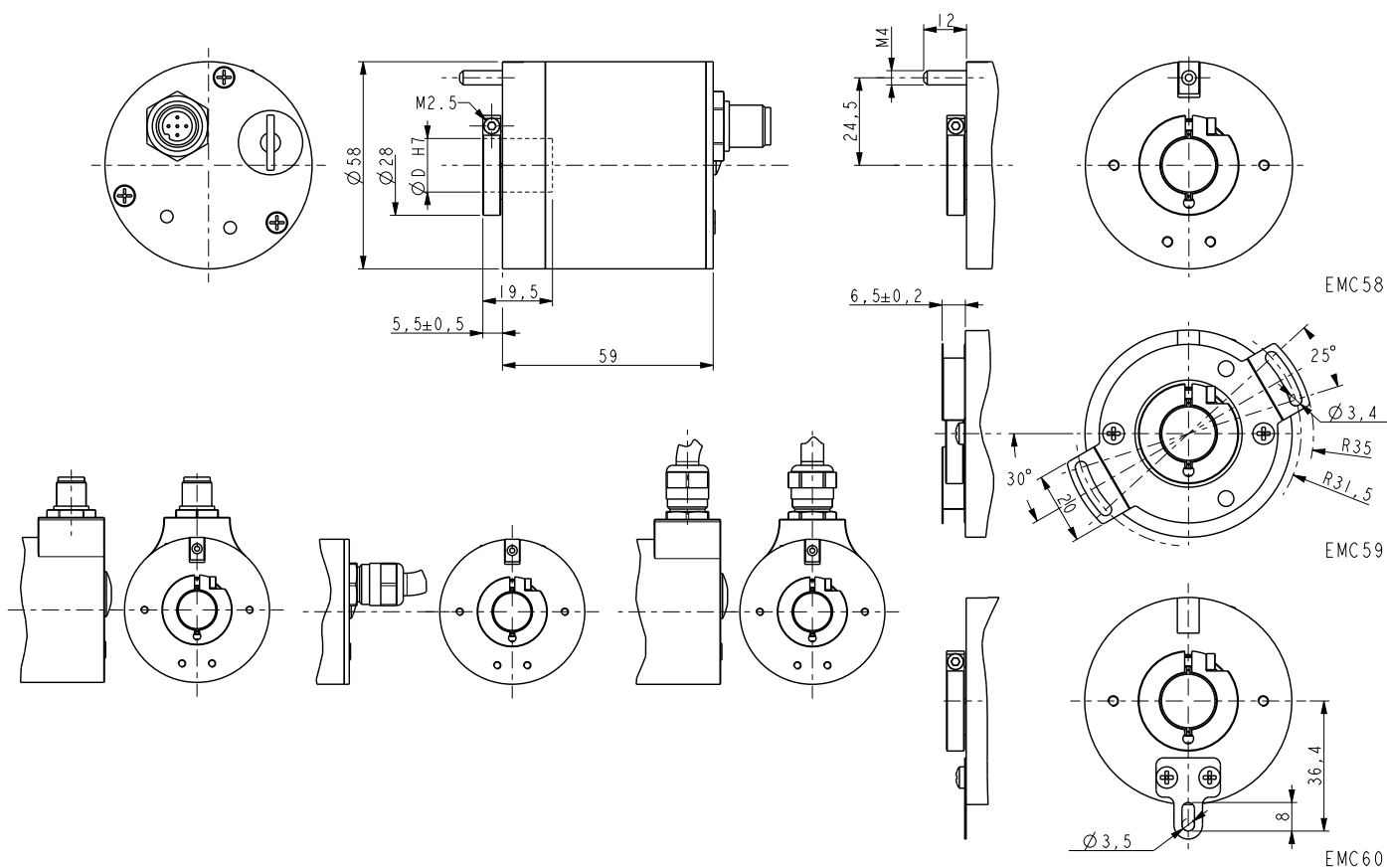
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
E-M12FC:	5 pin M12 mating connector
EC-M12FC-LK-CB-xx:	pre-assembled cable xx m
LKM-386:	fixing clamps
KIT EM58 MB:	M12 to USB programming cable



EM58



EM58S



Order code

EM58	XX	/	XXXXX	XX	-	XX	-	X	XX	/Sxxx
EM58S	Ⓐ		Ⓑ	Ⓒ		Ⓓ		Ⓔ	Ⓕ	Ⓖ
EMC58										
EMC59										
EMC60										

<p>Ⓐ RESOLUTION 12 = 4096 cpr</p> <p>Ⓑ REVOLUTIONS 16384 = 16384 turns</p> <p>Ⓒ OUTPUT MB = Modbus RTU</p>	<p>Ⓓ SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (EMCxx) 15 = 15 mm (EMCxx)</p>	<p>Ⓔ CONNECTION POSITION - = axial R = radial</p> <p>Ⓕ CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m Lx = cable output x m M = M12, 5 pin plug</p>
		Ⓖ CUSTOM VERSION

ROTACOD

Absolute single turn encoders

Series

HS58 • HS58S • HSC58



- Compact single turn encoders for feedback applications
- High resolution up to 262144 cpr
- Additional incremental track, 2048 PPR sin/cos
- Precise and fast optical sensing



HS58 • HS58S • HSC58

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Starting torque (at 20°C):	HS58: 0,15 Ncm (typ.) HS58S, HSCxx: 0,4 Ncm (typ.)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 2 m (6.56 ft)
Weight:	~ 300 g (10,6 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

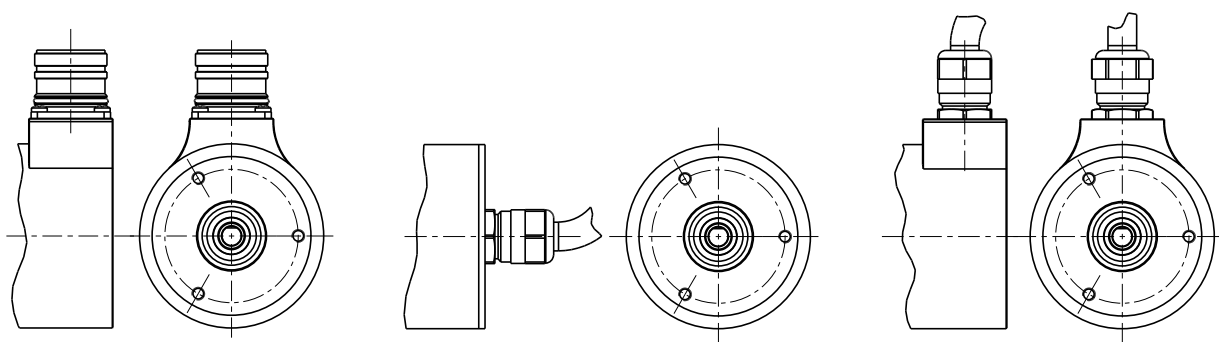
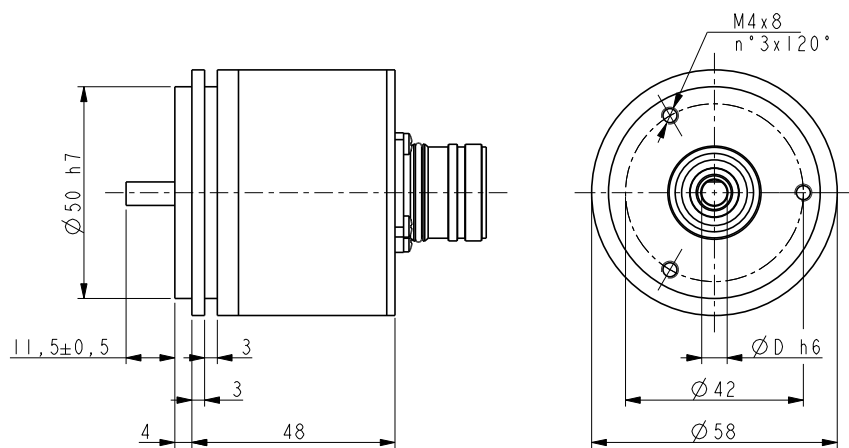
Resolution:	SSI, BiSS: 18 bit max. sin/cos: 2048 PPR AB, /AB: 2048, 4096, 8192
Accuracy:	± 0,007°
Output circuits:	SSI, SSI + 1Vpp, SSI + Line Driver 5V, BiSS (B-mode, C-mode) + 1Vpp
Output code:	Gray, Binary
Counting frequency:	220 kHz max.
Power supply:	+10V +30V
Power consumption:	0,9 W
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Optoelectronic life:	100.000 h min.
Functions:	• Counting direction (input) • Zero setting/Preset (input)

MATERIALS

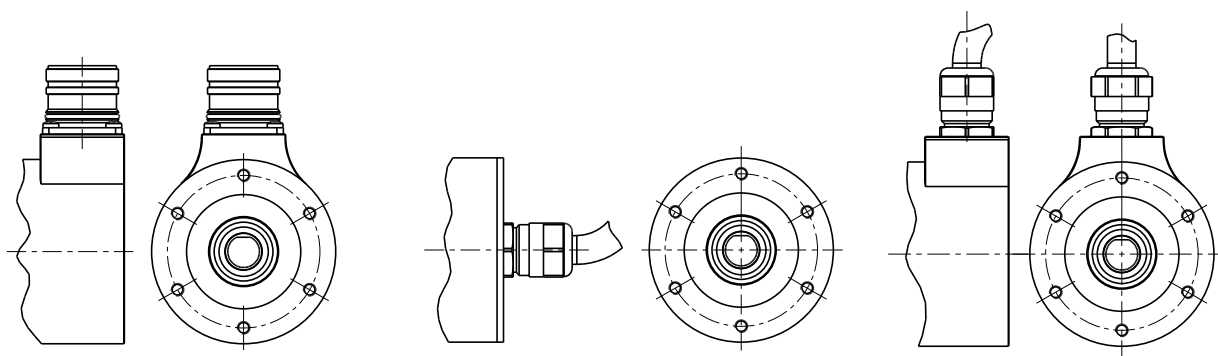
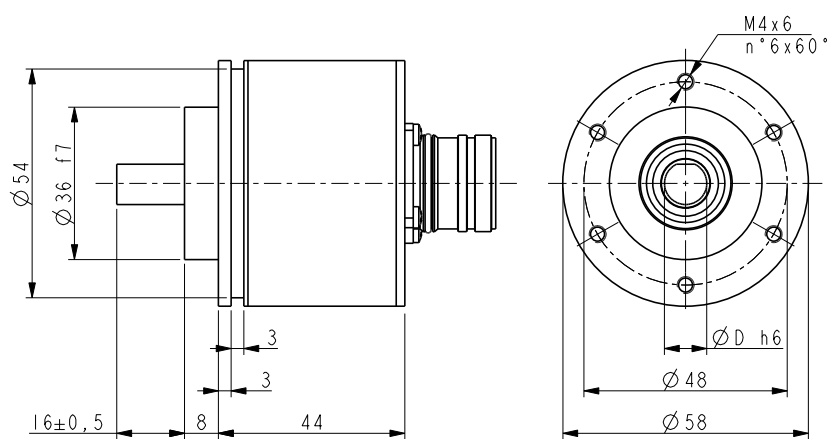
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

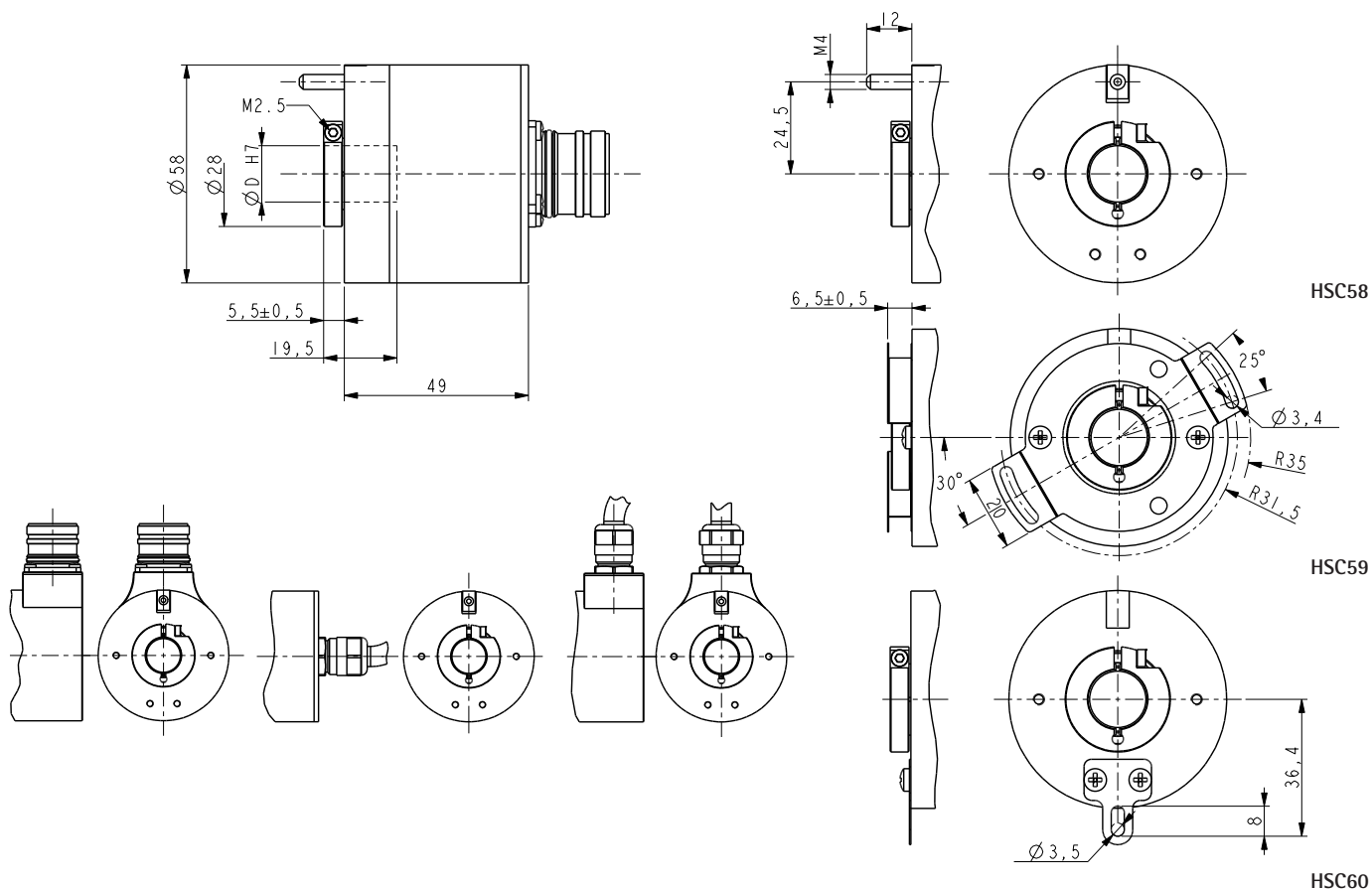
EPFL121H:	M23 12 pin connector
EM12F8:	M12 8 pin mating connector
EM12F12:	M12 12 pin mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
EC-CR12F-S28-T12-xx:	cordset xx m, M23 connector
EC-M12F8-LK-M8-xx:	cordset xx m, M12 8 pin connector
EC-M12F12-LK-T12-xx:	cordset xx m, M12 12 pin conn.
LKM-386:	fixing clamps



HS58



HS58S



Order code

HS58	XX	/	XX	-	XX	-	X	XX	/Sxxx
HS58S	Ⓐ		Ⓑ		Ⓒ		Ⓓ	Ⓔ	Ⓕ
HSC58									
HSC59									
HSC60									

Ⓐ RESOLUTION

13 = 8192 cpr
 16 = 65536 cpr
 18 = 262144 cpr

Ⓑ OUTPUT CIRCUITS

GV = SSI, LSB aligned, Gray code + 2048 PPR sin/cos
 BV = SSI, LSB aligned, Binary code + 2048 PPR sin/cos
 GA = SSI, LSB aligned, Gray code
 BA = SSI, LSB aligned, Binary code
 I7 = BiSS C-mode + 2048 PPR sin/cos
 I8 = BiSS B-mode + 2048 PPR sin/cos
 G1 = SSI, Gray code + 2048 PPR AB, /AB
 G2 = SSI, Gray code + 4096 PPR AB, /AB
 G3 = SSI, Gray code + 8192 PPR AB, /AB
 B1 = SSI, Binary code + 2048 PPR AB, /AB
 B2 = SSI, Binary code + 4096 PPR AB, /AB
 B3 = SSI, Binary code + 8192 PPR AB, /AB

Ⓒ SHAFT DIAMETER

6 = 10 mm
 8 = 8 mm
 P9 = 9.52 mm, 3/8"
 10 = 10 mm
 12 = 12 mm
 14 = 14 mm (HSCxx)
 15 = 15 mm (HSCxx)

Ⓓ CONNECTION POSITION

- = axial
 R = radial

Ⓔ CONNECTIONS

L2 = cable output 2 m
 L5 = cable output 5 m
 L10 = cable output 10 m
 M2 = M23 12 pin plug
 M = M12 8 pin plug
 M1 = M12 12 pin plug
 (only for GV, BV, GA, BA)
 (except with GV, BV, GA, BA)

Ⓕ CUSTOM VERSION

ROTACOD

Absolute multi-turn encoders

Series

HM58 • HM58S • HMC58



- Compact single turn encoders for feedback applications
- High resolution up to 65536 cpr and 16384 turns
- Additional incremental track, 2048 PPR sin/cos
- Precise and fast optical sensing



HM58 • HM58S • HMC58

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Starting torque (at 20°C):	HM58: 0,15 Ncm (typ.) HM58S, HMCxx: 0,4 Ncm (typ.)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 2 m (6.56 ft)
Weight:	~ 300 g (10,6 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

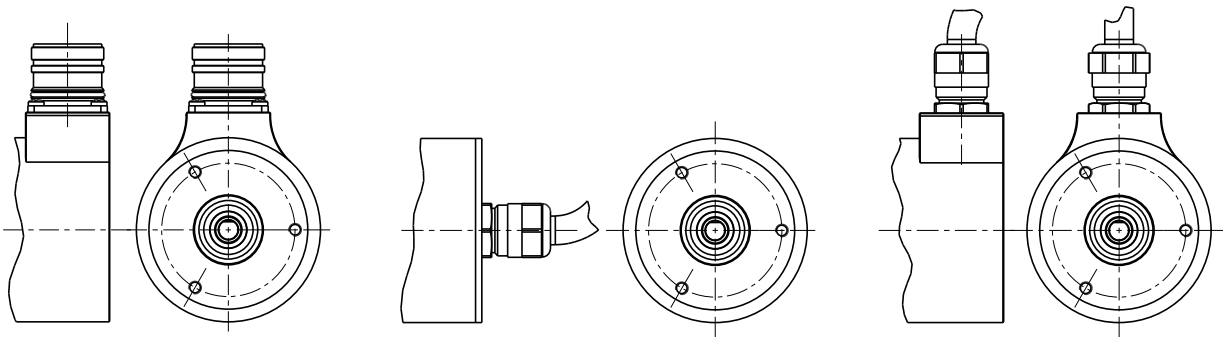
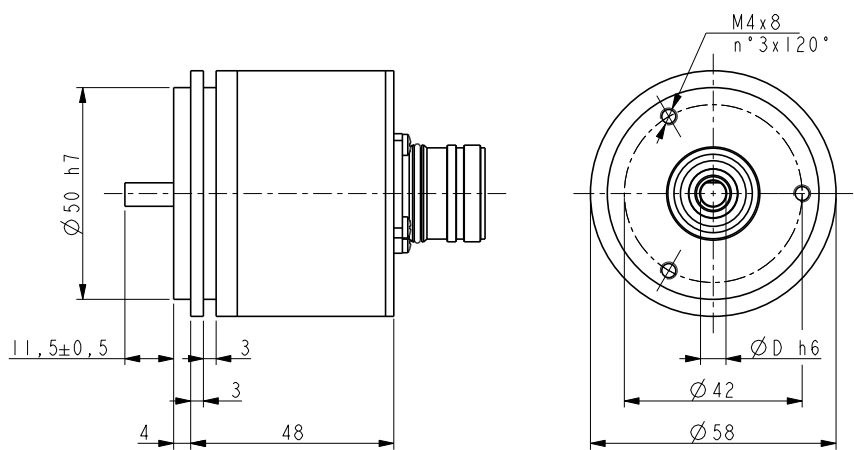
Resolution:	SSI, BiSS, 16x14 bit max. sin/cos: 2048 PPR AB, /AB: 2048, 4096, 8192
Accuracy:	± 0,007°
Output circuits:	SSI, SSI + 1Vpp, SSI + Push-Pull, SSI + Line Driver 5V, BiSS + 1Vpp
Output code:	Gray, Binary
Counting frequency:	220 kHz max.
Power supply:	+10V +30V
Power consumption:	1 W
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Optoelectronic life:	100.000 h min.
Functions:	• Counting direction (input) • Zero setting/Preset (input)

MATERIALS

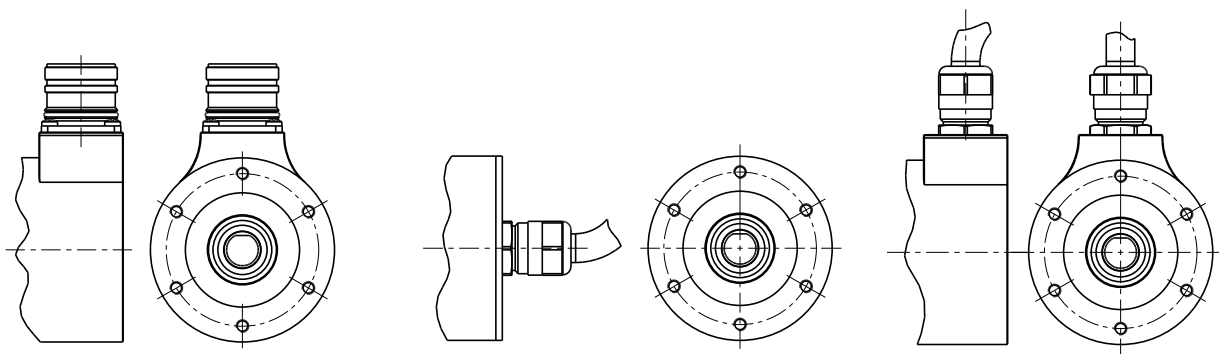
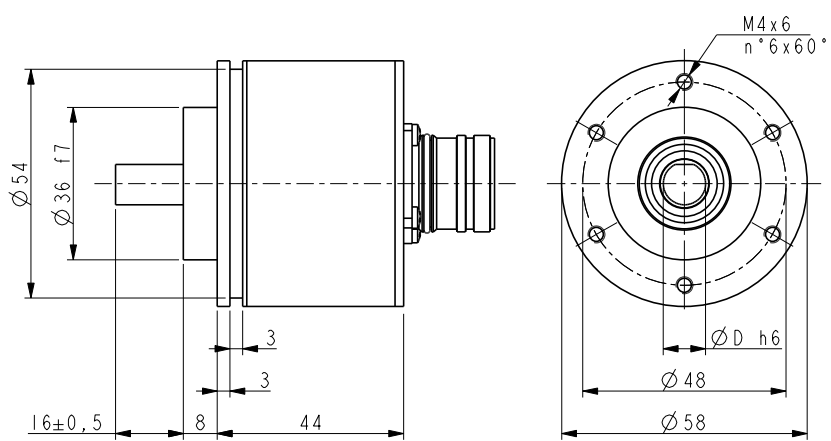
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

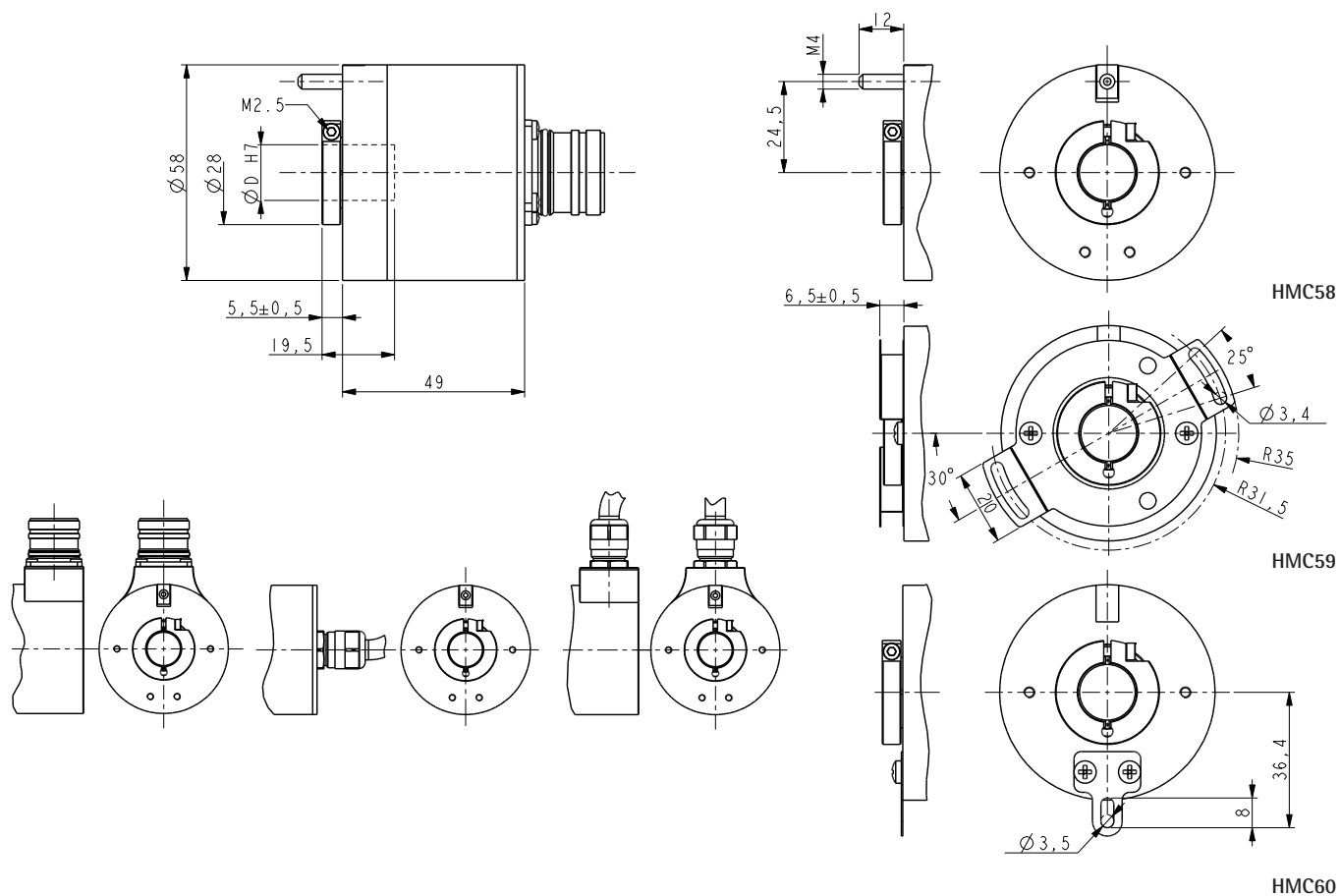
EPFL121H:	M23 12 pin connector
EM12F8:	M12 8 pin mating connector
EM12F12:	M12 12 pin mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
EC-CR12F-S28-T12-xx:	cordset xx m, M23 connector
EC-M12F8-LK-M8-xx:	cordset xx m, M12 8 pin connector
EC-M12F12-LK-T12-xx:	cordset xx m, M12 12 pin conn.
LKM-386:	fixing clamps



HM58



HM58S



Order code

HM58	XX / XXXXX	XX	-	XX	-	X	XX	/Sxxx
HM58S	Ⓐ	Ⓑ		Ⓒ		Ⓓ	Ⓔ	Ⓕ
HMC58								
HMC59								
HMC60								

<p>Ⓐ RESOLUTION 13/4096 = 8192 cpr x 4096 turns 16/16384 = 65536 cpr x 16384 turns</p>	<p>Ⓑ OUTPUT CIRCUITS GV = SSI, LSB aligned, Gray code + 2048 PPR sin/cos BV = SSI, LSB aligned, Binary code + 2048 PPR sin/cos GA = SSI, LSB aligned, Gray code BA = SSI, LSB aligned, Binary code I7 = BiSS C-mode + 2048 PPR sin/cos I8 = BiSS B-mode + 2048 PPR sin/cos G1 = SSI, Gray code + 2048 PPR AB, /AB Line Driver G2 = SSI, Gray code + 4096 PPR AB, /AB Line Driver G3 = SSI, Gray code + 8192 PPR AB, /AB Line Driver G6 = SSI, Gray code + 2048 PPR AB, /AB Push-Pull G7 = SSI, Gray code + 4096 PPR AB, /AB Push-Pull G8 = SSI, Gray code + 8192 PPR AB, /AB Push-Pull</p>	<p>Ⓒ SHAFT DIAMETER 6 = 10 mm 8 = 8 mm P9 = 9.52 mm, 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (HMCxx) 15 = 15 mm (HMCxx)</p> <p>Ⓓ CONNECTION POSITION - = axial R = radial</p>	<p>Ⓔ CONNECTIONS L2 = cable output 2 m L5 = cable output 5 m L10 = cable output 10 m M2 = M23 12 pin plug M = M12 8 pin plug M1 = M12 12 pin plug <i>(only for GV, BV, GA, BA)</i> <i>(except with GV, BV, GA, BA)</i></p> <p>Ⓕ CUSTOM VERSION</p>
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ROTACOD

Absolute single turn and multi turn encoder

Series

HSCT • HMCT



- Compact design, through hollow shaft
- Industrial & feedback applications
- Single turn version up to 18 bits
- Multi turn version, 16 x 12 bits
- Incremental resolution up to 8192 PPR or 2048 sin/cos



HSCT • HMCT

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx: from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	1 Ncm (typ.)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 1 m (3.3 ft)
Weight:	~ 200 g (7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution:	SSI, BiSS: HSCT 18 bit max., HMCT 16 x 12 bit sin/cos: 2048 PPR AB /AB: 2048, 4096, 8192 PPR
Accuracy:	± 0,007°
Output circuits:	SSI, SSI + 1Vpp sin/cos, SSI + Line Driver 5Vdc, SSI + Push-Pull 10-30Vdc, BiSS + 1Vpp sin/cos
Output code:	Gray, Binary
Counting frequency:	220 kHz max.
Power supply:	+10V +30V
Power consumption:	1 W
Protection:	against inversion of polarity
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Optoelectronic life:	100.000 h min.
Functions:	• Counting direction (input) • Electronic zero setting (input)

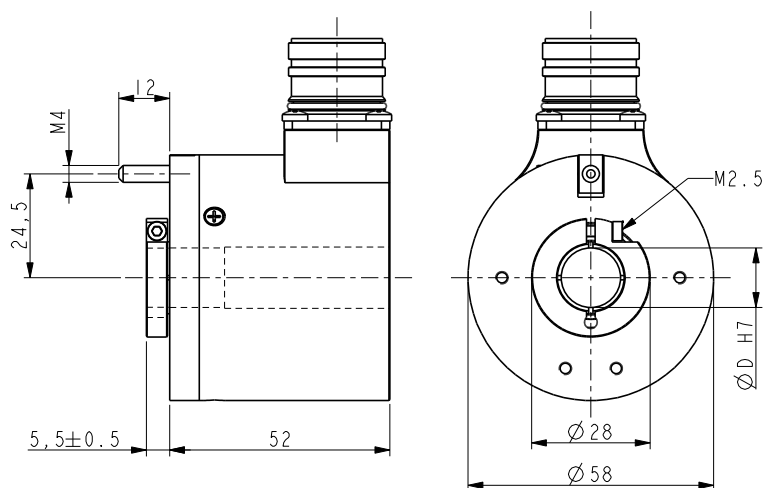
MATERIALS

Flange:	anticorrosional, UNI EN AW-6082
Housing:	anticorrosional, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

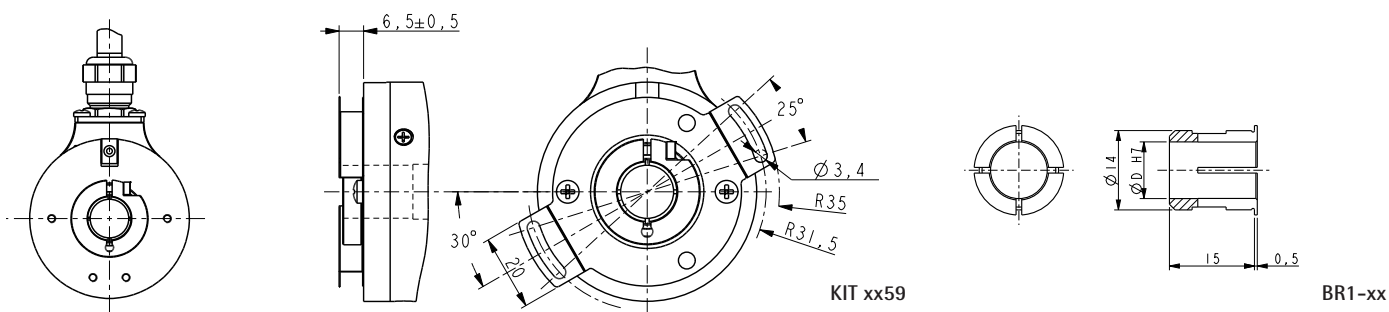
ACCESSORIES

EPFL121H:	M23 12 pin connector
EM12F8:	M12 8 pin mating connector
EM12F12:	M12 12 pin mating connector
BR1:	reducing sleeves
EC-CR12F-S28-T12-xx:	cordset xx m, M23 connector
EC-M12F8-LK-M8-xx:	cordset xx m, M12 8 pin connector
EC-M12F12-LK-T12-xx:	cordset xx m, M12 12 pin conn.
KIT xx59:	fixing plate

Specifications subject to changes without prior notice



HSCT • HMCT



BR1-xx

Order code - Single turn

HSCT	XX Ⓐ	/	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	XX Ⓔ	/Sxxx Ⓕ
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<p>Ⓐ RESOLUTION Counts x rev. 16 = 65536 cpr 18 = 262144 cpr</p>	<p>Ⓑ OUTPUT CIRCUITS GV = SSI, Gray code + 2048 PPR sin/cos BV = SSI, Binary code + 2048 PPR sin/cos GA = SSI, Gray code BA = SSI, Binary code I7 = BiSS C-mode + 2048 PPR sin/cos I8 = BiSS B-mode + 2048 PPR sin/cos G1 = SSI, Gray code + 2048 PPR AB, /AB Line Driver G2 = SSI, Gray code + 4096 PPR AB, /AB Line Driver G3 = SSI, Gray code + 8192 PPR AB, /AB Line Driver G6 = SSI, Gray code + 2048 PPR AB, /AB Push-Pull G7 = SSI, Gray code + 4096 PPR AB, /AB Push-Pull G8 = SSI, Gray code + 8192 PPR AB, /AB Push-Pull</p>	<p>Ⓒ SHAFT DIAMETER 14 = 14 mm 15 = 15 mm</p> <p>Ⓓ CONNECTOR POSITION R = radial</p>	<p>Ⓔ CONNECTIONS L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m M2 = M23 connector M = M12 8 pin plug (only for GV, BV, GA, BA) M1 = M12 12 pin plug (except with GV, BV, GA, BA)</p> <p>Ⓕ CUSTOM VERSION</p>
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Order code - Multi turn

HMCT	XX/XXXX Ⓐ	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	XX Ⓔ	/Sxxx Ⓕ
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<p>Ⓐ RESOLUTION Counts x rev./rev. 13/4096 = 8192 x 4096 16/4096 = 65536 x 4096</p>	<p>Ⓑ OUTPUT CIRCUITS GV = SSI, Gray code + 2048 PPR sin/cos BV = SSI, Binary code + 2048 PPR sin/cos GA = SSI, Gray code BA = SSI, Binary code I7 = BiSS C-mode + 2048 PPR sin/cos I8 = BiSS B-mode + 2048 PPR sin/cos G1 = SSI, Gray code + 2048 PPR AB, /AB Line Driver G2 = SSI, Gray code + 4096 PPR AB, /AB Line Driver G3 = SSI, Gray code + 8192 PPR AB, /AB Line Driver G6 = SSI, Gray code + 2048 PPR AB, /AB Push-Pull G7 = SSI, Gray code + 4096 PPR AB, /AB Push-Pull G8 = SSI, Gray code + 8192 PPR AB, /AB Push-Pull</p>	<p>Ⓒ SHAFT DIAMETER 14 = 14 mm 15 = 15 mm</p> <p>Ⓓ CONNECTOR POSITION R = radial</p>	<p>Ⓔ CONNECTIONS L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m M2 = M23 connector M = M12 8 pin plug (only for GV, BV, GA, BA) M1 = M12 12 pin plug (except with GV, BV, GA, BA)</p> <p>Ⓕ CUSTOM VERSION</p>
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ROTACOD

Absolute encoders

Series

AS58 • AS58S • ASC58



- Standard absolute single turn encoder
- Resolution up to 8192 counts/rev.
- Cable and connector output



AS58S • AS58 • ASC59

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	AS58: 0,15 Ncm (typ.) AS58S, ASCxx: 0,4 Ncm (typ.)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	SSI: MIL 7 pin plug (10 pin plug with zero setting) Bit parallel: MIL 19 pin plug
Weight:	~ 250 g (8,8 oz)
Options:	• DSub 15 pin plug • DSub 25 pin plug • MIL 19 pin plug • cable output 1 m (3.3 ft)

ELECTRICAL SPECIFICATIONS

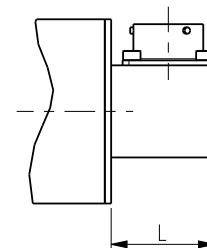
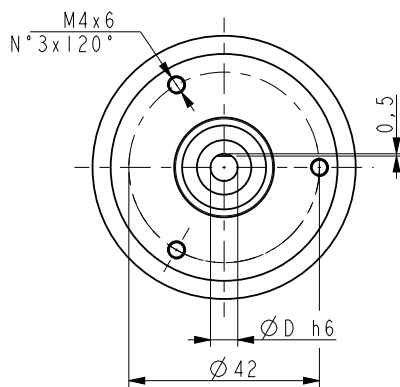
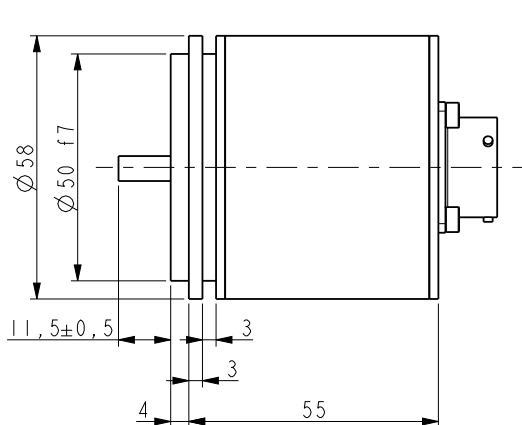
Resolution:	256, 360, 512, 720, 1024, 2048, 4096, 8192 cpr
Output circuits:	SSI (RS422), Bit parallel, NPN, PNP, Push-Pull
Output code:	Gray, Binary
Counting frequency:	50 kHz max.
Power supply:	+10V +30V
Power consumption:	SSI: 1 W Bit parallel: 1,2 W
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Optoelectronic life:	100.000 h min.
Functions:	• Counting direction (input)
Options:	• Zero setting / Preset (input) • LATCH output • TRI-STATE output • Electronic parity bit (on request)

MATERIALS

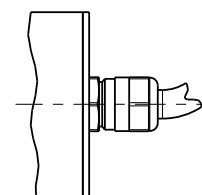
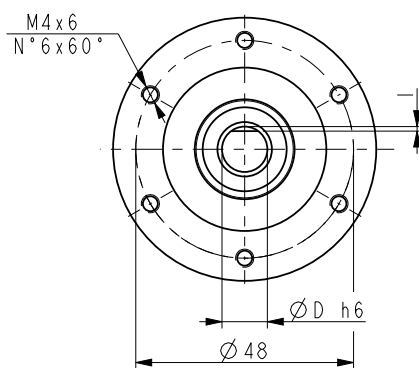
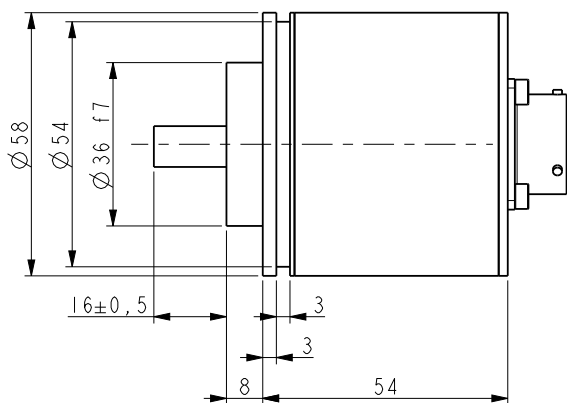
Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

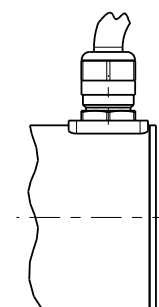
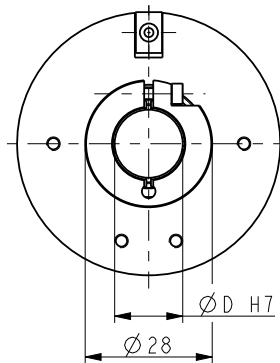
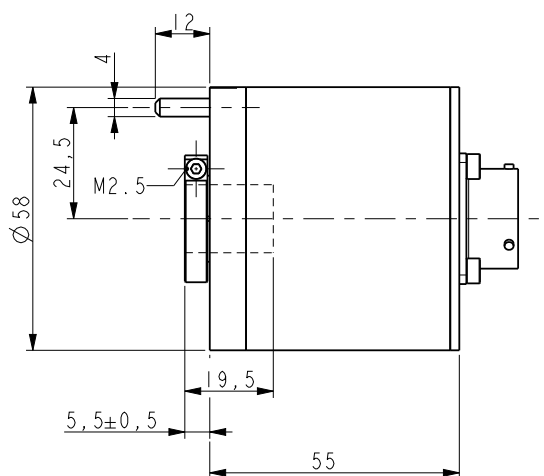
E19MLS:	19 pin MIL mating connector
E7MLS:	7 pin MIL mating connector
E10MLS:	10 pin MIL mating connector
EDB 25S:	25 pin DSub mating connector
EDA 15S:	15 pin DSub mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps



AS58



AS58S



ASC58

Order code - Bit parallel output

Additional code (optional)

AS58	X	/	X	X	-	XX	-	X	X	X	X	X	/Sxxx
AS58S	(a)		(b)	(c)		(d)		(e)	(f)	(g)	(h)	(i)	(j)
ASC58													
ASC59													
ASC60													

<p>(a) RESOLUTION</p> <p>08 = 256 cpr 36 = 360 cpr 09 = 512 cpr 72 = 720 cpr 10 = 1024 cpr 11 = 2048 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>(b) OUTPUT CODE</p> <p>B = Binary G = Gray</p>	<p>(c) OUTPUT CIRCUITS</p> <p>N = NPN o.c. P = PNP o.c. Y = Push-Pull</p> <p>on request: L = LATCH (NPN) M = LATCH (PNP) H = LATCH (Push-Pull) T = TRI-STATE (NPN) U = TRI-STATE (PNP) E = LATCH+TRI-STATE (PNP) F = LATCH+TRI-STATE (NPN)</p>	<p>(d) SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm P9 = 9.52 mm - 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (ASCxx) 15 = 15 mm (ASCxx)</p>	<p>(e) E = Zero setting (option)</p> <p>(f) B = Parity bit (option)</p> <p>(g) OPERATING TEMPERATURE RANGE K = -40°C +100°C (-40°F +212°F)</p> <p>(h) R = radial connection</p> <p>(i) CONNECTIONS L1 = cable output 1 m Lx = cable output x m Z = DSub 15 pin plug W = DSub 25 pin plug</p> <p>(j) CUSTOM VERSION</p>
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Order code - SSI output

Additional code (optional)

AS58	X	/	X	X	-	XX	-	X	X	X	X	X	/Sxxx
AS58S	(a)		(b)	(c)		(d)		(e)	(f)	(g)	(h)	(i)	(j)
ASC58													
ASC59													
ASC60													

<p>(a) RESOLUTION</p> <p>08 = 256 cpr 36 = 360 cpr 09 = 512 cpr 72 = 720 cpr 10 = 1024 cpr 11 = 2048 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>(b) OUTPUT CODE</p> <p>B = Binary G = Gray</p>	<p>(c) OUTPUT CIRCUITS</p> <p>S = SSI, tree format (connector) R = SSI, tree format (cable) A = SSI, LSB aligned (connector) B = SSI, LSB aligned (cable)</p>	<p>(d) SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm P9 = 9.52 mm - 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (ASCxx) 15 = 15 mm (ASCxx)</p>	<p>(e) E = Zero setting (option)</p> <p>(f) B = Parity bit (option)</p> <p>(g) OPERATING TEMPERATURE RANGE K = -40°C +100°C (-40°F +212°F)</p> <p>(h) R = radial connection</p> <p>(i) CONNECTIONS L1 = cable output 1 m Lx = cable output x m</p> <p>(j) CUSTOM VERSION</p>
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ROTACOD

Absolute multi turn encoders

Series

AM58 • AM58S • AMC58



- Standard absolute multi-turn encoder
- Resolution up to 8192 cpr x 4096 turns
- Cable and connector output



AM58 • AM58S • AMC59

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	AM58: 0,15 Ncm (typ.) AM58S, AMCxx: 0,4 Ncm (typ.)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	SSI: MIL 7 pin plug (10 pin plug with zero setting) Bit parallel: MIL 32 pin plug
Weight:	~ 250 g (8,8 oz)
Options:	• DSub 25 pin plug • cable output 1 m (3.3 ft)

ELECTRICAL SPECIFICATIONS

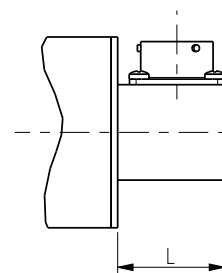
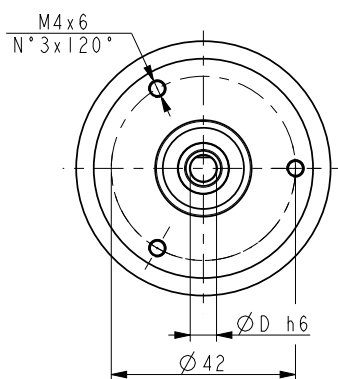
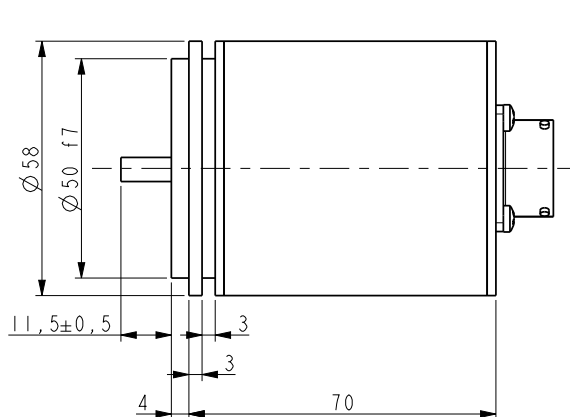
Resolution:	256, 512, 1024, 2048, 4096, 8192 cpr 16, 256, 4096 turns
Output circuits:	SSI (RS422), Bit parallel, NPN, PNP, Push-Pull
Output code:	Gray, Binary
Counting frequency:	50 kHz max.
Power supply:	+10V +30V
Power consumption:	SSI: 1 W Bit parallel: 2 W
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Optoelectronic life:	100.000 h min.
Functions:	• counting direction (input)
Options:	• Zero setting / Preset (input) • LATCH output • TRI-STATE output • Electronic parity bit (on request)

MATERIALS

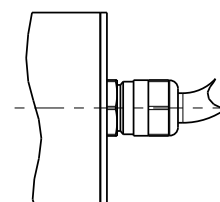
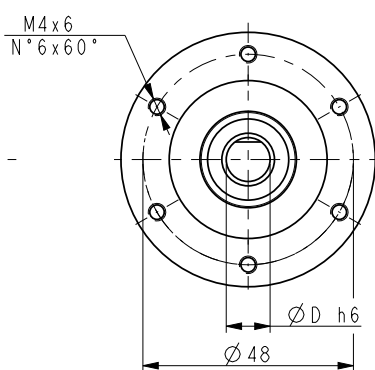
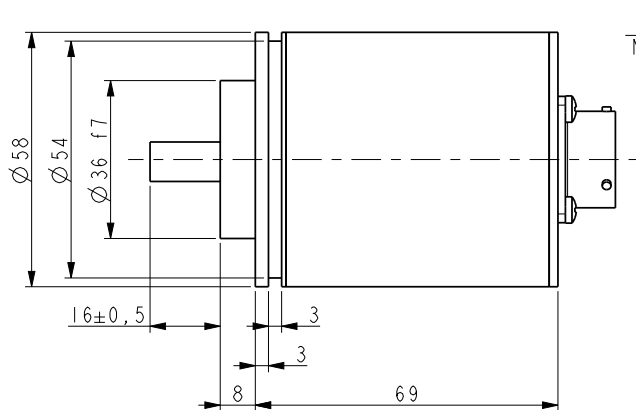
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

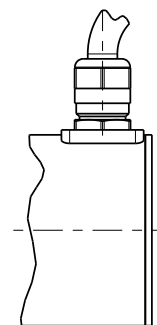
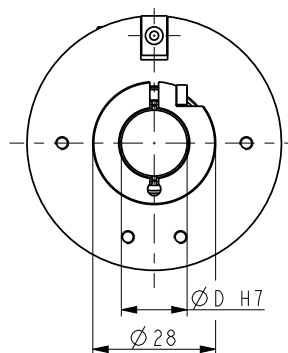
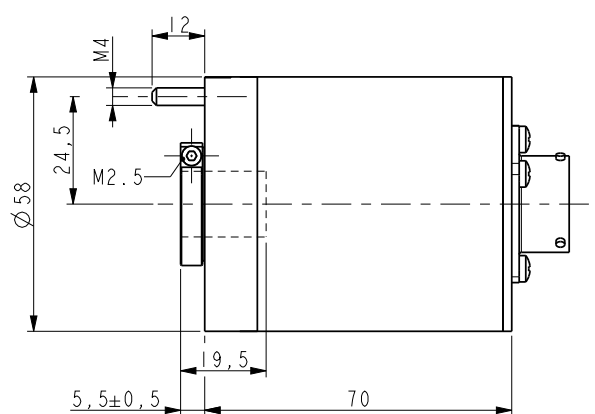
E32MLS:	32 pin MIL mating connector
E7MLS:	7 pin MIL mating connector
E10MLS:	10 pin MIL mating connector
EDB 25S:	25 pin DSub mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps



AM58



AM58S



AMC58

Order code - Bit parallel output

Additional code (optional)

AM58	XX	/	XXXX	X	X	-	XX	-	X	X	X	X	X	/Sxxx
AM58S	Ⓐ		Ⓑ	Ⓒ	Ⓓ		Ⓔ		Ⓕ	Ⓖ	Ⓗ	Ⓘ	Ⓚ	Ⓛ
AMC58														
AMC59														
AMC60														

<p>Ⓐ RESOLUTION</p> <p>08 = 256 cpr 09 = 512 cpr 10 = 1024 cpr 11 = 2048 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>Ⓑ REVOLUTIONS</p> <p>16 = 16 turns 256 = 256 turns 4096 = 4096 turns</p> <p>Ⓒ OUTPUT CODE</p> <p>B = Binary G = Gray</p>	<p>Ⓓ OUTPUT CIRCUITS</p> <p>N = NPN o.c. P = PNP o.c. Y = Push-Pull</p> <p>on request:</p> <p>L = LATCH (NPN) M = LATCH (PNP) H = LATCH (Push-Pull) T = TRI-STATE (NPN) U = TRI-STATE (PNP) E = LATCH+TRI-STATE (PNP) F = LATCH+TRI-STATE (NPN)</p>	<p>Ⓔ SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm P9 = 9.52 mm - 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (AMCxx) 15 = 15 mm (AMCxx)</p>	<p>Ⓕ E = Zero setting (option)</p> <p>Ⓖ B = Parity bit (option)</p> <p>Ⓗ OPERATING TEMPERATURE RANGE</p> <p>K = -40°C +100°C (-40°F +212°F)</p> <p>Ⓚ R = radial connection</p> <p>Ⓛ CONNECTIONS</p> <p>L1 = cable output 1 m Lx = cable output x m W = DSub 25 pin plug</p> <p>Ⓛ CUSTOM VERSION</p>
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Order code - SSI output

Additional code (optional)

AM58	XX	/	XXXX	X	X	-	XX	-	X	X	X	X	X	/Sxxx
AM58S	Ⓐ		Ⓑ	Ⓒ	Ⓓ		Ⓔ		Ⓕ	Ⓖ	Ⓗ	Ⓘ	Ⓚ	Ⓛ
AMC58														
AMC59														
AMC60														

<p>Ⓐ RESOLUTION</p> <p>08 = 256 cpr 09 = 512 cpr 10 = 1024 cpr 11 = 2048 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>Ⓑ REVOLUTIONS</p> <p>16 = 16 turns 256 = 256 turns 4096 = 4096 turns</p>	<p>Ⓒ OUTPUT CODE</p> <p>B = Binary G = Gray</p> <p>Ⓓ OUTPUT CIRCUITS</p> <p>S = SSI, tree format (connector) R = SSI, tree format (cable) A = SSI, LSB aligned (connector) B = SSI, LSB aligned (cable)</p>	<p>Ⓔ SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm P9 = 9.52 mm - 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (AMCxx) 15 = 15 mm (AMCxx)</p>	<p>Ⓕ E = Zero setting (option)</p> <p>Ⓖ B = Parity bit (option)</p> <p>Ⓗ OPERATING TEMPERATURE RANGE</p> <p>K = -40°C +100°C (-40°F +212°F)</p> <p>Ⓚ R = radial connection</p> <p>Ⓛ CONNECTIONS</p> <p>L1 = cable output 1 m Lx = cable output x m</p> <p>Ⓛ CUSTOM VERSION</p>
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ROTAMAG

Magnetic absolute encoder

Series

MH58S



- Compact heavy-duty encoder
- IP67 protection & extended temperature range
- High shaft load
- Comfortable presetting by push-button
- Suitable for outdoor and offshore installations
- SSI or analogue output
- IP69K protection on request



MH58S

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67
Operating temperature range:	-40°C +85°C (-40°F +185°F)
Storage temperature range:	-40°C +85°C (-40°F +185°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 10 mm
Shaft loading:	axial: 270 N max. radial: 150 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	1 Ncm (typical)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M23 12 pin plug, cable output 1 m (3.3 ft)
Weight:	~ 350 g (12,3 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

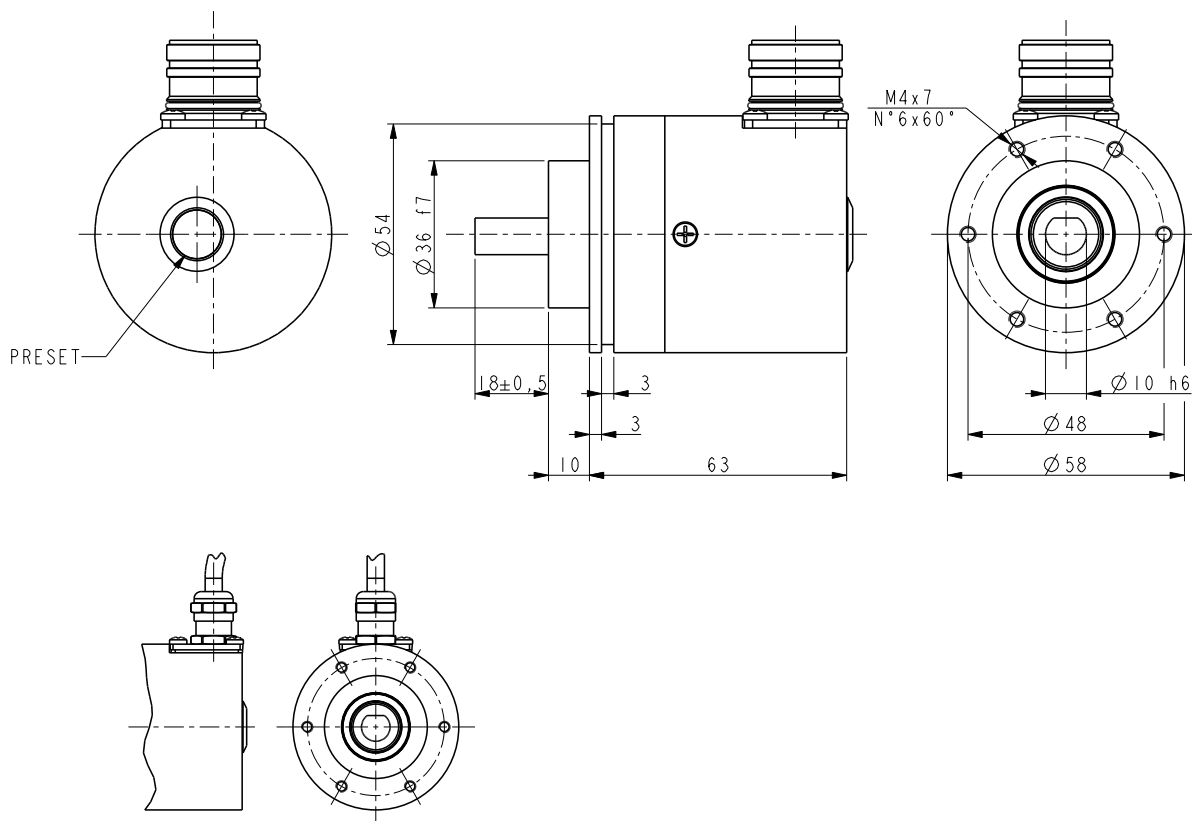
Resolution:	single turn: 4096 cpr multi turn: 4096 x 4096 bit
Start-up time:	200 msec
Accuracy:	± 0,9°
Output circuits:	SSI: SSI, Gray, Clock 1 MHz max. Analogue: 0-5V, 0-10V, -5/+5V, -10/+10V, 0-20mA, 0-24mA
Counting frequency:	100 kHz max.
Power supply:	SSI: +10Vdc +30Vdc Analogue: +13Vdc +30Vdc
Protection:	protected against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Battery life:	10 years min.
Functions:	• Counting direction (input) • Zero setting button (input)

MATERIALS

Flange:	anticorodal, EN AW-6082 (UNI EN 573)
Housing:	anticorodal, EN AW-6082 (UNI EN 573)
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305

ACCESSORIES

PAN/PGF:	flexible couplings
EPFL121H:	M23 12 pin mating connector



MH58S

Order code - Analogue output

MH58S	XX/X ⓐ	XXX ⓑ	-	XX ⓒ	-	X ⓓ	X ⓔ	/Sxxx ⓕ
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<p>ⓐ RESOLUTION</p> <p>12/1 = 4096 cpr</p>	<p>ⓑ OUTPUT</p> <p>AI1 = 4-20mA AI2 = 0-20mA AI3 = 0-24mA AV1 = 0-5V AV2 = 0-10V AV3 = -5/+5V AV4 = -10/+10V</p>	<p>ⓒ SHAFT DIAMETER</p> <p>10 = 10 mm</p>	<p>ⓓ CONNECTOR POSITION</p> <p>R = radial</p>	<p>ⓔ CONNECTIONS</p> <p>L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m M2 = M23 12 pin plug</p>	<p>ⓕ CUSTOM VERSION</p>
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Order code - SSI output

MH58S	XX/XXXX ⓐ	XX ⓑ	-	XX ⓒ	-	XX ⓓ	X ⓔ	/Sxxx ⓕ
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<p>ⓐ RESOLUTION</p> <p>12/1 = 4096 cpr 12/4096 = 4096 cpr x 4096 rev</p>	<p>ⓑ OUTPUT CODE</p> <p>GS = Gray, SSI tree format</p>	<p>ⓒ SHAFT DIAMETER</p> <p>10 = 10 mm</p>	<p>ⓓ CONNECTOR POSITION</p> <p>R = radial</p>	<p>ⓔ CONNECTIONS</p> <p>L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m M2 = M23 12 pin plug</p>	<p>ⓕ CUSTOM VERSION</p>
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ROTAMAG

Magnetic absolute encoders

Series

MM58 • MM58S • MMC58



- Rugged & compact multi turn encoder
- Stainless steel housing
- Magnetic sensing
- Through hollow shaft version available
- Up to 32768 turns (65536 on request)



MM58S • MM58 • MMC58

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-20°C +85°C (-4°F +185°F)
Storage temperature range:	-20°C +85°C (-4°F +185°F) (98% R.H. without condensation)
Option:	• protection IP67

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	12000 rpm max.
Starting torque (at 20°C):	MM58: 0,15 Ncm (typical) MM58S: 0,40 Ncm (typical) MMCxx: 1 Ncm (typical)
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 450 g (15,8 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution:	1024 cpr x 32768 turns 2048 cpr x 16384 turns 4096 cpr x 8192 turns
Accuracy:	± 1°
Output circuits:	SSI (clock 500 kHz, T _p =64 µsec.)
Output code:	Gray, Binary
Counting frequency:	20 kHz max.
Start-up time:	200 msec.
Power supply:	+10Vdc +30Vdc
Output current:	20 mA max.
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Battery life:	10 years min.
Functions:	• Counting direction (input) • Electronic zero setting (input)

MATERIALS

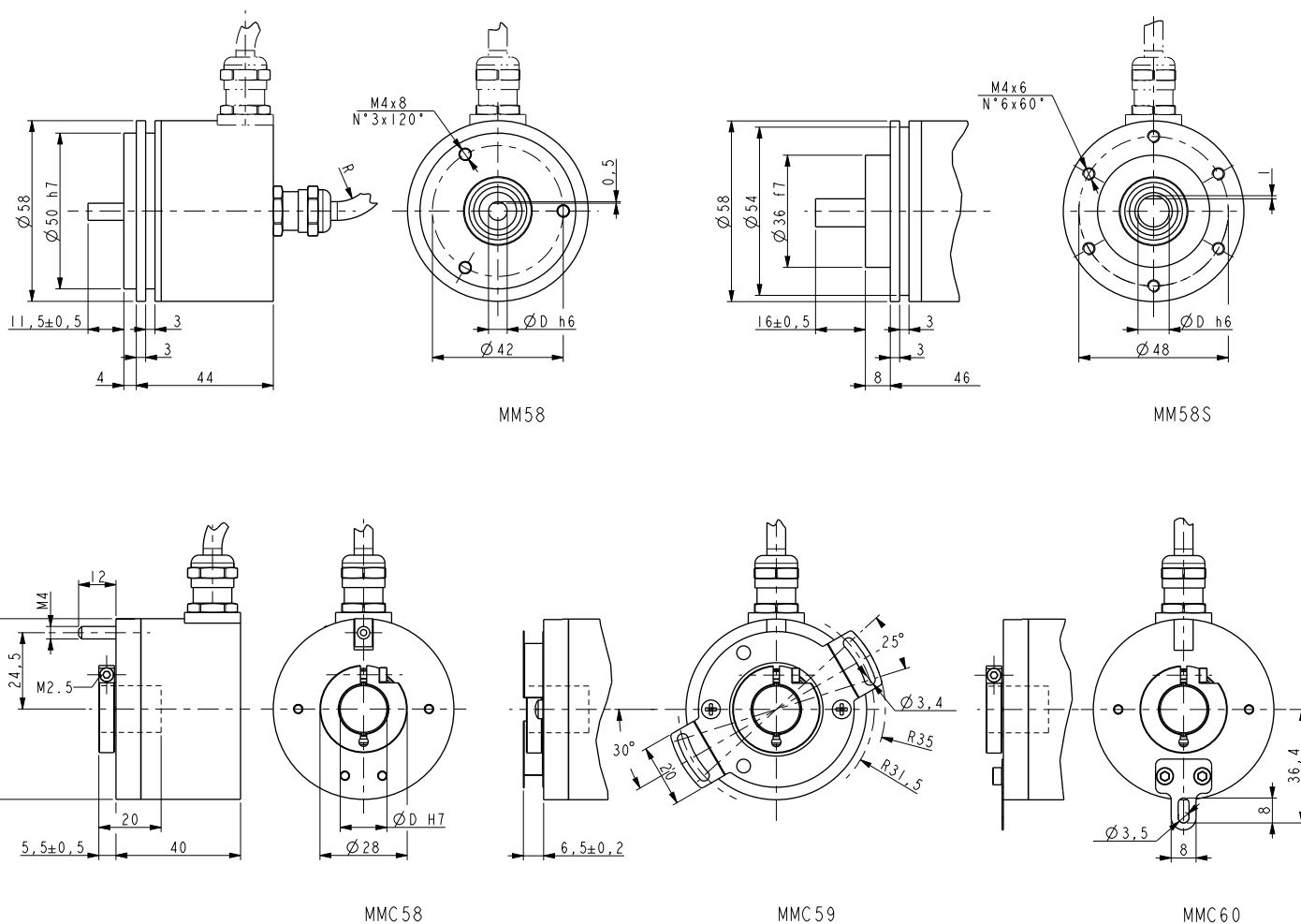
Flange:	AISI 420, UNI EN 4021
Housing:	AISI 420, UNI EN 4021
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

PREFERENTIAL MODEL

MMC5812/8192GB-15-L1	SSI, 24 bit
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ACCESSORIES

PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps



Order code

MM58	XX/XXXXX	XX	-	XX	-	X	X	XX	/Sxxx
MM58S	Ⓐ	Ⓑ		Ⓒ		Ⓓ	Ⓔ	Ⓕ	Ⓖ
MMC58									
MMC59									
MMC60									

<p>Ⓐ RESOLUTION 10/32768 = 1024 cpr x 32768 turns 11/16384 = 2048 cpr x 16384 turns 12/8192 = 4096 cpr x 8192 turns</p> <p>Ⓑ OUTPUT BB = Binary, SSI LSB aligned GB = Gray, SSI LSB aligned</p>	<p>Ⓒ SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (only for MMCxx) 15 = 15 mm (only for MMCxx)</p>	<p>Ⓓ CONNECTOR POSITION - = axial (standard) R = radial (mandatory on MMCxx series)</p> <p>Ⓔ PROTECTION - = IP65 (standard) J = IP67 with sealed circuit</p>	<p>Ⓕ CABLE LENGTH L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m</p>
			Ⓖ CUSTOM VERSION

ROTACOD

Absolute encoders

Series

HM58 P • HM58S P • HMC58 P



- Programmable absolute encoder (via USB cable)
- Compact housing
- Max. resolution 262144 cpr x 16384 turns
- Programmable scaling factor & Teach-in function
- Free SSI parameters setting
- Roundloop function
- Bit parallel output available



HM58 P • HM58S P • HMC58 P

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Operating temperature range:	-40°C +85°C (-40°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Protection:	IP67, IP65 shaft side

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Solid shaft:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial and radial):	100 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Starting torque (at 20°C):	HM58: 0,15 Ncm (typical) HM58S, HMCxx: 0,40 Ncm (typical)
Bearing life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Weight:	~ 300 g (10,6 oz)
Electrical connections:	SSI: M12, M23 plug, MIL inline plug or cable output 1 m (3.3 ft) Bit parallel: MIL, DSub inline plug or cable output 1 m (3.3 ft)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

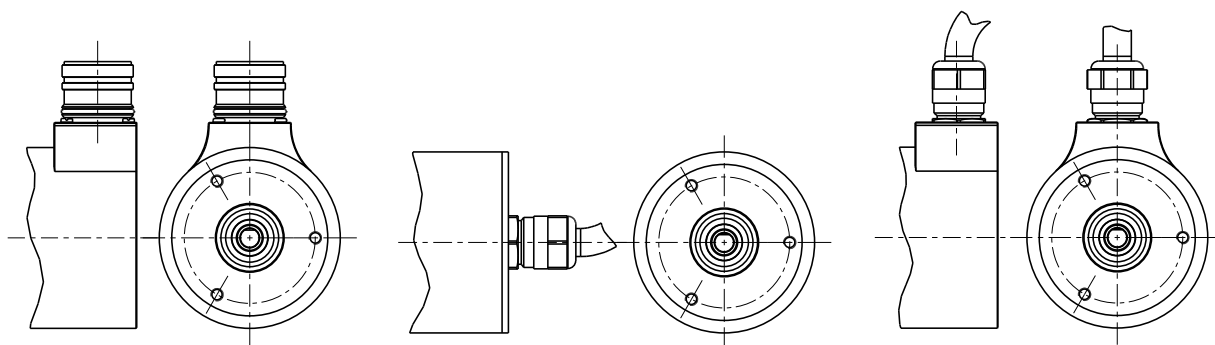
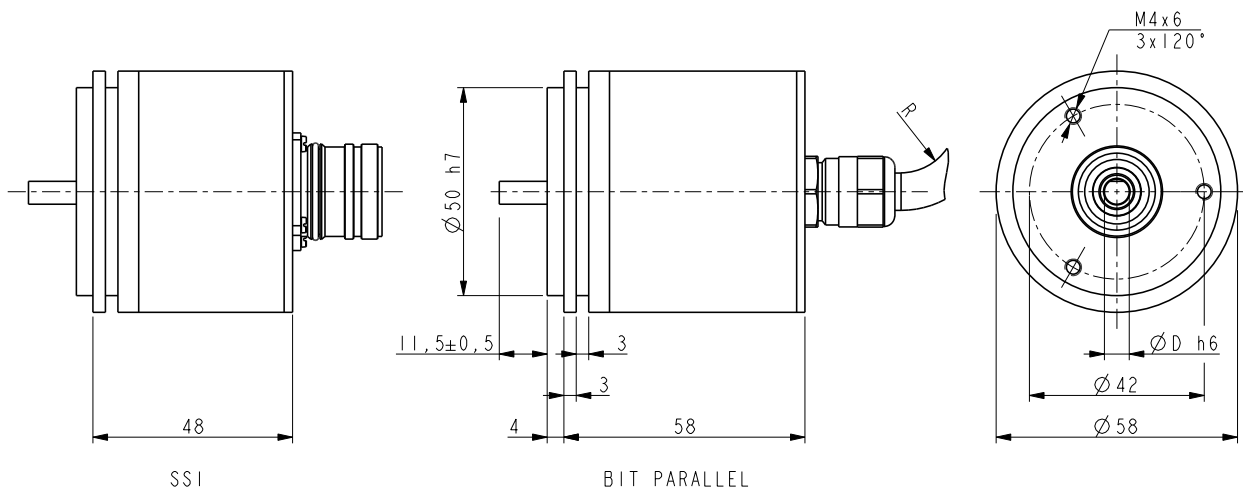
Resolution:	262144 cpr x 16384 turns programmable
Accuracy:	± 0,007°
Output code:	Gray, Binary, BCD
Power supply:	+10Vdc ÷ 30Vdc
Power consumption:	SSI: 1 W Bit parallel: 2,2 W
Output circuits:	SSI (RS422), Bit parallel Push-Pull, NPN
Counting frequency:	SSI: 150 kHz, Bit parallel: 30 kHz
Protection:	against inversion of polarity, short-circuit
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	<ul style="list-style-type: none"> • Programmable resolution <ul style="list-style-type: none"> • Teach-in of resolution • Counting direction (programmable + input) • Zero setting / Preset (programmable + input) <ul style="list-style-type: none"> • Parity bit (even/odd) • SSI protocol (alignment, clock, timing) <ul style="list-style-type: none"> • Latch, Tristate inputs

MATERIALS

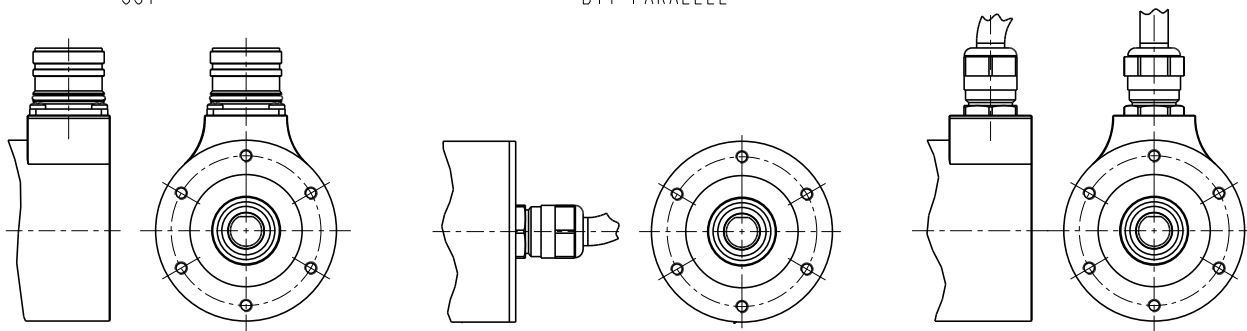
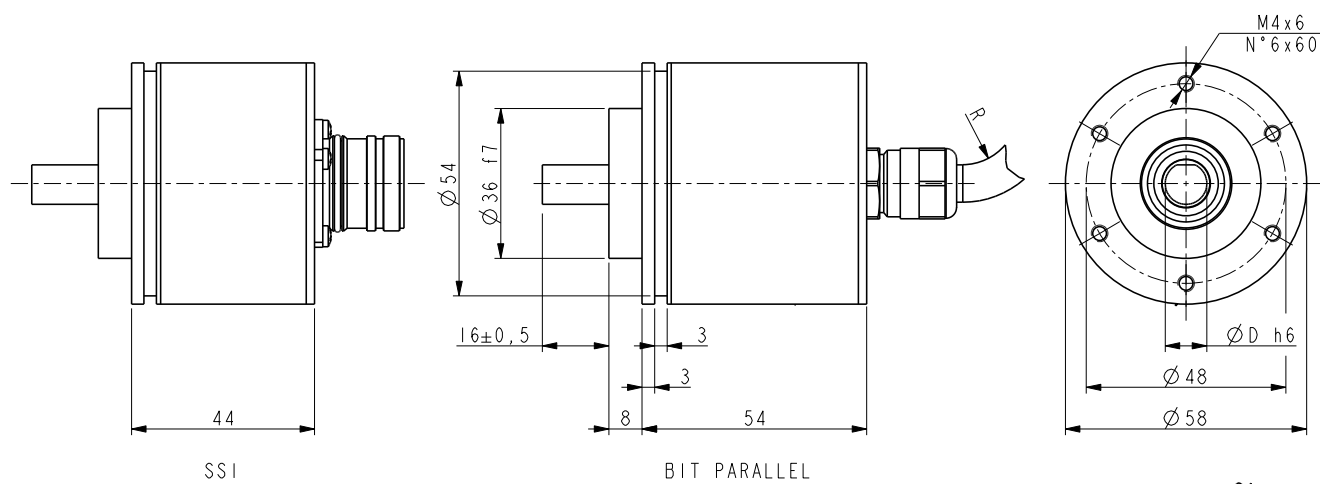
Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

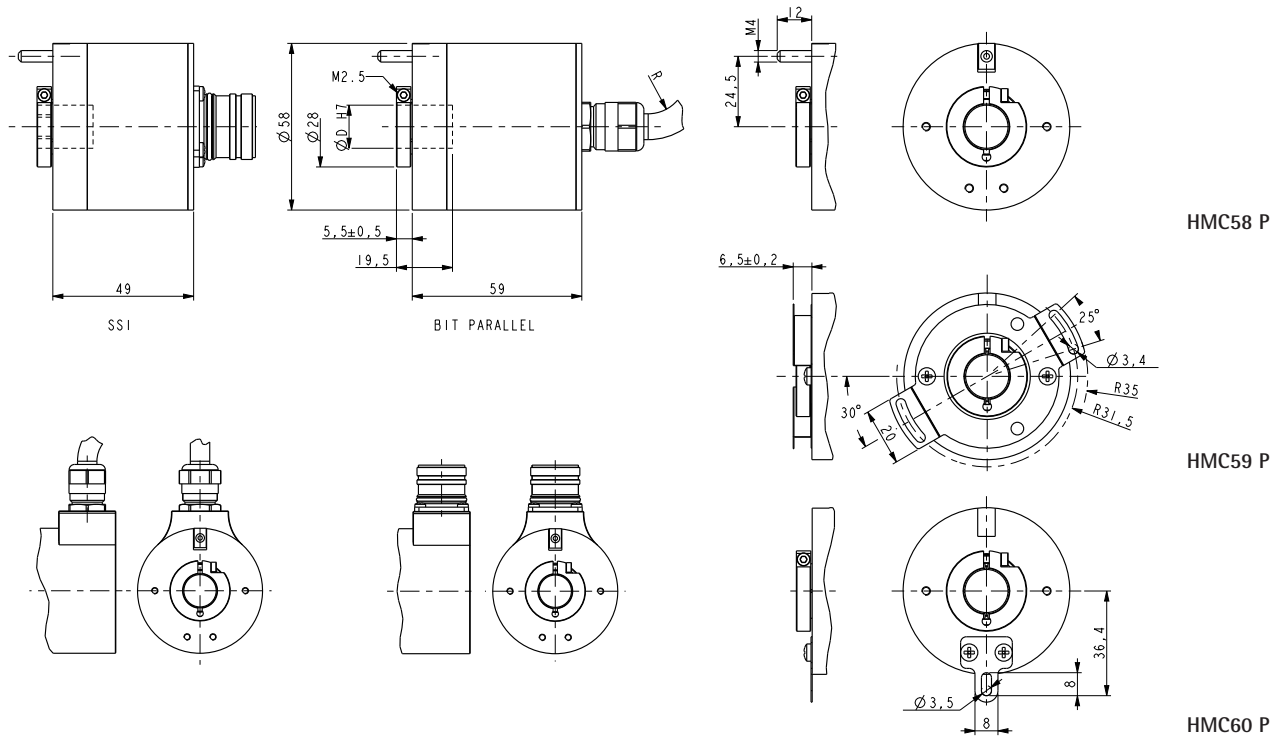
EPFL121H:	M23 12 pin mating connector
EM12F12:	M12 12 pin mating connector
E41MLS:	MIL 41 pin mating connector
E32MLS:	MIL 32 pin mating connector
E19MLS:	MIL 19 pin mating connector
E10MLS:	MIL 10 pin mating connector
E7MLS:	MIL 7pin mating connector
EDA 15S:	DSub 15 pin mating connector
EDB 25S:	DSub 25 pin mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps



HM58 P



HM58S P



Order code - Bit parallel output

HM58 HM58S HMC58 HMC59 HMC60	XX/XXXXX a	XX b	-	XX c	-	X d	XX e	/Sxxx - /Pxxx f
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<p>a RESOLUTION 18/16384 = 262144 cpr x 16384 turns</p> <p>b OUTPUT PY = programmable, Push-Pull PN = programmable, NPN</p>	<p>c SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (HMCxx) 15 = 15 mm (HMCxx)</p>	<p>d CONNECTION POSITION - = axial R = radial</p> <p>e CONNECTIONS Lx = cable output x m Y1 = 1 m cable + MIL 41 pin inline plug</p>	<p>with f = /Pxxx Z1 = 1 m cable + DSub 15 pin inline plug W1 = 1 m cable + DSub 25 pin inline plug X1 = 1 m cable + MIL 19 pin inline plug V1 = 1 m cable + MIL 32 pin inline plug Ax = A19 cable x m Bx = A32 cable x m</p> <p>f /Sxxx: Custom version /Pxxx: Factory programmed encoder on customer request</p>
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Order code - SSI output

HM58 HM58S HMC58 HMC59 HMC60	XX/XXXXX a	XX b	-	XX c	-	X d	XX e	/Sxxx - /Pxxx f
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<p>a RESOLUTION 18/16384 = 262144 cpr x 16384 turns</p> <p>b OUTPUT PS = programmable, SSI</p>	<p>c SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (HMCxx) 15 = 15 mm (HMCxx)</p>	<p>d CONNECTION POSITION - = axial R = radial</p> <p>e CONNECTIONS Lx = cable output x m M2 = M23 12 pin plug M = M12 12 pin plug</p>	<p>with f = /Pxxx D1 = 1 m cable + MIL 7 pin inline plug P1 = 1 m cable + MIL 10 pin inline plug Cx = A8 cable x m</p> <p>f /Sxxx: Custom version /Pxxx: Factory programmed encoder on customer request</p>
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ROTACOD

Absolute multi turn encoders

Series

EM58 TA • EM58S TA • EMC58 TA



- Accurate analogue conversion
- Multiple voltage and current outputs
- Teach-in of travel length by push buttons
- Overrun function
- M12 or cable connection



EM58 TA • EM58S TA • EMC58 TA

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12 plug or cable output 2 m (6.56 ft)
Weight:	~ 250 g (8,8 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

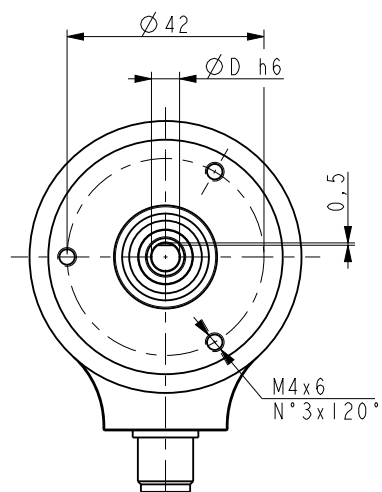
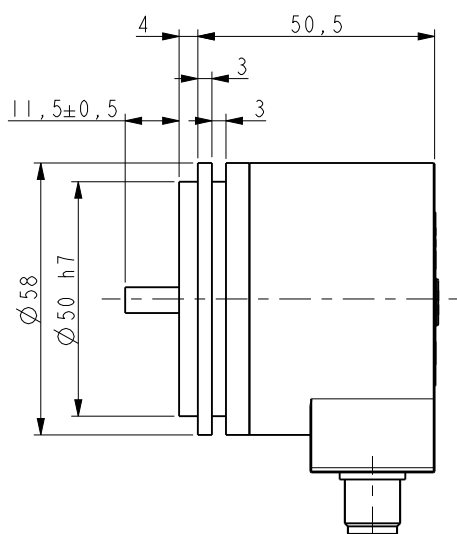
Resolution:	4096 cpr x 16384 turns max. (programmable with Teach-in)
Accuracy:	± 0,04° - D/A 16 bit conversion
Output:	0-5V, 0-10V, +/-5V, +/-10V, 4-20mA, 0-20mA, 0-24mA
Counting frequency:	> 150 kHz
Power supply:	+13Vdc ÷ 30Vdc
Power consumption:	1.3 W max.
Start-up time:	~ 40 ms
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	• Teach-in of travel length • Overrun

MATERIALS

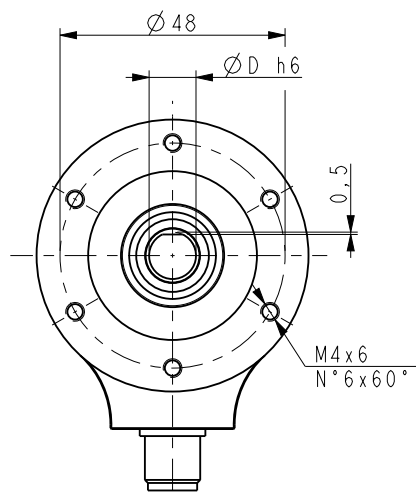
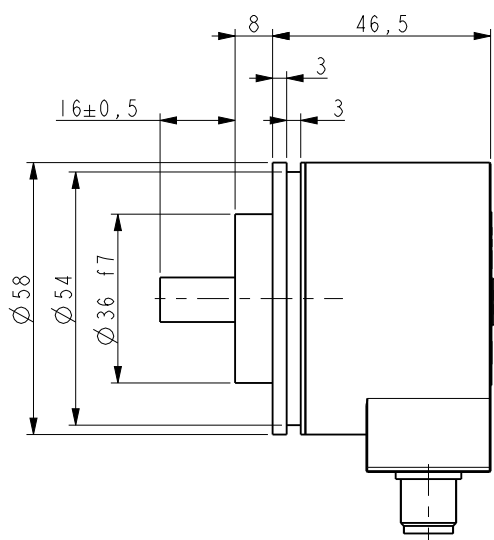
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

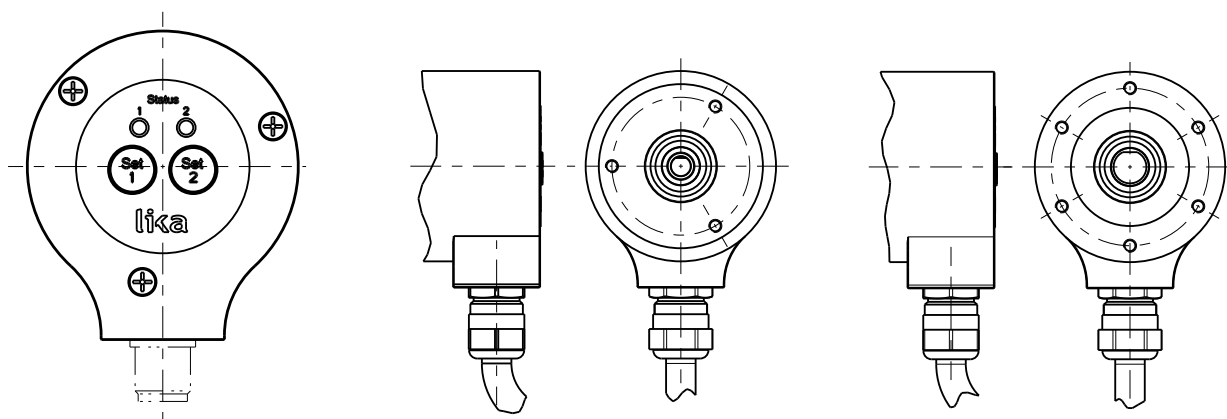
E-M12FC:	M12 5 pin connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps

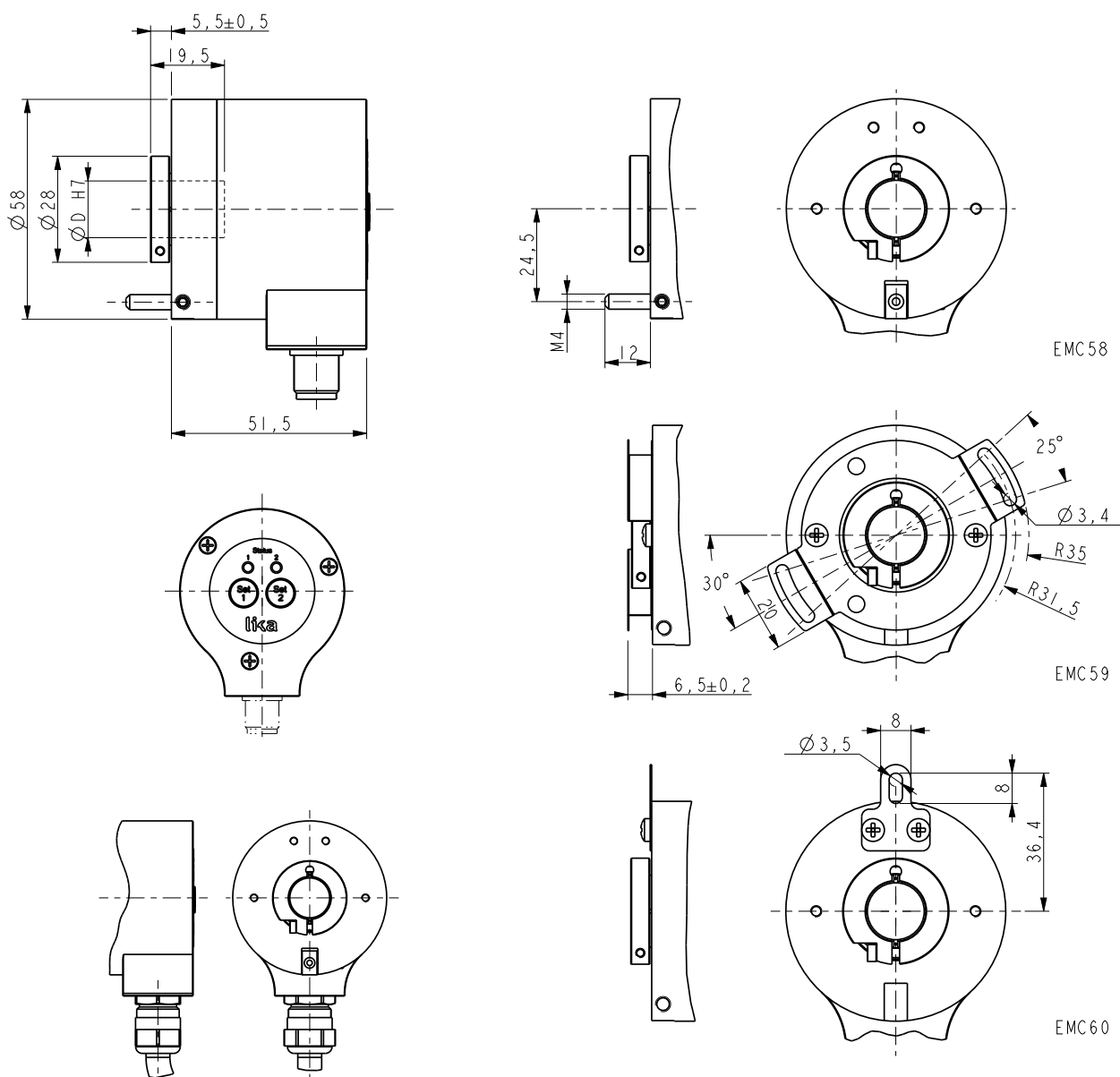


EM58 TA



EM58S TA





Order code

EM58	XX	/	XXXXX	XXX	-	XX	-	X	XX	/Sxxx
EM58S	Ⓐ		Ⓑ	Ⓒ		Ⓓ		Ⓔ	Ⓕ	Ⓖ
EMC58										
EMC59										
EMC60										

<p>Ⓐ RESOLUTION 12 = 4096 cpr</p> <p>Ⓑ REVOLUTIONS 16384 = 16384 turns</p>	<p>Ⓒ OUTPUT TI1 = 4-20 mA TI2 = 0-20 mA TI3 = 0-24 mA TV1 = 0-5V TV2 = 0-10V TV3 = +/- 5V TV4 = +/- 10V</p>	<p>Ⓓ SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (only EMCxx) 15 = 15 mm (only EMCxx)</p>	<p>Ⓔ CONNECTION POSITION R = radial</p> <p>Ⓕ CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m L10 = cable output 10 m M = M12 5 pin plug</p>	<p>Ⓖ CUSTOM VERSION</p>
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ROTACOD

Absolute encoder with analogue output

Series

AS58 A • AM58 A



- Optical encoder with analogue output
- Accurate sensing and D/A conversion
- 0-5/10V, $\pm 5/10V$, 0-20mA, 4-20mA, 0-24mA
- Compact dimensions
- Cable, M12 or M23 connections



AS58 A • AM58S A

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Bearing life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 2 m (6.56 ft)
Weight:	~ 250 g (8,8 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution:	AS: 12 bit AM: 16 bit
Accuracy:	$\pm 0,04^\circ$
Output circuits:	0-5V, 0-10V, -5/+5V, -10/+10V, 0-20mA, 4-20mA, 0-24mA
Counting frequency:	> 150 kHz
Power supply:	+13Vdc \div 30Vdc
Power consumption:	1, 3 W max.
Start-up time:	~ 40 ms
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	• Counting direction (input) • Zero setting (input)

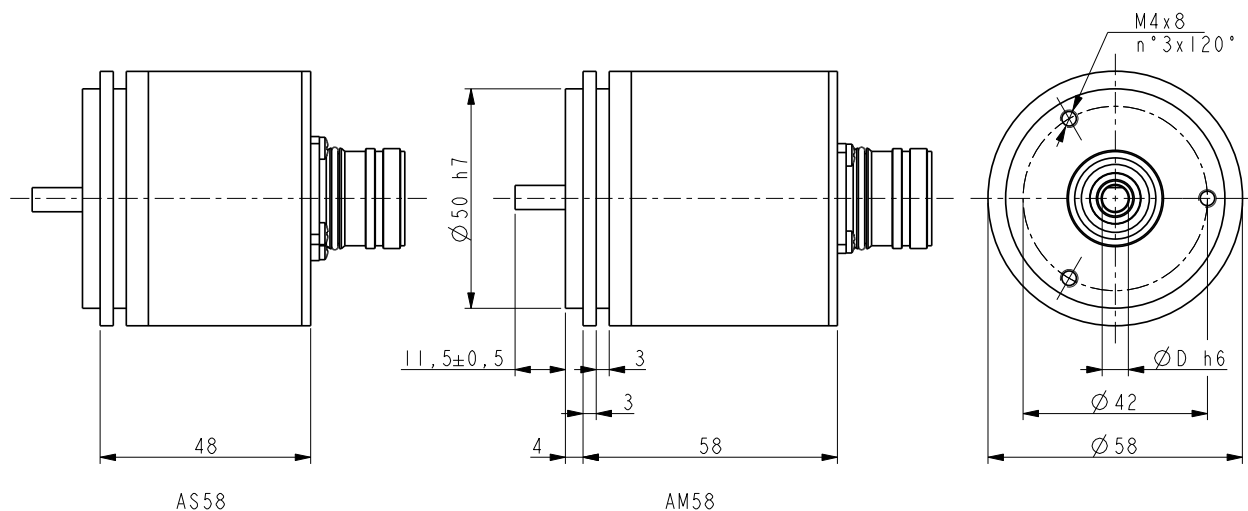
MATERIALS

Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

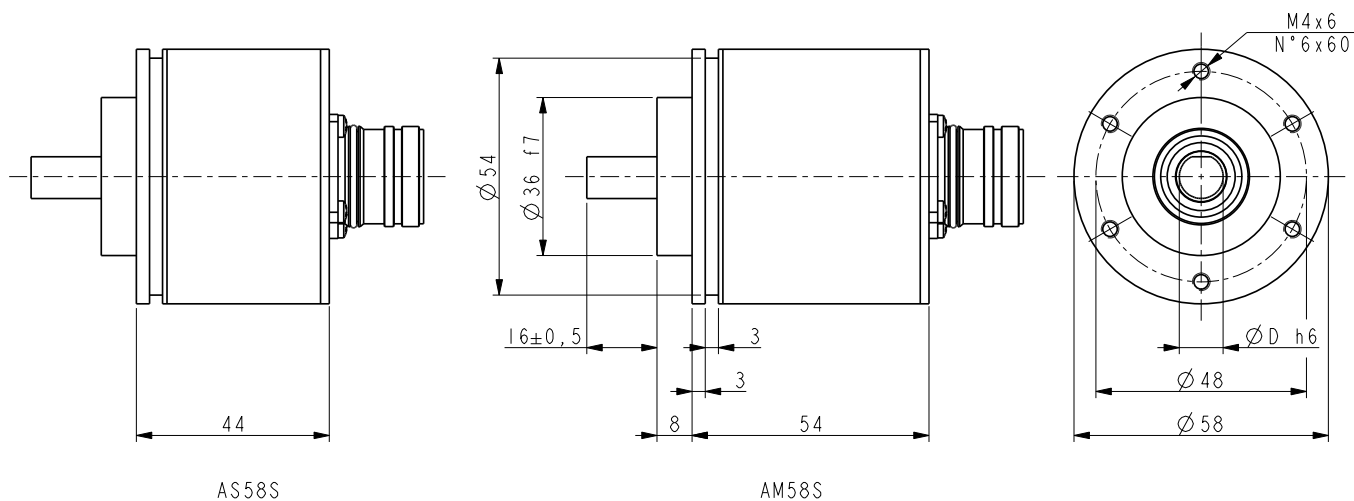
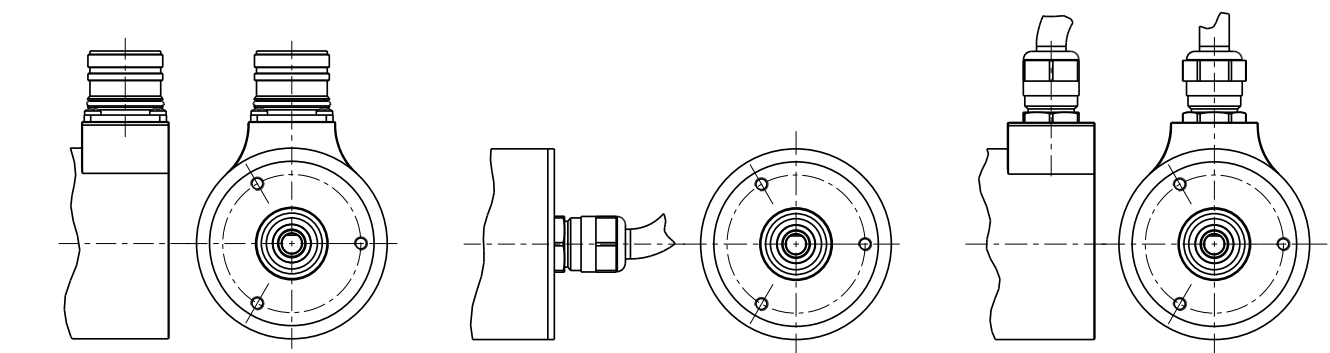
ACCESSORIES

EPFL121H:	12 pin M23 mating connector
EM12F8:	8 pin M12 mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
EC-M12F8-LK-M8-xx:	M12 cordset with xx m cable
EC-CR12F-S28-T12-xx:	M23 cordset with xx m cable
LKM-386:	fixing clamps

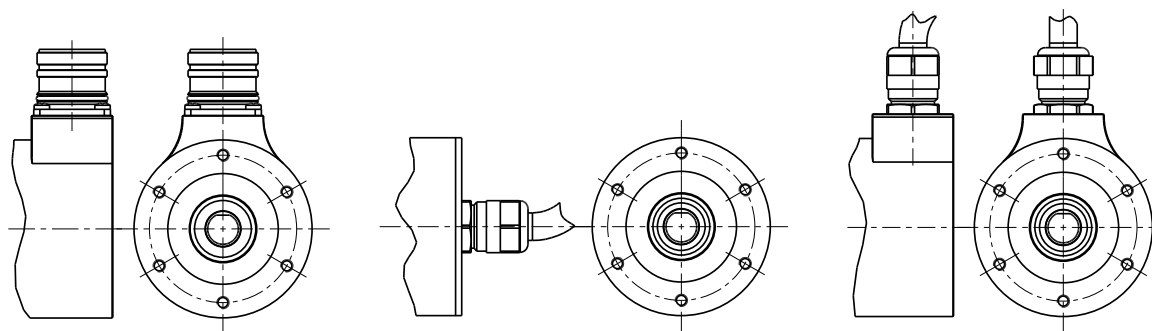
Specifications subject to changes without prior notice

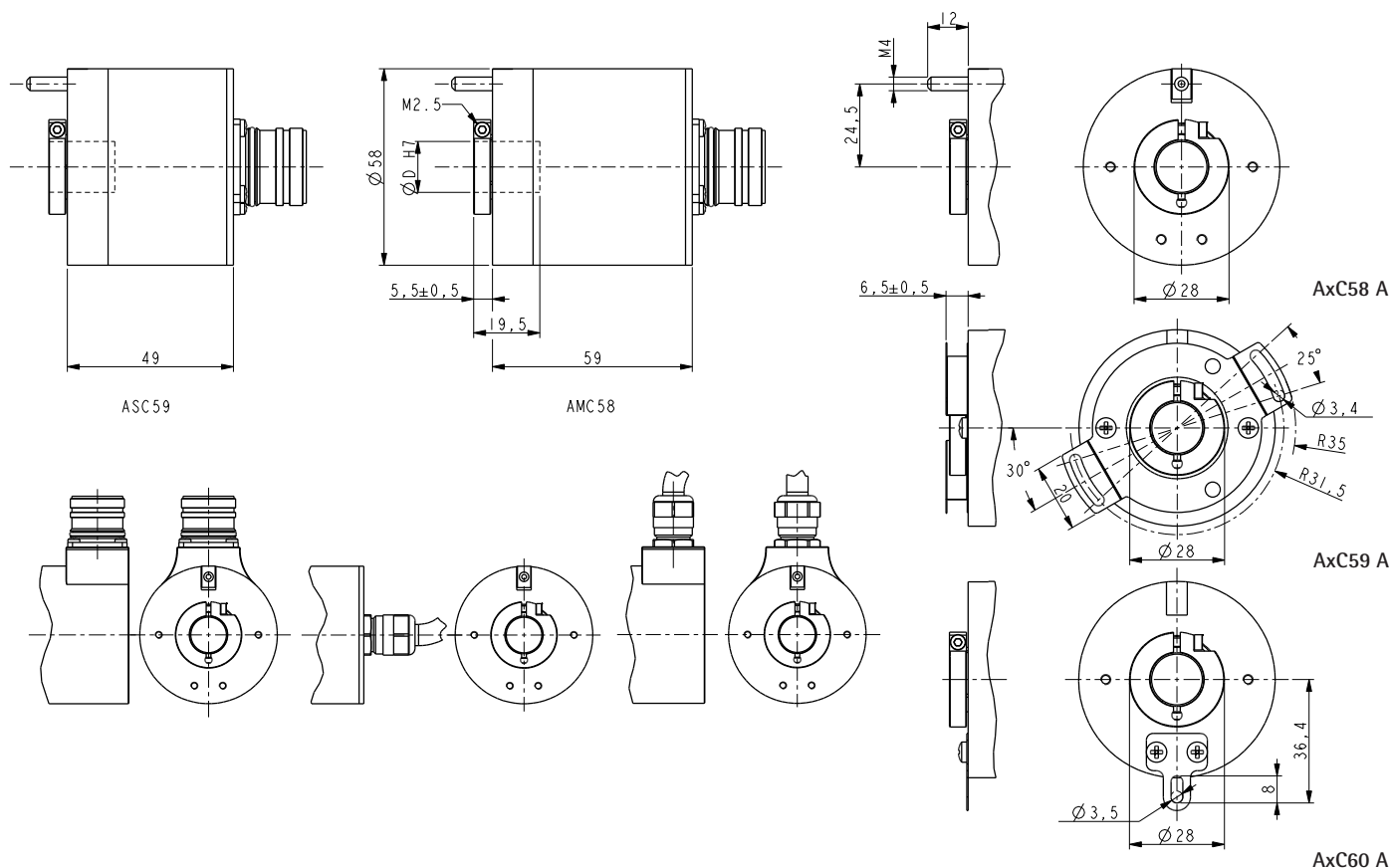


AS58 A - AM58 A



AS58S A - AM58S A





Order code - Single turn

AS58	12	/	XXX	-	XX	-	X	XX	/Sxxx
AS58S	(a)		(b)		(c)		(d)	(e)	(f)
ASC58									
ASC59									
ASC60									

<p>(a) RESOLUTION 12 = 12 bit</p>	<p>(b) OUTPUT AI1 = 4-20mA AI2 = 0-20mA AI3 = 0-24mA AV1 = 0-5V AV2 = 0-10V AV3 = -5/+5V AV4 = -10/+10V</p>	<p>(c) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (only ASCxx) 15 = 15 mm (only ASCxx)</p>	<p>(d) CONNECTION POSITION - = axial R = radial</p> <p>(e) CONNECTIONS L2 = cable output 2 m (standard) Lx = cable output x m M = M12, 8 pin plug M2 = M23, 12 pin plug</p>	<p>(f) CUSTOM VERSION</p>
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Order code - Multi turn

AM58	XX/XXXX	XXX	-	XX	-	X	XX	/Sxxx
AM58S	(a)	(b)		(c)		(d)	(e)	(f)
AMC58								
AMC59								
AMC60								

<p>(a) RESOLUTION 12/2 = 2 turns 12/4 = 4 turns 12/16 = 16 turns 10/64 = 64 turns 8/256 = 256 turns 6/1024 = 1024 turns 4/4096 = 4096 turns</p>	<p>(b) OUTPUT AI1 = 4-20mA AI2 = 0-20mA AI3 = 0-24mA AV1 = 0-5V AV2 = 0-10V AV3 = -5/+5V AV4 = -10/+10V</p>	<p>(c) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8" 10 = 10 mm 12 = 12 mm 14* = 14 mm (only AMCxx) 15* = 15 mm (only ACxx)</p>	<p>(d) CONNECTION POSITION - = axial R = radial</p> <p>(e) CONNECTIONS L2 = cable output 2 m Lx = cable output x m M = M12, 8 pin plug M2 = M23, 12 pin plug</p>	<p>(f) CUSTOM VERSION</p>
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ROTACOD

Absolute multi turn encoders

Series

EM58 PA • EM58S PA • EMC58 PA



- Programmable analogue output
- 0-5V, 0-10V, -5/+5V, -10/+10V, 4-20mA, 0-20mA, 0-24mA
- Multi turn up to 16384 rev.
- Programmable overrun mode
- RS232 service interface
- Programmable via USB cable



EM58 PA • EM58S PA • EMC59 PA

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	12000 rpm, 9000 rpm continuous operation
Bearing life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	M12, M23 plug or cable output 2 m (6.56 ft)
Weight:	~ 300 g (10,6 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

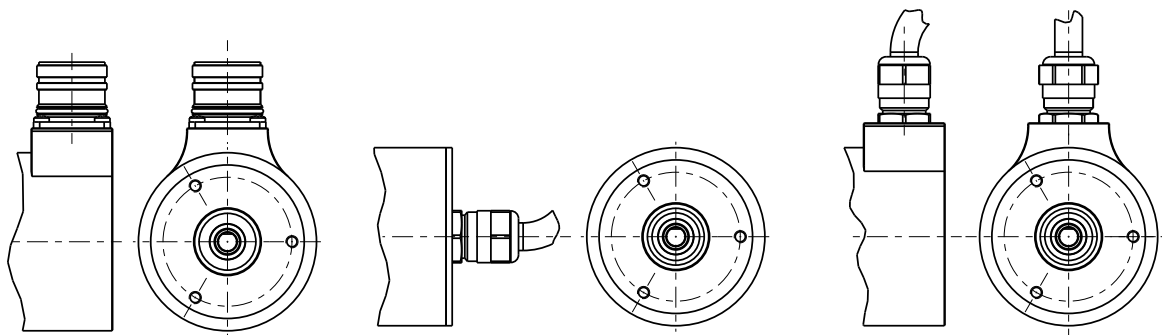
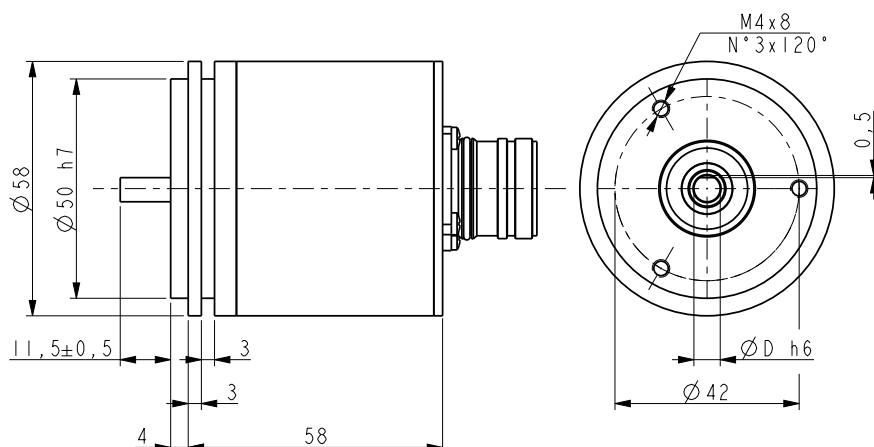
Resolution:	4096 cpr x 16384 turns
Accuracy:	± 0,04°
Output circuits:	programmable 0-5V, 0-10V, -5/+5V, -10/+10V, 4-20mA, 0-20mA, 0-24mA
Counting frequency:	> 150 kHz
Power supply:	+13Vdc ÷ 30Vdc
Power consumption:	1,3 W max.
Start-up time:	~ 40 ms
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	• Programmable resolution • Teach-in of resolution • Counting direction (programmable + input) • Zero setting (programmable + input) • Programmable overrun

MATERIALS

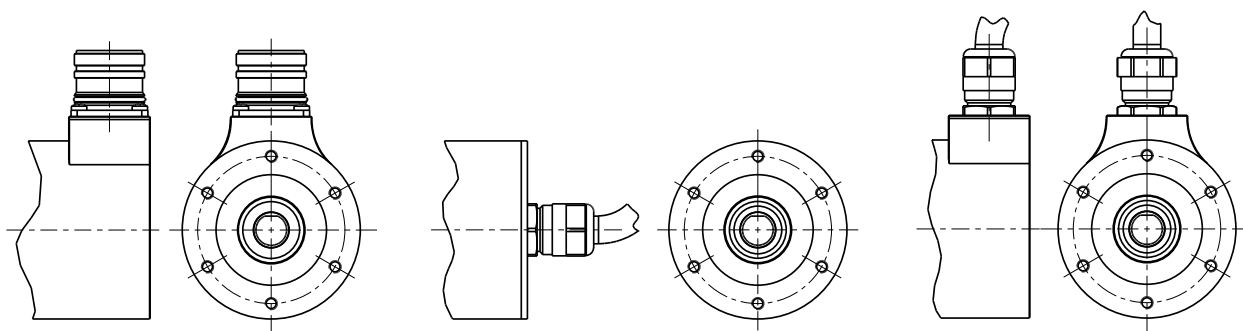
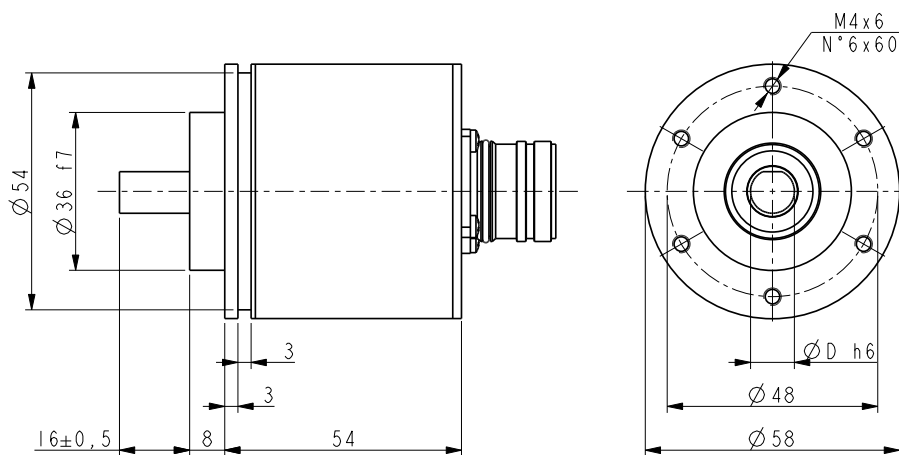
Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

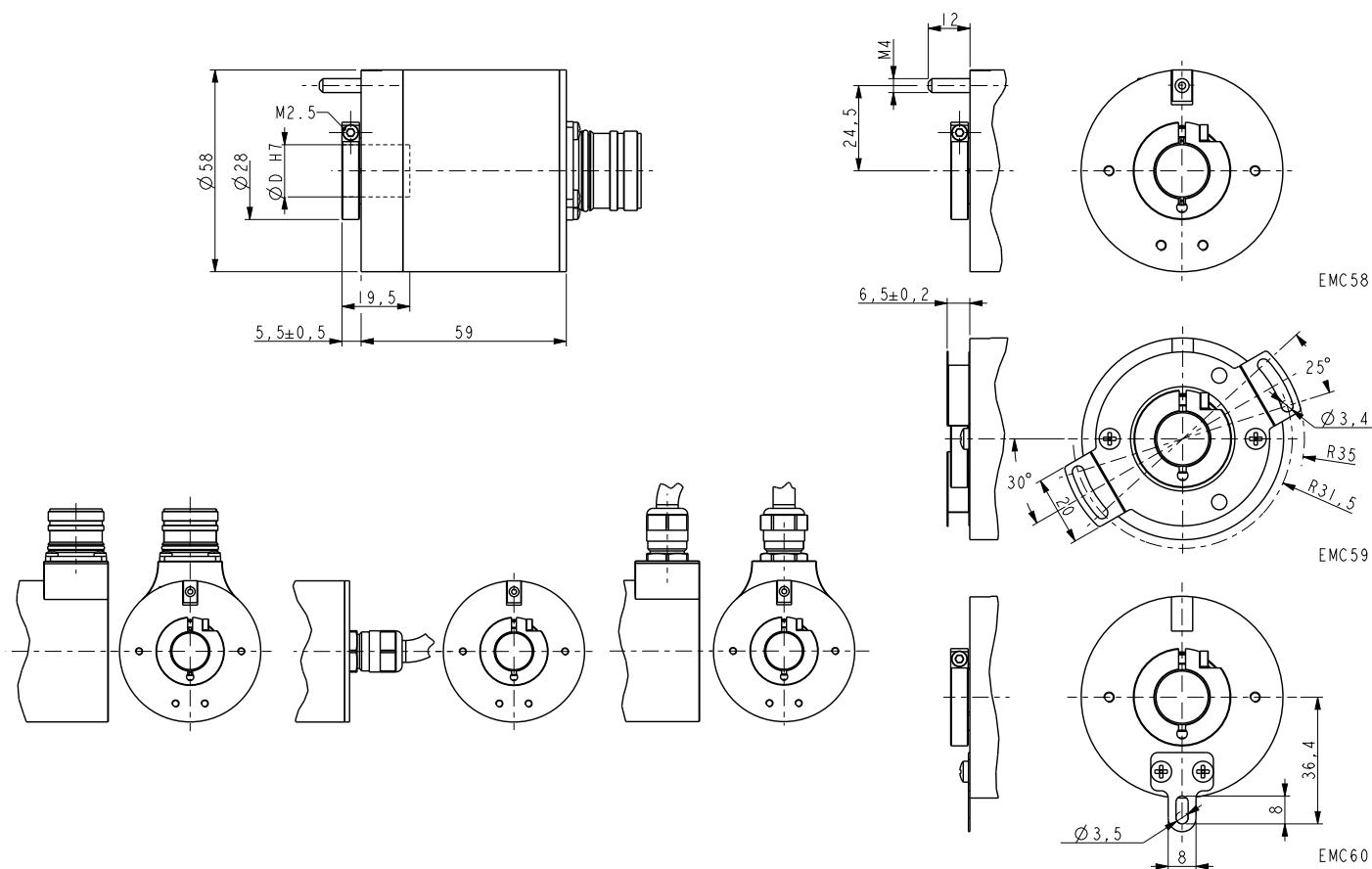
EPFL121H:	M23 12 pin connector
E-M12F12:	M12 12 pin connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
EC-M12F12-LK-T12-xx:	M12 cordset with xx m cable
EC-CR12F-S28-T12-xx:	M23 cordset with xx m cable
LKM-386:	fixing clamps



EM58 PA



EM58S PA



Order code

EM58	XX	/	XXXXX	XX	-	XX	-	X	XX	/Sxxx - /Pxxx
EM58S	Ⓐ		Ⓑ	Ⓒ		Ⓓ		Ⓔ	Ⓕ	Ⓖ
EMC58										
EMC59										
EMC60										

<p>Ⓐ RESOLUTION 12 = 4096 cpr</p> <p>Ⓑ REVOLUTIONS 16384 = 16384 turns</p> <p>Ⓒ OUTPUT PA = Programmable analogue</p>	<p>Ⓓ SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (EMCxx) 15 = 15 mm (EMCxx)</p>	<p>Ⓔ CONNECTION POSITION - = axial R = radial</p> <p>Ⓕ CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m L10 = cable output 10 m M = M12, 12 pin plug M2 = M23, 12 pin plug</p>	<p>Ⓖ /Sxxx: Custom version /Pxxx: Factory programmed encoder on customer request</p>
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ROTACAM

Encoder with integrated cam programmer

Series

ASR58 • AMR58



- Absolute encoder with integrated cam switch programmer
- Single- and multiturn version
- Up to 16 digital real-time outputs
- Allows to store up to 16 programs/recipes
- SSI position output, Profibus on request
- Optional programmable analogue output



ASR58 • AMR58

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400 x10 ⁶ rev. min. (10 ⁹ rev. min. with 20 N shaft loading max.)
Electrical connections:	ASR58: DSub 15 + 25 pin plug or cable 1 m (3.3 ft) AMR58: MIL 32 pin plug or cable 1 m (3.3 ft)
Weight:	~ 250 g (8,8 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

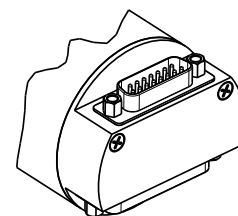
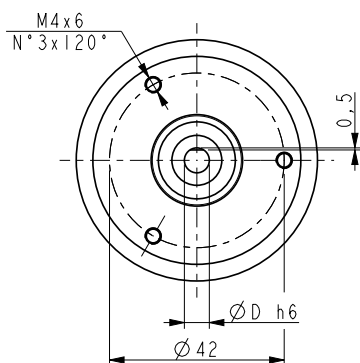
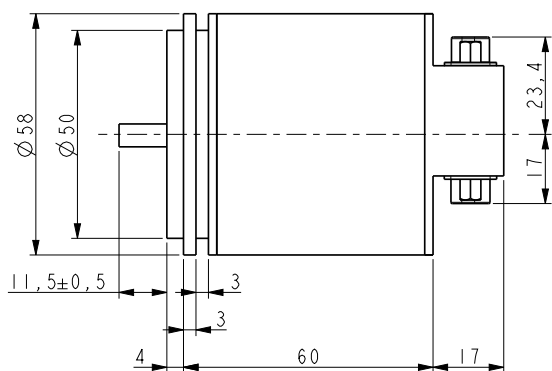
Resolution:	ASR58: 3600 cpr / 0.1° AMR58: 4096 cpr x 256 turns / 0,09°
Nr. of cams per program:	120
Nr. of selectable programs/recipes:	16
Outputs:	ASR: 16 x Push-Pull outputs (100 mA), analogue (see option) AMR: 8 x Push-Pull outputs (80 mA), SSI MSB aligned
Diagnostics:	Error signal indicating output status
Cam switching time:	ASR ~1 µs, AMR ~10 µs
Power supply:	+10V +30V
Power consumption:	ASR: 2 W, AMR: 2,5 W
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.
Option:	ASR58: analogue output (freely programmable on OUT1)

MATERIALS

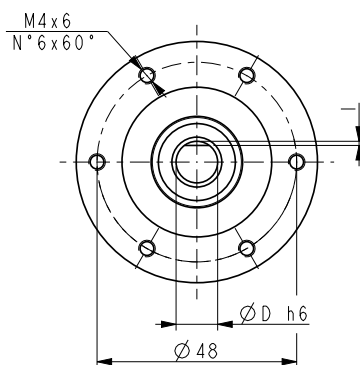
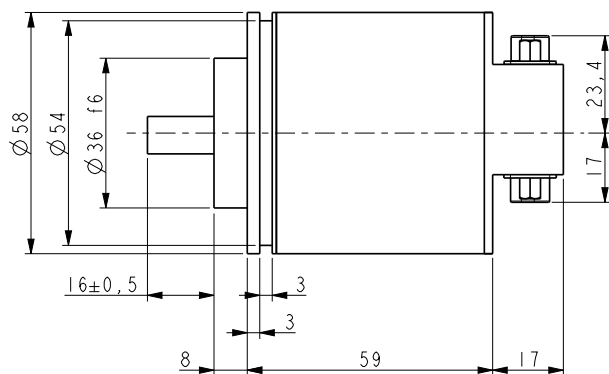
Flange:	anticorrosive, EN AW-6082
Housing:	anticorrosive, EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic - UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

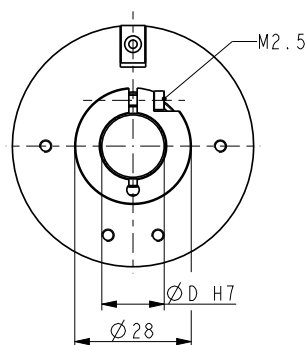
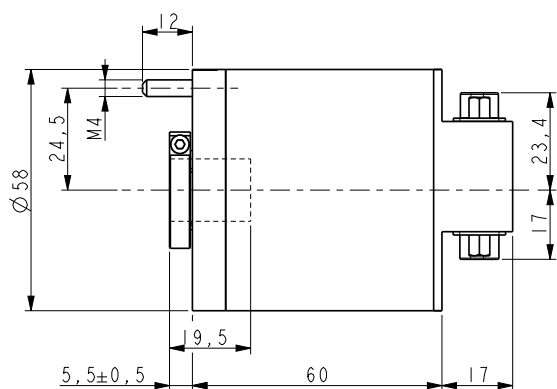
EDB 255:	25 pin DSub mating connector
EDA 155:	15 pin DSub mating connector
E32MLS:	32 pin MIL mating connector
KIT xx59:	fixing plate for ASRC, AMRC
KIT xx60:	fixing plate for ASRC, AMRC
KIT-ASR58:	connection Kit ASR > PC
KIT-AMR58:	connection Kit AMR > PC
PAN/PGF:	flexible couplings
LKM-386:	fixing clamps



ASR58



ASR58S

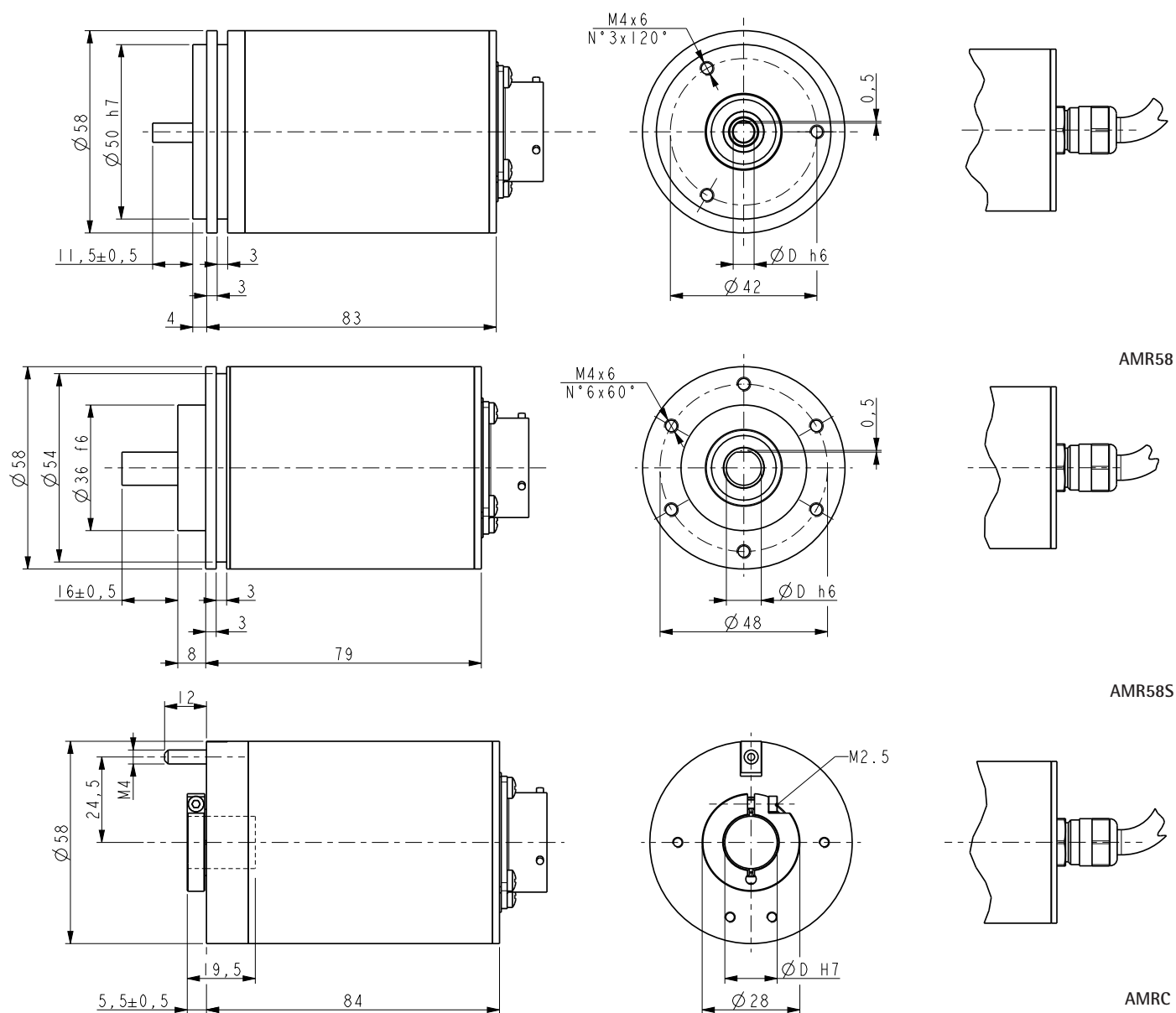


ASRC

Order code - Single turn

ASR58 ASR58S ASRC	XX Ⓐ	-	XX Ⓑ	XX Ⓒ	XX Ⓓ	/Sxxx Ⓔ
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<p>Ⓐ RESOLUTION</p> <p>81 = 3600 cpr</p>	<p>Ⓑ SHAFT DIAMETER</p> <p>6 = 6 mm</p> <p>8 = 8 mm</p> <p>P9 = 9.52 mm, 3/8"</p> <p>10 = 10 mm</p> <p>12 = 12 mm</p> <p>14 = 14 mm (only ASRC)</p> <p>15 = 15 mm (only ASRC)</p>	<p>Ⓒ CONNECTIONS</p> <p>- = DSub plugs</p> <p>L1 = cable output 1 m</p> <p>Lx = cable output x m</p>	<p>Ⓓ ANALOGUE OUTPUT</p> <p>- = no analogue output (standard)</p> <p>A1 = analogue output 0-10V</p> <p>A2 = analogue output 0-5V</p> <p>A3 = analogue output -5V +5V</p>	<p>Ⓔ CUSTOM VERSION</p>
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Order code - Multi turn

AMR58 AMR58S AMRC	XX/XXX Ⓐ	XX Ⓑ	-	XX Ⓒ	XX Ⓓ	/Sxxx Ⓔ
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<p>Ⓐ TOTAL RESOLUTION 12/256 = 4096 cpr x 256 turns</p>	<p>Ⓑ OUTPUT CS = Cam switch + SSI</p>	<p>Ⓒ SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (only AMRC) 15 = 15 mm (only AMRC)</p>	<p>Ⓓ CONNECTIONS V = MIL 32 pin plug L1 = cable output 1 m Lx = cable output x m</p>	<p>Ⓔ CUSTOM VERSION</p>
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ROTACOD

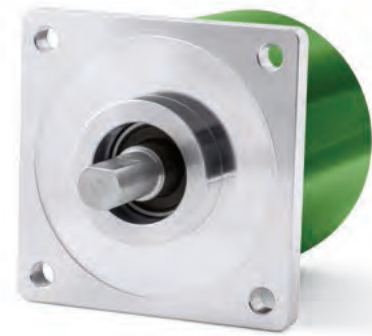
Absolute multi turn encoders

Series

AST6 • AMT6



- US standard optical encoders
- Single turn up to 13 bit (8192 cpr) and multi turn up to 13x14 bit (8192 x 16384)
- Additional incremental track
- High degree of protection, IP67
- BCD output code on request



AST6 • AMT6

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H. without condensation)
Options:	<ul style="list-style-type: none">• Operating temperature range: -40°C +100°C (-40°F +212°F)• IP66 protection shaft side

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	∅ 6, 8, 9.52, 10, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	≤ 1,5 Ncm (typical)
Bearings life:	400x10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	M23 or MIL plug, MIL 32 pin inline plug or cable output 1 m (3.3 ft)
Weight:	~ 400 g (14,1 oz)
Option:	<ul style="list-style-type: none">• additional cable

ELECTRICAL SPECIFICATIONS

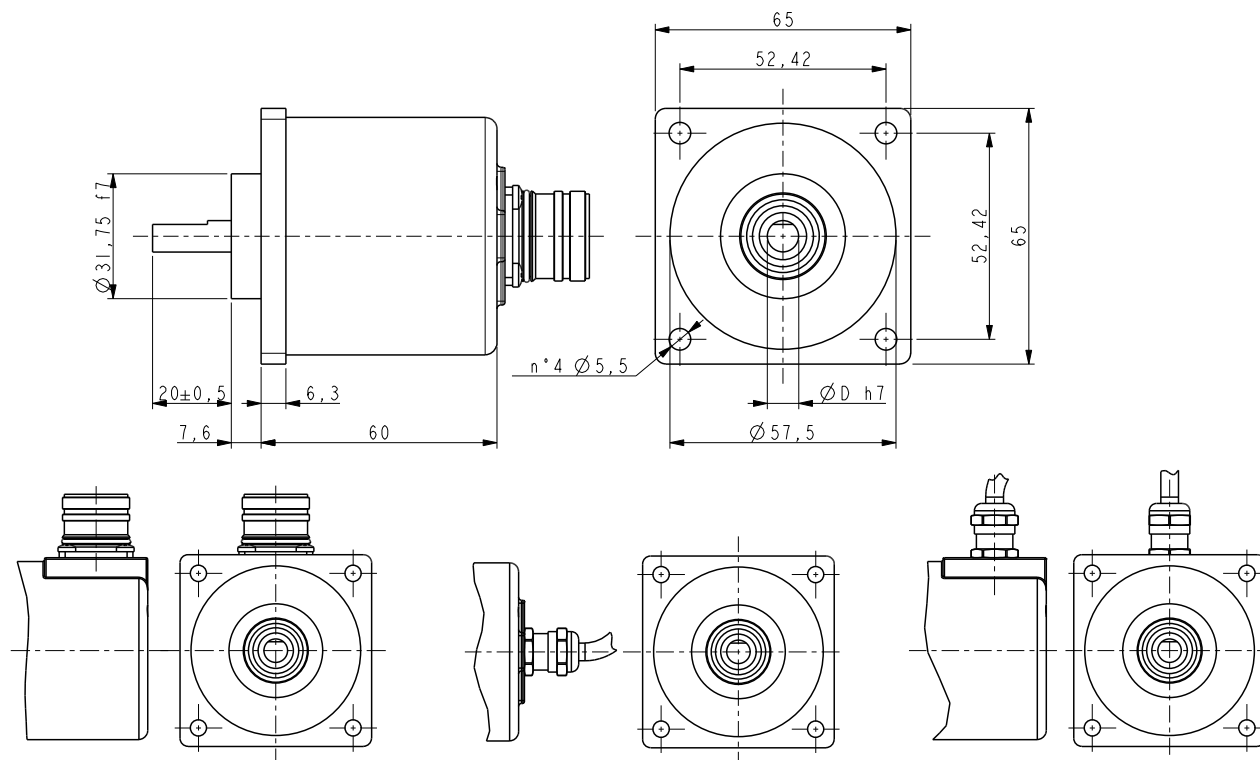
Resolution:	single turn = 1024, 4096, 8192 cpr multi turn = 4096, 16384 turns
Accuracy:	± 0,04°
Output circuits:	SSI (RS422), Bit parallel Push-Pull, NPN
Output code:	Gray, Binary
Counting frequency:	> 150 kHz
Power supply:	+7,5Vdc ÷ 34Vdc
Power consumption:	SSI: 1 W max., Bit parallel: 1,7 W max.
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	> 100.000 h
Functions:	<ul style="list-style-type: none">• counting direction (input)• Zero setting/Preset (input)

MATERIALS

Flange:	anticorodal, UNI EN AW-6082
Housing:	zamac die cast
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305

ACCESSORIES

EPFL121H:	M23 12 pin connector
EPFL171H:	M23 17 pin connector
E10MLS:	MIL 10 pin connector
E19MLS:	MIL 19 pin connector
E32MLS:	MIL 32 pin connector
PAN/PGF:	flexible couplings
EC-CR12F-S28-T12-xx:	M23 cordset with xx m cable



AST6

Order code - Bit parallel output

AST6	XX Ⓐ	/	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	X Ⓔ	X Ⓕ	XXX Ⓖ	/Sxxx Ⓗ
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<p>Ⓐ RESOLUTION</p> <p>10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>Ⓑ OUTPUT</p> <p>BY = Binary, Push-Pull GY = Gray, Push-Pull BN = Binary, NPN GN = Gray, NPN (BCD on request)</p>	<p>Ⓒ SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm</p> <p>Ⓓ OPERATING TEMPERATURE RANGE</p> <p>- = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)</p>	<p>Ⓔ CONNECTION POSITION</p> <p>- = axial R = radial</p> <p>Ⓕ PROTECTION</p> <p>- = IP65 shaft side Q = IP66 shaft side</p>	<p>Ⓖ CONNECTIONS</p> <p>L1 = cable output 1 m (standard) L5 = cable output 5 m Lx = cable output x m M2 = M23 17 pin plug X = MIL 19 pin plug Z1 = 1 m cable + DSub 15 pin plug</p>
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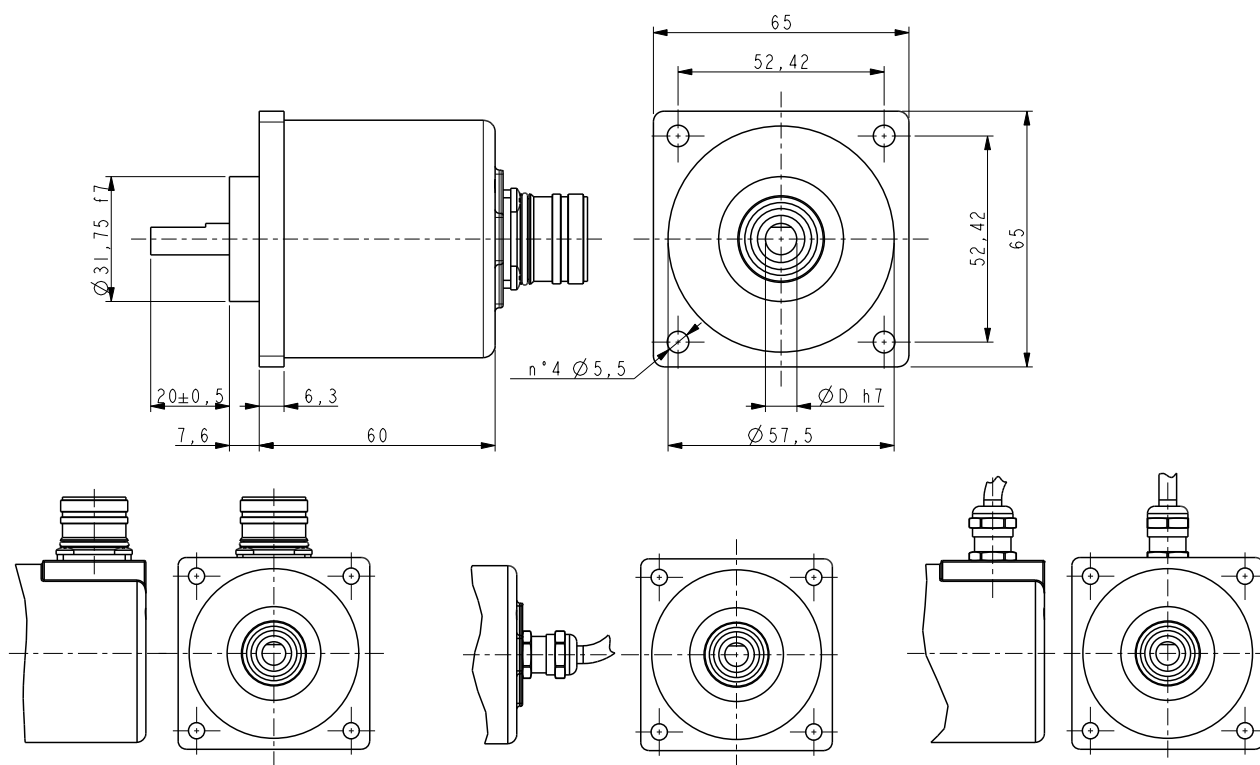
Ⓗ CUSTOM VERSION

Order code - SSI output

AST6	XX Ⓐ	/	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	X Ⓔ	X Ⓕ	XX Ⓖ	/Sxxx Ⓗ
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<p>Ⓐ RESOLUTION</p> <p>10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>Ⓑ OUTPUT</p> <p>BS = Binary, SSI tree format BA = Binary, SSI LSB aligned GS = Gray, SSI tree format GA = Gray, SSI LSB aligned G5 = Gray, SSI tree format + 1024 PPR AB /AB Push-Pull</p>	<p>Ⓒ SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm</p> <p>Ⓓ OPERATING TEMPERATURE RANGE</p> <p>- = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)</p>	<p>Ⓔ CONNECTION POSITION</p> <p>- = axial R = radial</p> <p>Ⓕ PROTECTION</p> <p>- = IP65 shaft side Q = IP66 shaft side</p>	<p>Ⓖ CONNECTIONS</p> <p>L1 = cable output 1 m (standard) L5 = cable output 5 m Lx = cable output x m CP = MIL 10 pin plug M2 = M23 12 pin plug</p>
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Ⓗ CUSTOM VERSION



AMT6

Order code - Bit parallel output

AMT6	XX a	/	XXXX b	XX c	-	XX d	-	X e	X f	X g	XXX h	/Sxxx i
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<p>a) RESOLUTION 10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>b) REVOLUTIONS 4096 = 4096 turns 16384 = 16384 turns</p>	<p>c) OUTPUT BY = Binary, Push-Pull GY = Gray, Push-Pull BN = Binary, NPN GN = Gray, NPN BCD on request</p>	<p>d) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm</p> <p>e) OPERATING TEMP. RANGE - = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)</p>	<p>f) CONNECTION POSITION - = axial R = radial</p> <p>g) PROTECTION - = IP65 shaft side Q = IP66 shaft side</p>	<p>h) CONNECTIONS L1 = cable output 1 m L5 = cable output 5 m L10 = cable output 10 m Lx = cable output x m V = MIL 32 pin plug</p>	<p>i) CUSTOM VERSION</p>
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Order code - SSI output

AMT6	XX a	/	XXXX b	XX c	-	XX d	-	X e	X f	X g	XX h	/Sxxx i
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<p>a) RESOLUTION 10 = 1024 cpr 12 = 4096 cpr 13 = 8192 cpr</p> <p>b) REVOLUTIONS 4096 = 4096 turns 16384 = 16384 turns (16384 only with SSI LSB aligned)</p>	<p>c) OUTPUT BS = Binary, SSI tree format BA = Binary, SSI LSB aligned GS = Gray, SSI tree format GA = Gray, SSI LSB aligned G5 = Gray, SSI tree format + 1024 PPR AB /AB Push-Pull</p>	<p>d) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52mm / 3/8" 10 = 10 mm 12 = 12 mm</p> <p>e) OPERATING TEMPERATURE - = -25°C +85°C (-13°F +185°F) K = -40°C +100°C (-40°F +212°F)</p>	<p>f) CONNECTION POSITION - = axial R = radial</p> <p>g) PROTECTION - = IP65 shaft side Q = IP66 shaft side</p>	<p>h) CONNECTIONS L1 = cable output 1 m L5 = cable output 5 m Lx = cable output x m CP = MIL 10 pin plug M2 = M23 12 pin plug</p>	<p>i) CUSTOM VERSION</p>
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ROTACOD

ATEX absolute encoder

Series

XAC77



- Encoder with ATEX II 2GD Ex d IIC T6 certification
- For use in zones 1, 2, 21 and 22
- Resolution up to 30 bit
- SSI, Profibus, CANopen and parallel output



XAC77

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 10-2000 Hz
Protection:	IP65
Environmental temperature at max. speed:	40°C max.
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Protection mode:	EEx d IIC T6
Dimensions:	see drawing
Shaft diameter:	∅ 14 mm
Shaft loading (axial, radial):	60 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	< 5 Ncm
Bearings life:	400x10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	cable output 1 m (3.3 ft)
Weight:	~ 1 kg (35,2 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

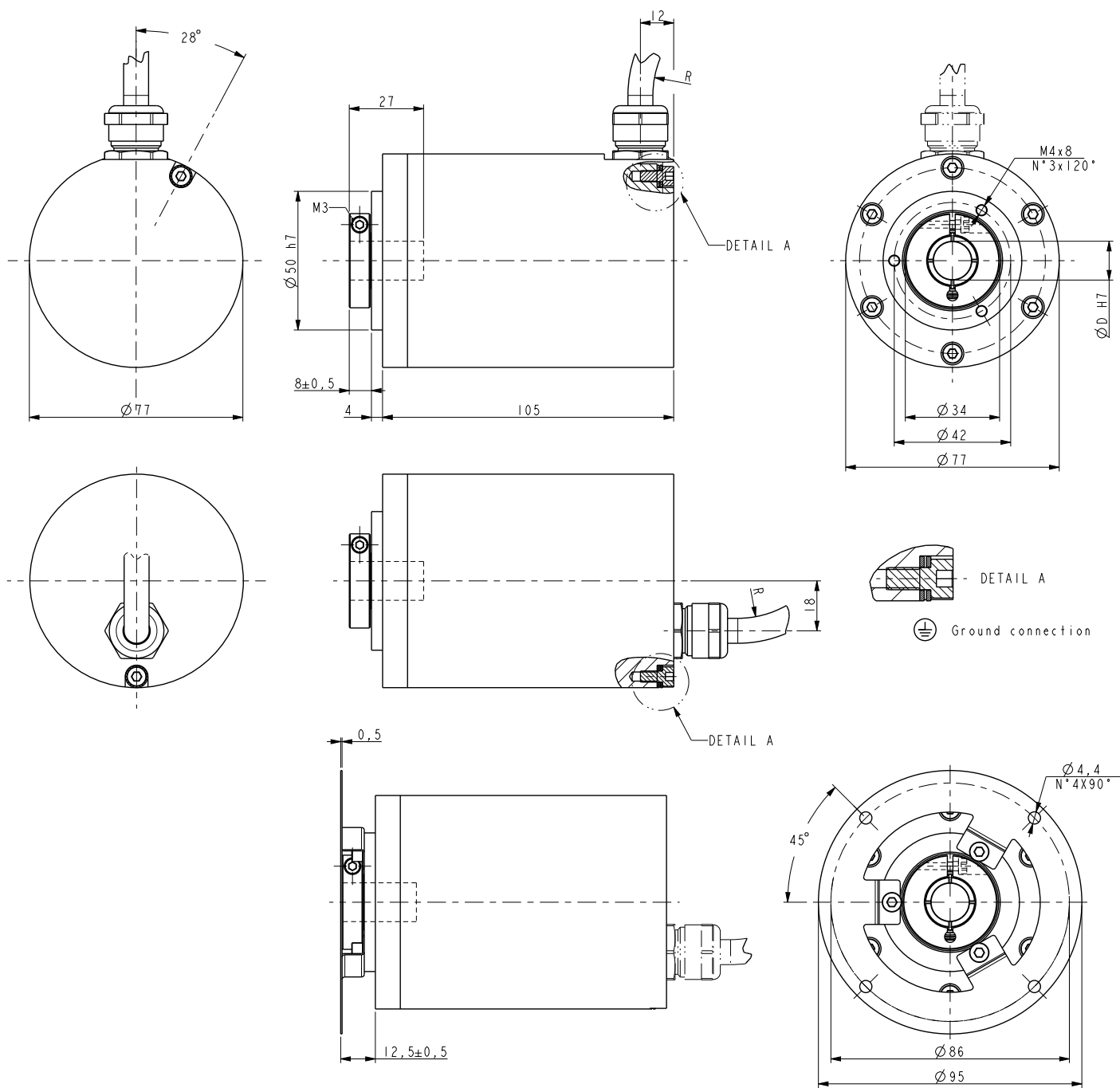
Resolution:	SSI, Bit Parallel: 8192 cpr max. or 8192 cpr x 4096 turns max. Analogue output: 12 bit or 13 x 14 bit Profibus, CANopen: 262144 cpr or 65536 cpr x 16384 turns
Accuracy:	± 0,04°
Output circuits:	SSI (RS422), Bit Parallel NPN, Push Pull Profibus-DP, CANopen 0-5V, 0-10V, -5/+5V, -10/+10V 4-20mA, 0-20mA, 0-24mA
Output code:	Gray, Binary
Counting frequency:	> 150 kHz
Power supply:	+10Vdc +30Vdc
Power consumption:	2,2 W max.
Protection:	against inversion of polarity and short circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Functions:	• Counting direction (input) • Zero setting / Preset (input) <i>Profibus, CANopen functions refer to HM58 FB series on page 186</i> <i>Analogue functions refer to EM58 PA series on page 168</i>
Optoelectronic life:	100.000 hrs min.

MATERIALS

Flange:	anticorodal, EN AW-6082 (UNI EN 573)
Housing:	anticorodal, EN AW-6082 (UNI EN 573)
Bearings:	ABEC 5
Shaft:	1.4305 (UNI EN 10088-1)

ACCESSORIES

LKM-1758:	∅ 10 mm solid shaft extension
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XAC77

Order code - Profibus and CANopen

XAC77	XX/XXXXX Ⓐ	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	XX Ⓔ	/Sxxx Ⓕ
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Ⓐ RESOLUTION

18/1 = 262144 cpr single turn
16/16384 = 65536 cpr x 16384 turns

Ⓑ OUTPUT

PB = Profibus-DP V1
CB = CANopen DS301, DS406

Ⓒ SHAFT DIAMETER

14 = 14 mm

Ⓓ CONNECTION POSITION

- = axial
R = radial

Ⓔ CABLE LENGTH

L1 = cable output 1 m (standard)
L2 = cable output 2 m
Lx = cable output x m

Ⓕ CUSTOM VERSION

Order code - SSI and Bit Parallel

XAC77	XX Ⓐ	/	XXXXX Ⓑ	X Ⓒ	XX Ⓓ	-	XX Ⓔ	-	X Ⓕ	XX Ⓖ	/Sxxx Ⓗ
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Ⓐ RESOLUTION

12 = 4096 cpr
13 = 8192 cpr

Ⓑ REVOLUTIONS

1 = single turn
4096 = 4096 turns
16384 = 16384 turns

Ⓒ OUTPUT CODE

B = Binary
G = Gray

Ⓓ OUTPUT CIRCUITS

N = NPN o.c.
Y = Push-Pull
R = SSI, tree format
B = SSI, LSB aligned

Ⓔ SHAFT DIAMETER

14 = 14 mm

Ⓕ CONNECTION POSITION

- = axial
R = radial

Ⓖ CABLE LENGTH

L1 = cable output 1 m (standard)
L2 = cable output 2 m
Lx = cable output x m

Ⓗ CUSTOM VERSION

Order code - Analogue output

XAC77	XX/XXXXX Ⓐ	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	XX Ⓔ	/Sxxx Ⓕ
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Ⓐ RESOLUTION

12/1 = 12 bit single turn
12/16384 = 12 x 14 bit

Ⓑ OUTPUT

PA = Programmable analogue

Ⓒ SHAFT DIAMETER

14 = 14 mm

Ⓓ CONNECTION POSITION

- = axial
R = radial

Ⓔ CABLE LENGTH

L1 = cable output 1 m (standard)
L2 = cable output 2 m
Lx = cable output x m

Ⓕ CUSTOM VERSION

ROTACOD

Absolute multi turn encoders

Series

AM9 • AMC9



- Compact & flat multi turn encoder
- Resolution up to 8192 cpr x 4096 turns
- Radial M23 connector output
- AM9 with Ø 10 mm solid shaft
- AMC9 with Ø 15 mm through hollow shaft



AMC9 • AM9

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H. without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 10 mm
Hollow shaft diameter:	Ø 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400x10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	M23, 12 pin plug
Weight:	~ 400 g (14,1 oz)

ELECTRICAL SPECIFICATIONS

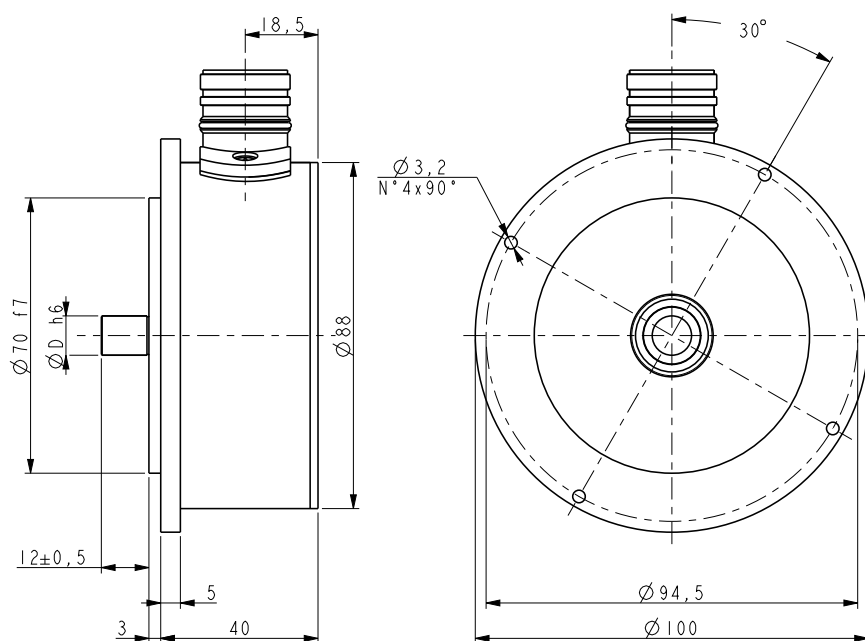
Resolution:	8192 cpr x 4096 turns max.
Accuracy:	± 0,04°
Output circuit:	SSI
Counting frequency:	100 kHz max.
Power supply:	+10V +30V
Power consumption:	1,5 W
Protection:	against inversion of polarity and short circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.
Functions:	• Counting direction (input)
Option:	• Zero setting (input)

MATERIALS

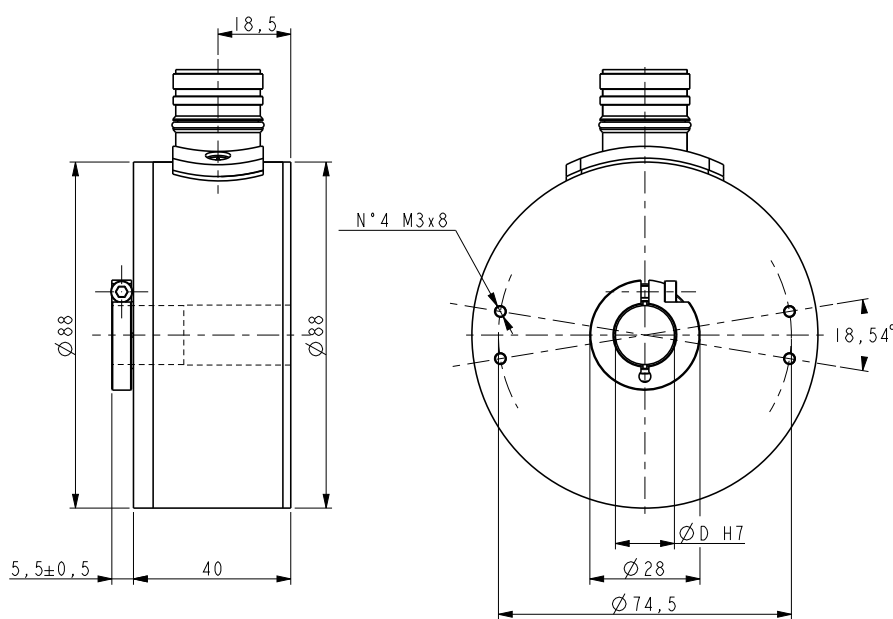
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

EPFL121H:	12 pin M23 mating connector
EC-CR12F-S27-A8-xx:	M23 cordset with xx m cable
PAN/PGF:	flexible couplings
BR1:	reducing sleeves



AM9



AMC9

Order code

Additional code (optional)

AM9 AMC9	XX/XXXX Ⓐ	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	/Sxxx Ⓔ
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Ⓐ RESOLUTION

12/4096 = 4096 cpr x 4096 turns
13/4096 = 8192 cpr x 4096 turns

Ⓑ OUTPUT

BS = SSI tree format, Binary code
GS = SSI tree format, Gray code
BA = SSI LSB aligned, Binary code
GA = SSI LSB aligned, Gray code

Ⓒ SHAFT DIAMETER

10 = 10 mm (only AM9)
15 = 15 mm (only AMC9)

Ⓓ E = Zero setting

Ⓔ CUSTOM VERSION

ROTACOD

Absolute encoder with Profibus DP output

Series

Ax58 PB • Ax58S PB • Ax58C PB

- Standard Profibus encoder
- Single & multi turn versions
- Connection via M12 or PG outlet
- Roundloop function
- Resistant against magnetic fields



Ax58 PB • Ax58C PB

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65 (with assembled connection cap)
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	PG outlet or M12 plugs
Weight:	~ 350 g (12,3 oz)

ELECTRICAL SPECIFICATIONS

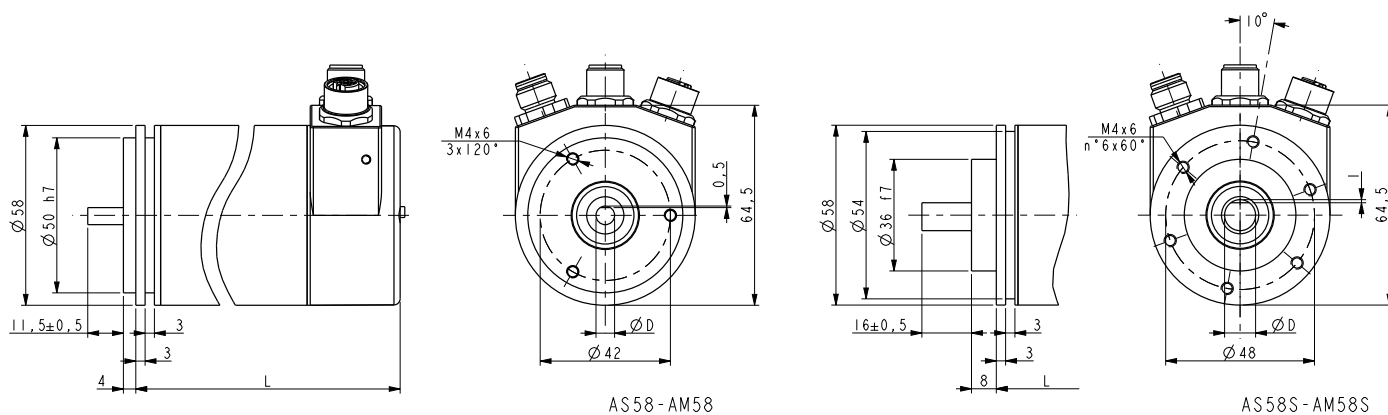
Resolution:	8192 cpr x 4096 turns max.
Accuracy:	± 0,04°
Counting frequency:	100 kHz max.
Power supply:	+10V +30V
Power consumption:	2,6 W max.
Interface:	Profibus-DP V0, Class 2 (RS485)
Programmable parameters:	<ul style="list-style-type: none"> • counting direction • scaling factor • preset value • offset value
Baudrate:	12 Mbit/sec. max.
Device address:	programmable by Dip-switches
Bus connection:	galvanically separated by opto-couplers
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

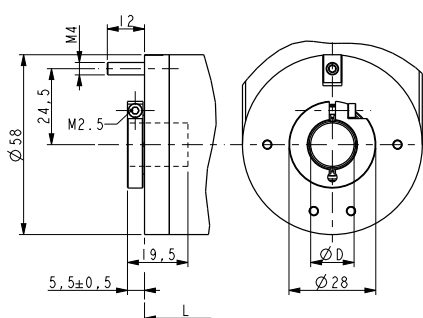
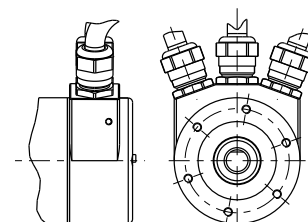
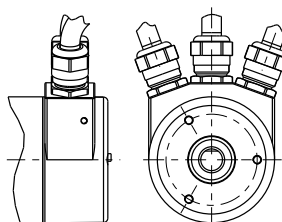
CC-PB:	connection cap with PG outlet
CC-PB-C:	connection cap with M12 plugs
EC-M12MP-LK-PB-xx:	M12 plug cordset with xx m cable
EC-M12FP-LK-PB-xx:	M12 conn. cordset with xx m cable
EC-M12PP-LK-PBS-xx:	M12 power supply cordset with xx m cable
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps



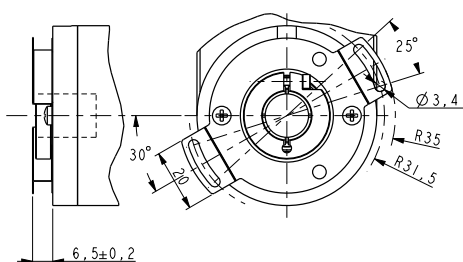
AS58-AM58

AS58S-AM58S

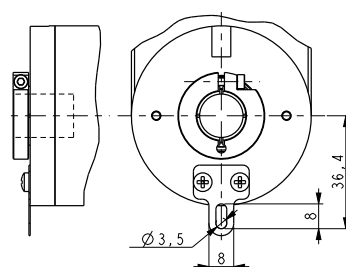
SERIES	L	D
AS58	83	6-10h6 8-12g6
AM58	98	
AS58S	82	6-8-10h6 12g6
AM58S	97	
ASCXX	88	14-15H7
AMCXX	98	



ASC58-AMC58



ASC59-AMC59



ASC60-AMC60

Order code - Single turn

AS58	XX	/	PB	-	XX	/Sxxx
AS58S	(a)				(b)	(c)
ASC58						
ASC59						
ASC60						

Order code - Multi turn

AM58	XX/XXXX	PB	-	XX	/Sxxx
AM58S	(a)			(b)	(c)
AMC58					
AMC59					
AMC60					

(a) RESOLUTION 12 = 4096 cpr 13 = 8192 cpr	10 = 10 mm
	12 = 12 mm
	14 = 14 mm (ASCxx)
	15 = 15 mm (ASCxx)
(b) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8"	(c) CUSTOM VERSION

(a) RESOLUTION 12/4096 = 4096 cpr x 4096 turns 13/4096 = 8192 cpr x 4096 turns	10 = 10 mm
	12 = 12 mm
	14 = 14 mm (AMCxx)
	15 = 15 mm (AMCxx)
(b) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8"	(c) CUSTOM VERSION

CONNECTION CAP (to be ordered separately)	
CC-PB:	Connection cap with PG outlet
CC-PB-C:	Connection cap with M12 connectors

Cordsets (standard lengths, other on request)	
EC-M12MP-LK-PB-5:	M12 plug cordset with 5 m cable
EC-M12FP-LK-PB-5:	M12 connector cordset with 5 m cable
EC-M12PP-LK-PBS-5:	M12 power supply cordset with 5 m cable
EC-M12MP-LK-PB-10:	M12 plug cordset with 10 m cable
EC-M12FP-LK-PB-10:	M12 connector cordset with 10 m cable
EC-M12PP-LK-PBS-10:	M12 power supply cordset with 10 m cable

ROTACOD

Absolute encoders with CANopen output

Series

Ax58 CB • Ax58S CB • Ax58 CB

- Standard CANopen encoder
- Single & multi turn versions
- Connection via M12 or PG outlet
- Roundloop function & velocity output
- Resistant against magnetic fields

CANopen



Ax58 CB • Ax58S CB

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65 (with assembled connection cap)
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-25°C +85°C (-13°F +185°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	PG outlet or M12 plugs
Weight:	~ 350 g (12,3 oz)

ELECTRICAL SPECIFICATIONS

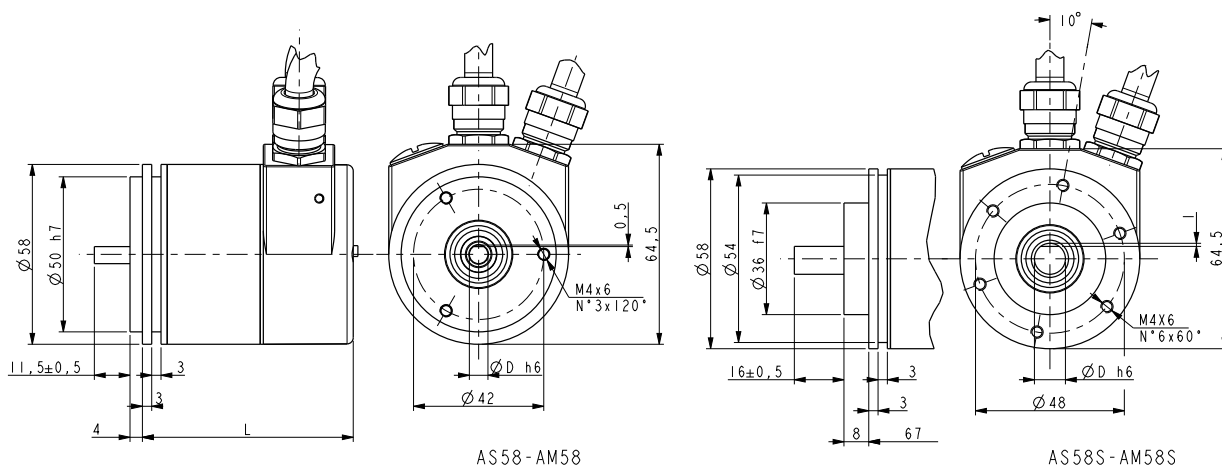
Resolution:	8192 cpr x 4096 turns max.
Accuracy:	± 0,04°
Counting frequency:	100 kHz max.
Power supply:	+10V +30V
Power consumption:	2,6 W max.
Interface:	CANopen DS301, DS406, Class 2 (RS485)
Programmable parameters:	<ul style="list-style-type: none"> • counting direction • scaling factor • preset value • two software limit switches
Baudrate:	programmable by Dip-switches
Device address:	programmable by Dip-switches
Bus connection:	galvanically separated by opto-couplers
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

MATERIALS

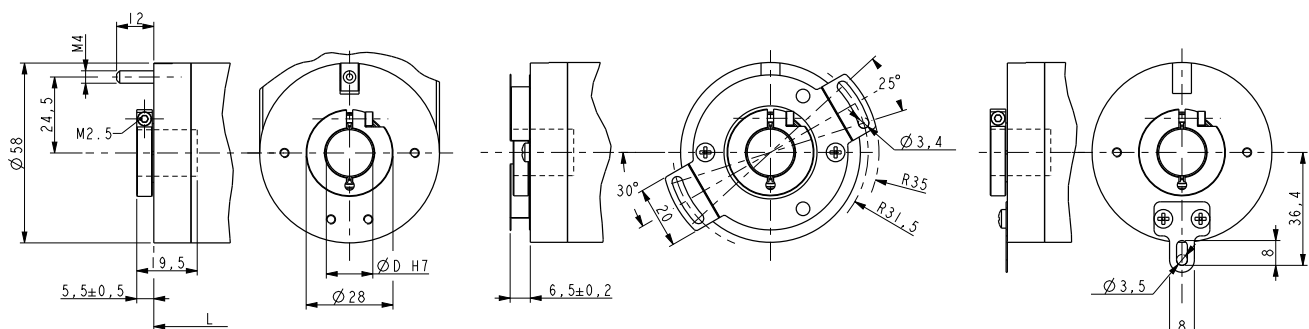
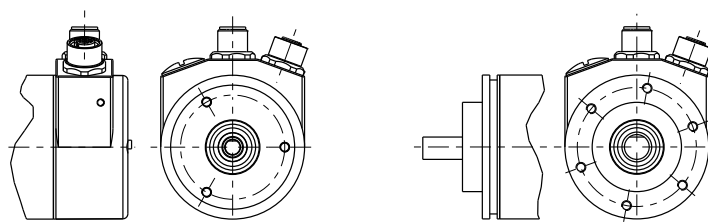
Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

CC-CB:	connection cap with PG outlet
CC-CB-C:	connection cap with M12 plugs
EC-M12MC-LK-CB-xx:	M12 plug cordset with xx m cable
EC-M12FC-LK-CB-xx:	M12 conn. cordset with xx m cable
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps



SERIES	L	D
AS58	83	6-10h6 8-12g6
AM58	98	
AS58S	82	6-8-10h6 12g6
AM58S	97	
ASCXX	88	14-15H7
AMCXX	98	



ASC58-AMC58

ASC59-AMC59

ASC60-AMC60

Order code - Single turn

AS58	XX	/	CB	-	XX	/Sxxx
AS58S	(a)				(b)	(c)
ASC58						
ASC59						
ASC60						

Order code - Multi turn

AM58	XX/XXXX	CB	-	XX	/Sxxx
AM58S	(a)			(b)	(c)
AMC58					
AMC59					
AMC60					

(a) RESOLUTION	10 = 10 mm 12 = 4096 cpr 13 = 8192 cpr
(b) SHAFT DIAMETER	6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8"
(c) CUSTOM VERSION	

(a) RESOLUTION	10 = 10 mm 12 = 12 mm 13/4096 = 4096 cpr x 4096 turns 13/8192 = 8192 cpr x 4096 turns
(b) SHAFT DIAMETER	6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8"
(c) CUSTOM VERSION	

CONNECTION CAP (to be ordered separately)	
CC-CB:	Connection cap with PG outlet
CC-CB-C:	Connection cap with M12 connectors

Cordsets (standard lengths, other on request)	
EC-M12MC-LK-CB-5:	M12 plug cordset with 5 m cable
EC-M12FC-LK-CB-5:	M12 connector cordset with 5 m cable
EC-M12MC-LK-CB-10:	M12 plug cordset with 10 m cable
EC-M12FC-LK-CB-10:	M12 connector cordset with 10 m cable

ROTACOD

Absolute encoders with Fieldbus interface

Series

Hx58 FB • Hx58S FB • HxC58 FB

- High resolution Fieldbus encoders
- Single turn resolution 262144 cpr
- Multi turn resolution 65536 cpr x 16384 turns
- Roundloop function & velocity output
- Bus cover with M12 or PG outlet
- Precise & fast optical sensing
- Resistant against magnetic fields



HxC58 FB • Hx58S FB

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65 (with assembled connection cap)
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400x10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	PG outlet or M12 plugs
Weight:	~ 300 g (10,5 oz)

ELECTRICAL SPECIFICATIONS

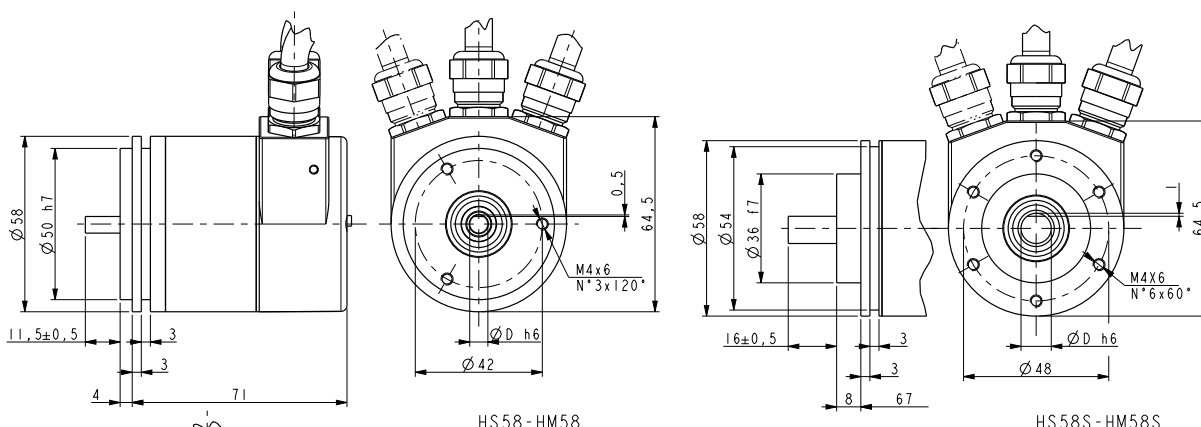
Resolution:	262144 cpr or 65536 cpr x 16384 turns
Accuracy:	± 0,007°
Counting frequency:	150 kHz max.
Power supply:	+10V +30V
Power consumption:	2,2 W
Interface:	Profibus-DP V0 CANopen DS301, DS406 CANlift DS301, DSP417 DeviceNet
Programmable parameters:	standard functions see user manual for each fieldbus • velocity output • round loop function
Baudrate:	programmable by Dip-switches
Device address:	programmable by Dip-switches
Bus connection:	galvanically separated by opto-couplers
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

MATERIALS

Flange:	anticorrosional, UNI EN AW-6082
Housing:	anticorrosional, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

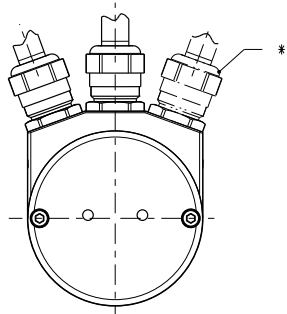
ACCESSORIES

BC-PB:	Profibus conn. cap with PG outlet
BC-PB-C:	Profibus conn. cap with M12 plugs
BC-CB:	CANopen conn. cap with PG outlet
BC-CB-C:	CANopen conn. cap with M12 plugs
BC-FDV:	DeviceNet conn. cap with PG outlet
BC-FDV-C:	DeviceNet conn. cap with M12 plugs
BC-I6:	CANlift conn. cap with PG outlet
BC-I6-C:	CANlift conn. cap with M12 plugs
EC-M12xx-LK-xx-xx:	M12 cordset with xx m cable
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps

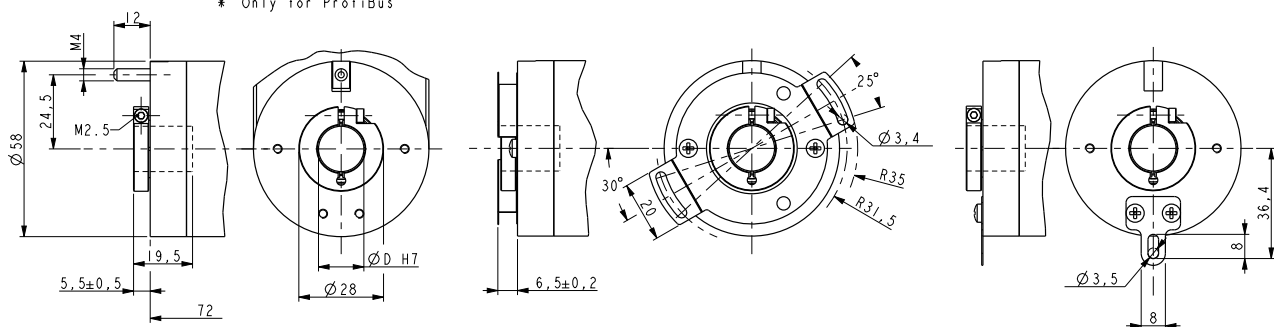


HS58-HM58

HS58S-HM58S



* Only for ProfiBus



HSC58-HMC58

HSC59-HMC59

HSC60-HMC60

Order code - Single turn

HS58	XX	/	FB	-	XX	/Sxxx
HS58S	(a)				(b)	(c)
HSC58						
HSC59						
HSC60						

Order code - Multi turn

HM58	XX/XXXXX	/	FB	-	XX	/Sxxx
HM58S	(a)				(b)	(c)
HMC58						
HMC59						
HMC60						

(a) RESOLUTION
 10 = 10 mm
 12 = 12 mm
 14 = 14 mm (only HSCxx)
 15 = 15 mm (only HSCxx)

(b) SHAFT DIAMETER
 6 = 6 mm
 8 = 8 mm
 P9 = 9.52 mm, 3/8"

(c) CUSTOM VERSION

(a) RESOLUTION
 10 = 10 mm
 12 = 12 mm
 14 = 14 mm (only HMCxx)
 15 = 15 mm (only HMCxx)

(b) SHAFT DIAMETER
 6 = 6 mm
 8 = 8 mm
 P9 = 9.52 mm, 3/8"

(c) CUSTOM VERSION

CONNECTION CAP (to be ordered separately)

BC	-	XX	-	X
		(a)		(b)

(a) INTERFACE
 PB = Profibus-DP V1
 CB = CANopen DS301, DS406
 FDV = DeviceNet
 I6 = CANlift DS301, DSP417

(b) CONNECTIONS
 - = PG output
 C = M12 connector output

Cordsets
 (standard lengths, other on request)

EC-M12MC-LK-CB-5:	CAN/DeviceNet M12 plug cordset with 5 m cable
EC-M12FC-LK-CB-5:	CAN/DeviceNet M12 conn. cordset with 5 m cable
EC-M12MC-LK-CB-10:	CAN/DeviceNet M12 plug cordset with 10 m cable
EC-M12FC-LK-CB-10:	CAN/DeviceNet M12 conn. cordset with 10 m cable
EC-M12MP-LK-PB-5:	Profibus M12 plug cordset with 5 m cable
EC-M12FP-LK-PB-5:	Profibus M12 connector cordset with 5 m cable
EC-M12PP-LK-PBS-5:	Profibus M12 power supply cordset with 5 m cable
EC-M12MP-LK-PB-10:	Profibus M12 plug cordset with 10 m cable
EC-M12FP-LK-PB-10:	Profibus M12 connector cordset with 10 m cable
EC-M12PP-LK-PBS-10:	Profibus M12 pwr supply cordset with 10 m cable

ROTACOD

Absolute encoder

Series

AM58K



- Profibus and CANopen encoder
- Stainless steel housing suitable for food industry
- IP67 washdown protection
- Bus cover with M12 connectors
- Roundloop function
- Position & velocity output (CANopen)



AM58K

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67 (with assembled connection cap)
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Shaft loading (axial, radial):	100 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400x10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connection:	connection cap with M12 connectors
Weight:	~ 800 g (28,2 oz)

ELECTRICAL SPECIFICATIONS

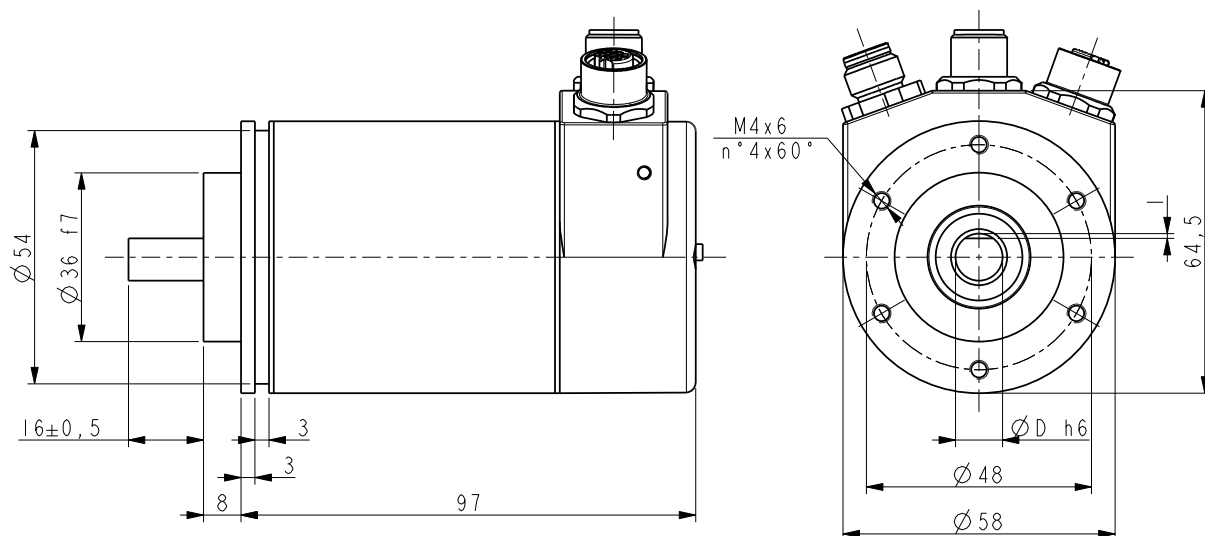
Resolution:	13 + 12 bit (8192 cpr x 4096 turns)
Accuracy:	± 0,04°
Counting frequency:	150 kHz max.
Power supply:	+10V +30V
Power consumption:	~ 2,2 W
Interface:	Profibus-DP V0 CANopen DS301, DS406
Programmable parameters:	<ul style="list-style-type: none"> • counting direction • resolution up to 8192 counts/rev. and 4096 rev. <ul style="list-style-type: none"> • preset value • offset value • position/velocity output other parameters see manual
Baudrate:	CANopen: 1 MHz max. (programmable by Dip-switches) Profibus: max 12 Mbit/sec.
Device address:	programmable by Dip-switches
Bus connection:	galvanically separated by opto-couplers
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

MATERIALS

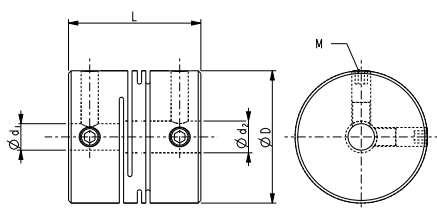
Flange:	AISI 410 stainless steel
Housing:	AISI 410 stainless steel
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, AISI 303

ACCESSORIES

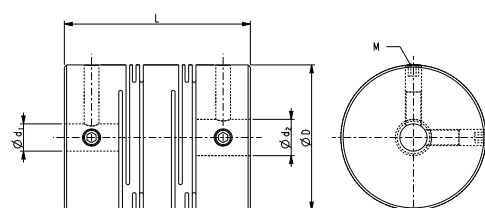
MWSS, MSTs:	stainless steel flexible couplings
EC-M12MP-LK-PB-x:	PB M12 plug cordset x m cable
EC-M12FP-LK-PB-x:	PB M12 conn. cordset x m cable
EC-M12PP-LK-PBS-x:	PB M12 cordset power supply x m cable
EC-M12MC-LK-CB-x:	CB M12 plug cordset x m cable
EC-M12FC-LK-CB-x:	CB M12 conn. cordset x m cable



AM58K



MWSS



MST5

Order code

AM58K	XX/XXXX Ⓐ	XX Ⓑ	-	XX Ⓒ	/Sxxx Ⓓ
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Ⓐ RESOLUTION

13/4096 = 8192 cpr x 4096 turns

Ⓑ SHAFT DIAMETER

PB = Profibus DP

CB= CANopen

Ⓒ SHAFT DIAMETER

6 = 6 mm

8 = 8 mm

P9 = 9.52 mm, 3/8"

10 = 10 mm

12 = 12 mm

Ⓓ CUSTOM VERSION

ROTACOD

Absolute encoders with CANopen output

Series

Ax58 • Ax58S • Ax58 EasyCAN

- Compact CAN single and multi turn encoders
- High resolution, 18 bits or 30 bits
- CANopen and CANlift protocols
- Point-to-point connection
- Velocity output & roundloop function
- Resistant against magnetic fields

CANopen



AS58 EasyCan

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000Hz
Protection:	IP67, IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	∅ 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	∅ 14, 15
Reducing sleeves BR1-xx from ∅ 15 mm to:	∅ 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Starting torque (at 20°C):	< 1 Ncm (typical)
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	M12 plug or cable output 2 m (6,56 ft)
Weight:	~ 250 g (8,8 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

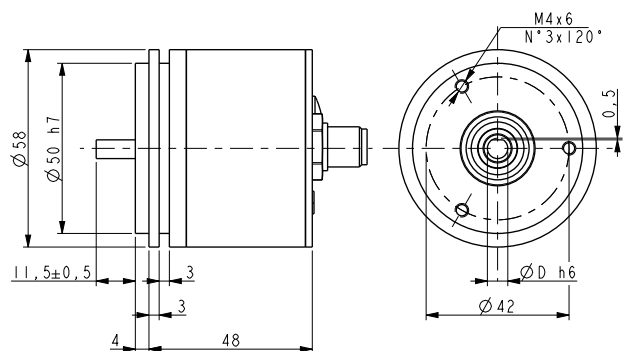
Resolution:	single turn = 4096, 65536, 262144 cpr multi turn = 65536 cpr x 16384 turns
Accuracy:	± 0,007°
Counting frequency:	220 kHz max.
Power supply:	+10V +30V
Power consumption:	AS = 1.2 W, AM = 3 W
Interface:	CANopen DS301, DS406, Class 2 (RS485) CANlift DS301, DSP417, Class 2 (RS485)
Programmable parameters:	<ul style="list-style-type: none"> • Baudrate • Device address (Node ID) • Scaling function • Counting direction • Preset value • Two software limit switches • Transmission mode: Cyclic, Sync • Velocity output • Round loop function
Bus termination:	programmable by Dip-switches
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

MATERIALS

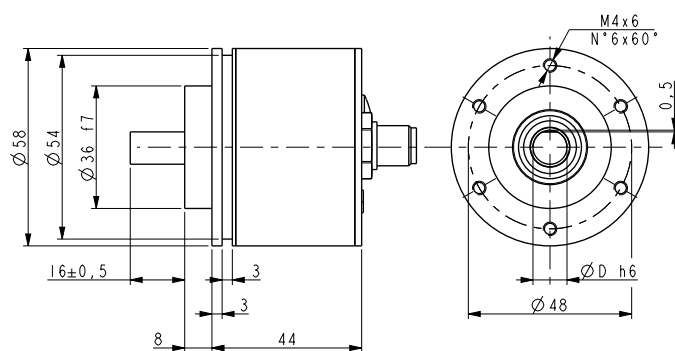
Housing:	anticorrosive, UNI EN AW-6082
Flange:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non-magnetic, UNI EN 4305

ACCESSORIES

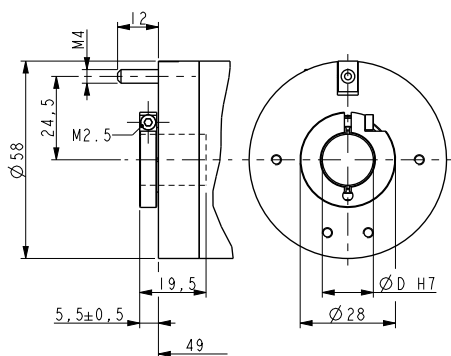
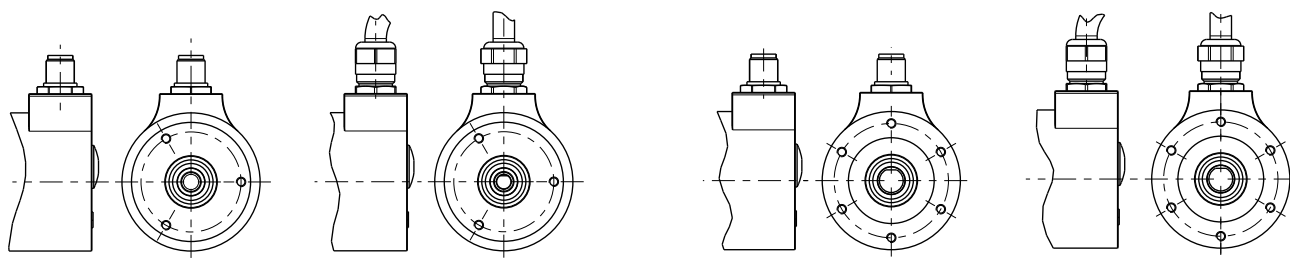
EM12FC:	M12 5 pin mating connector
PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps



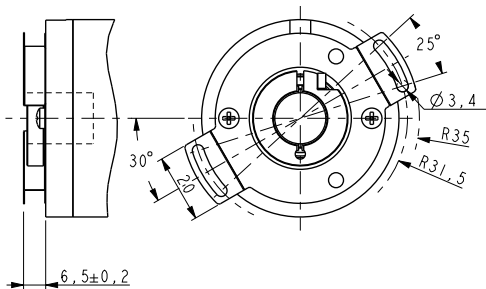
AS58



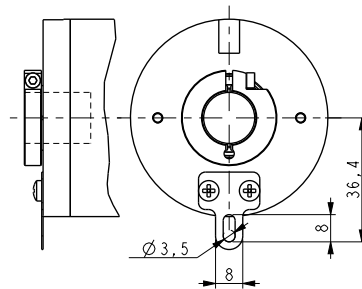
AS58S



ASC58



ASC59



ASC60

Order code - Single turn

AS58	XX	/	XX	-	XX	-	X	XX	/Sxxx
AS58S	(a)		(b)		(c)		(d)	(e)	(f)
ASC58									
ASC59									
ASC60									

(a) RESOLUTION

12 = 4096 cpr
16 = 65536 cpr
18 = 262144 cpr

(b) INTERFACE

CB = CANopen (DS301, DS406)
I6 = CANlift (DS301, DSP417)

(c) SHAFT DIAMETER

6 = 6 mm
8 = 8 mm
P9 = 9.52 mm, 3/8"
10 = 10 mm
12 = 12 mm
14 = 14 mm (only ASCxx)
15 = 15 mm (only ASCxx)

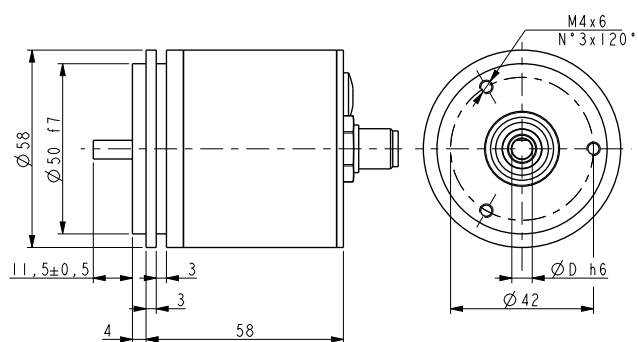
(d) CONNECTION POSITION

- = axial
R = radial

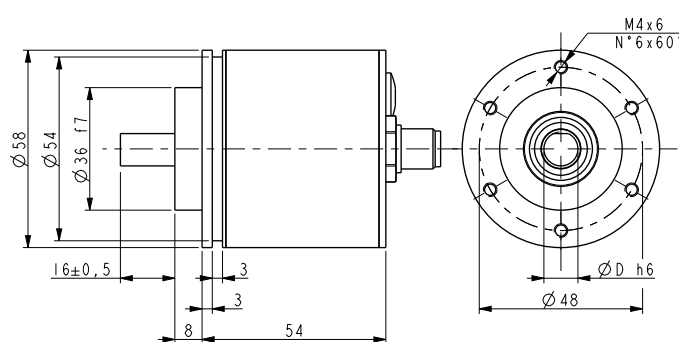
(e) CONNECTIONS

L2 = cable output 2 m (standard)
L5 = cable output 5 m
M = M12 5 pin plug

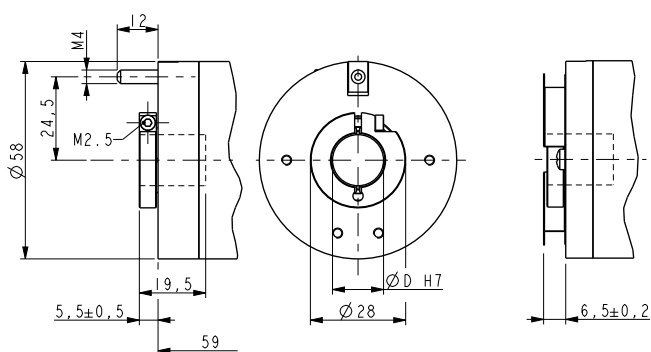
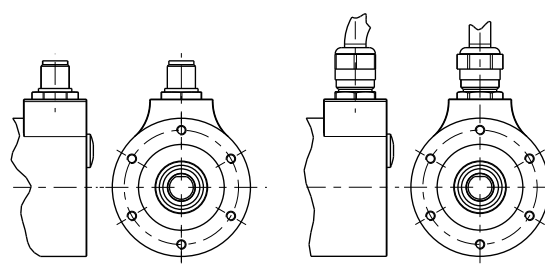
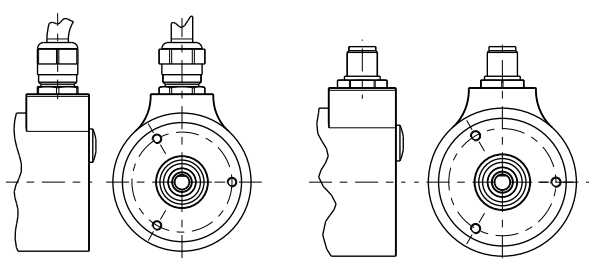
(f) CUSTOM VERSION



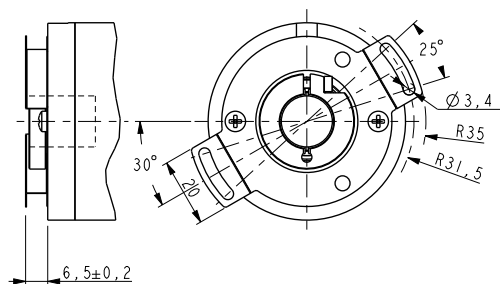
AM58



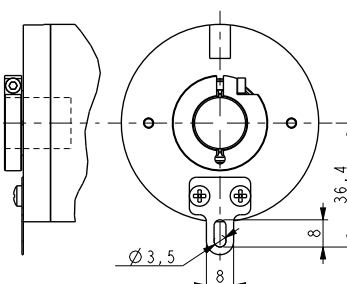
AM58S



AMC58



AMC59



AMC60

Order code - Multi turn

AM58	XX/XXXXX	XX	-	XX	-	X	XX	/Sxxx
AM58S	(a)	(b)		(c)		(d)	(e)	(f)
AMC58								
AMC59								
AMC60								

<p>(a) RESOLUTION 16/16384 = 65536 cpr x 16384 turns</p> <p>(b) INTERFACE CB = CANopen (DS301, DS406) I6 = CANlift (DS301, DSP417)</p>	<p>(c) SHAFT DIAMETER 6 = 6 mm 8 = 8 mm P9 = 9.52 mm, 3/8" 10 = 10 mm 12 = 12 mm 14 = 14 mm (only AMCxx) 15 = 15 mm (only AMCxx)</p>	<p>(d) CONNECTION POSITION - = axial R = radial</p> <p>(e) CONNECTIONS L2 = cable output 2 m (standard) L5 = cable output 5 m M = M12 5 pin plug</p>	<p>(f) CUSTOM VERSION</p>
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ROTACOD

Absolute encoders with Ethercat interface

Series

EM58 • HS58 • HM58 EC



- Single & multi turn EtherCAT encoders
- Cycle time only 62,5 μs (position refresh)
- Fast and precise optical sensing
- Resistant against magnetic fields



EM58 • HS58 • HM58 EC

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	∅ 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	∅ 14, 15 mm
Reducing sleeves BR1-xx from ∅ 15 mm to:	∅ 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Weight:	~ 350 g (12,3 oz)

ELECTRICAL SPECIFICATIONS

Resolution:	HS: 262144 cpr EM: 4096 cpr x 16384 turns HM: 65536 cpr x 16384 turns
Accuracy:	HS, HM: ± 0,007° - EM: ± 0,5°
Counting frequency:	150 kHz max.
Power supply:	+10V +30V
Power consumption:	2,2 W max.
Interface:	EtherCAT, CoE (CANopen over EtherCAT)
Programmable parameters:	see user manual
Communication modes:	Freerun, Sync-mode, Distributed clock
Cycle time:	≥ 62,5 μs
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

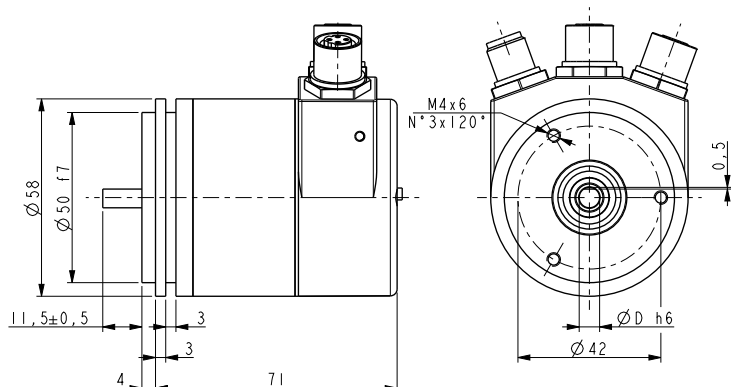
MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

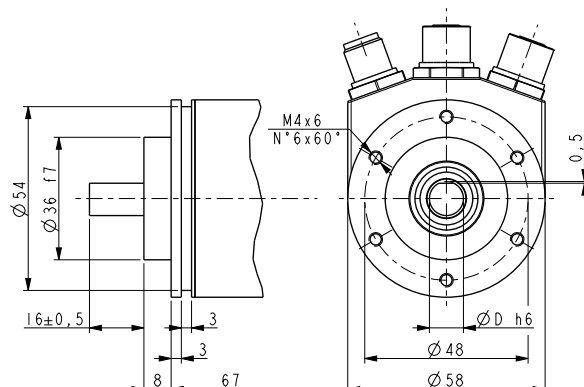
ACCESSORIES

PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps
EC-M12ME-GN-EC-xx:	M12 cordset with x m cable
EC-M12PP-LK-PBS-xx:	M12 power supply cordset with x m cable

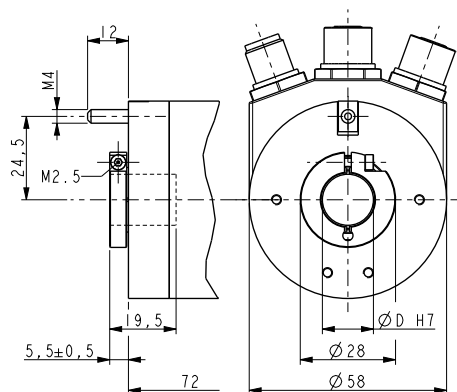
Specifications subject to changes without prior notice



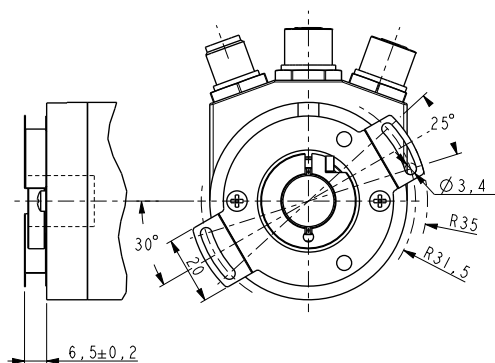
EM58 • HS58 • HM58 EC



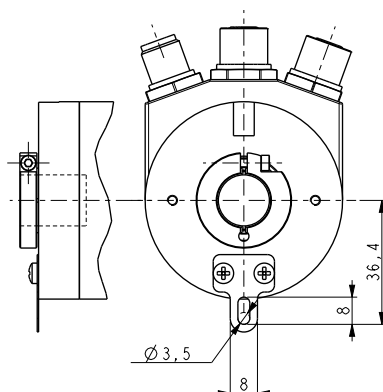
EM58 • HS58S • HM58S EC



EM58 • HSC58 • HMC58 EC



EM58 • HSC59 • HMC59 EC



EM58 • HSC60 • HMC60 EC

Order code - Single turn

HS58	XX	/	EC	-	XX	/Sxxx
HS58S	(a)				(b)	(c)
HSC58						
HSC59						
HSC60						

Order code - Multi turn

HM58	EM58	XX/XXXXX	EC	-	XX	/Sxxx
HM58S	EM58S	(a)			(b)	(c)
HMC58	EMC58					
HMC59	EMC59					
HMC60	EMC60					

<p>(a) RESOLUTION</p> <p>18 = 262144 cpr</p>	<p>(b) SHAFT DIAMETER</p> <p>6 = 6 mm</p> <p>8 = 8 mm</p> <p>P9 = 9.52 mm, 3/8"</p> <p>10 = 10 mm</p> <p>12 = 12 mm</p> <p>14 = 14 mm (HSCxx)</p> <p>15 = 15 mm (HSCxx)</p>	<p>(c) CUSTOM VERSION</p>
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<p>(a) RESOLUTION</p> <p>12/16384 = 4096 cpr x 16384 turns (EMxx)</p> <p>16/16384 = 65536 cpr x 16384 turns (HMxx)</p>	<p>10 = 10 mm</p> <p>12 = 12 mm</p> <p>14 = 14 mm (EMCxx, HMCxx)</p> <p>15 = 15 mm (EMCxx, HMCxx)</p>	<p>(b) SHAFT DIAMETER</p> <p>6 = 6 mm</p> <p>8 = 8 mm</p> <p>P9 = 9.52 mm, 3/8"</p>	<p>(c) CUSTOM VERSION</p>
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ROTACOD

Absolute encoders with Profinet interface

Series

EM58 • HS58 • HM58 PT



- Single & multi turn Profinet encoders
- Fast and precise optical sensing
- Encoder profile PNO No 3.162 V4.1
- Dynamically assigned IP address via DCP



EM58 • HS58 • HM58 PT

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP65
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 9.52, 10, 12 mm
Hollow shaft diameter:	Ø 14, 15 mm
Reducing sleeves BR1-xx from Ø 15 mm to:	Ø 6, 8, 9.52, 10, 11, 12 mm
Shaft loading (axial, radial):	40 N max.
Shaft rotational speed:	6000 rpm max.
Bearings life:	400 x 10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Weight:	~ 350 g (12,3 oz)

ELECTRICAL SPECIFICATIONS

Resolution:	HS: 262144 cpr EM: 4096 cpr x 16384 turns HM: 65536 cpr x 16384 turns
Accuracy:	HS, HM: ± 0,007° - EM: ± 0,5°
Counting frequency:	150 kHz max.
Power supply:	+10V +30V
Power consumption:	1,7 W max.
Interface:	Profinet IO
Programmable parameters:	see user manual
Communication modes:	RT2, RT3 (Isochronous)
Cycle time:	≥ 1ms
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

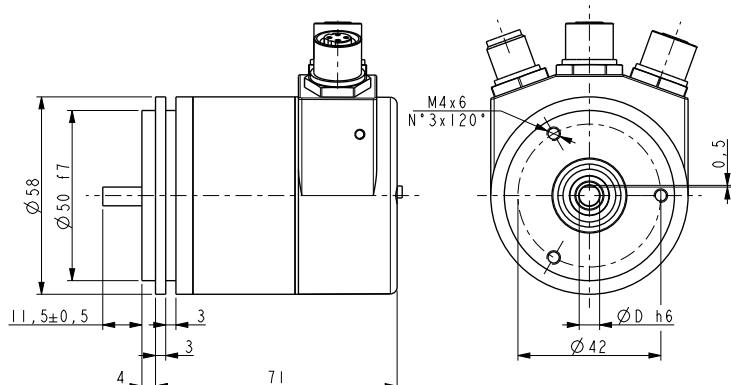
MATERIALS

Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

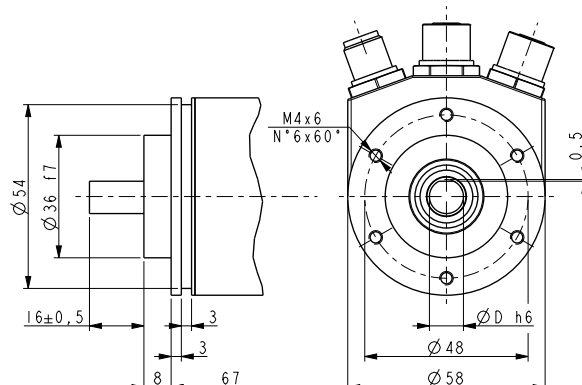
ACCESSORIES

PAN/PGF:	flexible couplings
BR1:	reducing sleeves
LKM-386:	fixing clamps
EC-M12ME-GN-EC-xx:	M12 cordset with x m cable
EC-M12PP-LK-PBS-xx:	M12 power supply cordset with x m cable

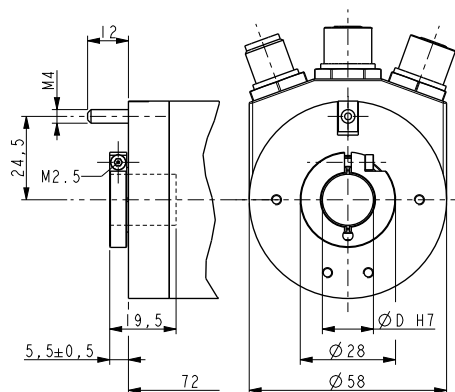
Specifications subject to changes without prior notice



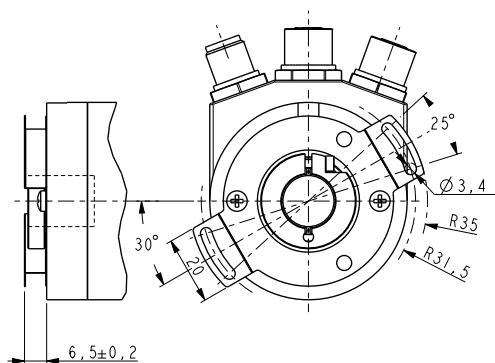
EM58 • HS58 • HM58 PT



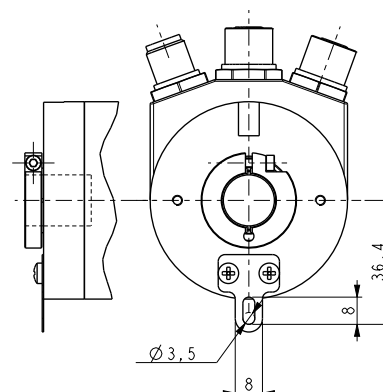
EM58 • HS58S • HM58S PT



EM58 • HSC58 • HMC58 PT



EM58 • HSC59 • HMC59 PT



EM58 • HSC60 • HMC60 PT

Order code - Single turn

HS58	XX	/	PT	-	XX	/Sxxx
HS58S	Ⓐ				Ⓑ	Ⓒ
HSC58						
HSC59						
HSC60						

Order code - Multi turn

HM58	EM58	XX/XXXXX	PT	-	XX	/Sxxx
HM58S	EM58S	Ⓐ			Ⓑ	Ⓒ
HMC58	EMC58					
HMC59	EMC59					
HMC60	EMC60					

Ⓐ RESOLUTION	Ⓑ SHAFT DIAMETER	Ⓒ CUSTOM VERSION
18 = 262144 cpr	6 = 6 mm	
	8 = 8 mm	
	P9 = 9.52 mm, 3/8"	
	10 = 10 mm	
	12 = 12 mm	
	14 = 14 mm (HSCxx)	
	15 = 15 mm (HSCxx)	

Ⓐ RESOLUTION	10 = 10 mm	Ⓒ CUSTOM VERSION
12/16384 = 4096 cpr x 16384 turns (EMxx)	12 = 12 mm	
16/16384 = 65536 cpr x 16384 turns (HMxx)	14 = 14 mm (EMCxx, HMCxx)	
	15 = 15 mm (EMCxx, HMCxx)	
Ⓑ SHAFT DIAMETER		
6 = 6 mm		
8 = 8 mm		
P9 = 9.52 mm, 3/8"		

ROTACOD

Heavy-duty Fieldbus encoder

Series

XAC77 FB



- Heavy-duty fieldbus encoder
- Single turn (18 bits) and multi turn (30 bits)
- Easy access by removable connection cap
- Profibus, CANopen, DeviceNet interfaces
- Velocity output, roundloop function (CANopen)
- For harsh environment such as steel mills, mobile equipment, construction machinery



XAC77

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP66 (with connection cap assembled), IP65 shaft side
Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F) (98% R.H.without condensation)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 14 mm
Shaft loading (axial, radial):	150 N max.
Shaft rotational speed:	6000 rpm max.
Bearing life:	400x10 ⁶ rev. min. (10 ⁹ rev. min. with shaft loading of 20 N max.)
Electrical connections:	PG outlet
Weight:	~1,3 kg (45,8 oz)

ELECTRICAL SPECIFICATIONS

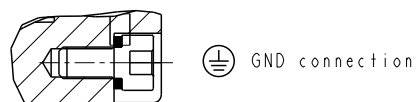
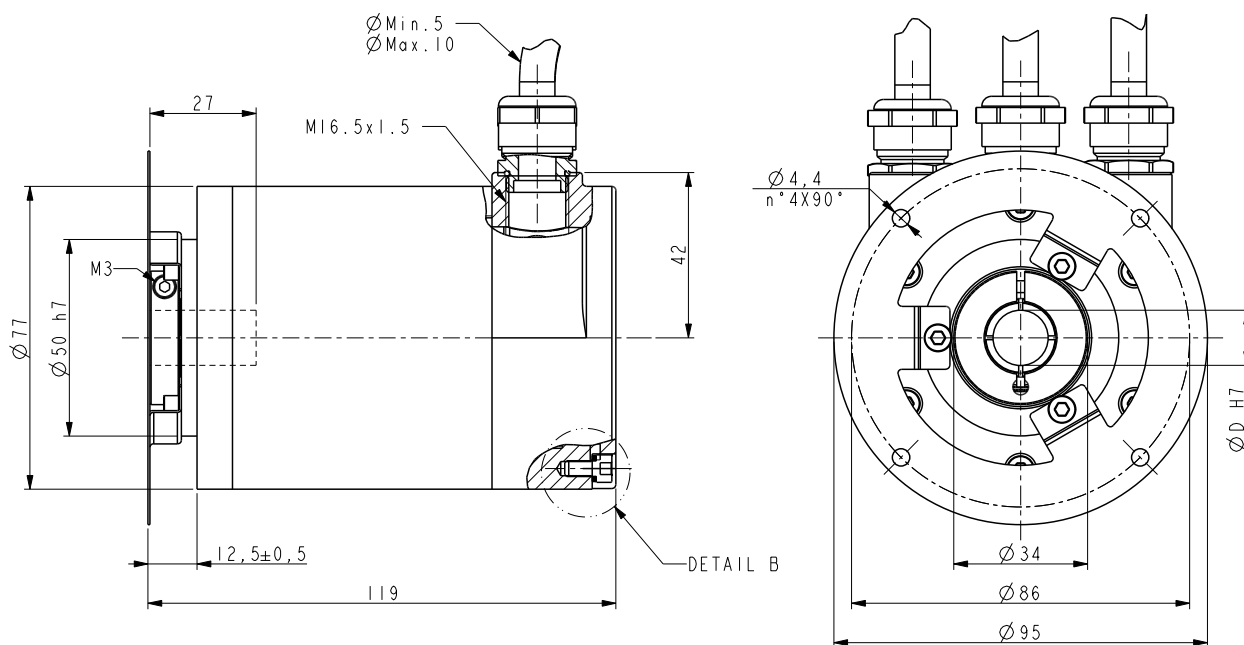
Resolution:	262144 cpr or 65536 cpr x 16384 turns
Accuracy:	± 0,007°
Counting frequency:	150 kHz max.
Power supply:	+10V +30V
Power consumption:	2,2 W
Programmable parameters:	see user manual for each Fieldbus
Baudrate:	programmable by Dip-switches
Device address:	programmable by Dip-switches
Interface:	Profibus-DP V0 CANopen® DS301, DS406 DeviceNet
Protection:	against inversion of polarity and short-circuit
EMC:	electro-magnetic immunity, according to: EN 61000-4-2 EN 61000-4-4
Optoelectronic life:	100.000 h min.

MATERIALS

Flange:	anticorrosive, UNI EN AW-6082
Housing:	anticorrosive, UNI EN AW-6082
Bearings:	ABEC 5
Shaft:	stainless steel, non magnetic, UNI EN 4305
Light source:	GaAl diodes

ACCESSORIES

LKM-1758:	Ø 10 mm shaft extension
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DETAIL B
SCALA 2,000

XAC77

Order code

XAC77	XX/XXXXX a	XX b	-	XX c	/Sxxx d
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<p>a) RESOLUTION 18/1 = 262144 cpr 16/16384 = 65536 cpr x 16384 turns</p>	<p>b) INTERFACE PX = Profibus-DP CX = CANopen DX = DeviceNet</p>	<p>c) SHAFT DIAMETER 14 = 14 mm</p>	<p>d) CUSTOM VERSION</p>
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ROTAPULS

Incremental encoder modules

Series

IM30 • IM31 • IM56



- Low cost encoder modules
- Easy assembly and disc alignment
- Bearingless design



IM56 • IM31

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range:	-40°C +85°C (-40°F +185°F)
Storage temperature range:	-40°C +85°C (-40°F +185°F)
Option:	• Operating temperature range: -40°C +100°C (-40°F +212°F)

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hub:	Ø 3, 4, 5, 6, 6.35, 8 mm
Electrical connections:	pin or 15 cm flat cable

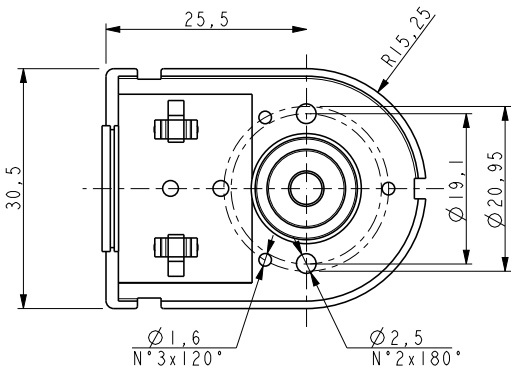
ELECTRICAL SPECIFICATIONS

Resolution (PPR):	IM30: 96, 100, 192, 200, 256, 300, 360, 400, 500, 512 1000, 1024, 1200, 1250 IM31: 50, 100, 200, 256, 360, 400, 500, 512, 1000, 1024 IM56: 1000, 1024, 2000, 2048
Output signals:	IM30: AB 90° ± 8° IM31, IM56: ABO 90° ± 8° (1000, 1024 PPR only AB)
Output circuit:	TTL
Power supply:	+5V ±10%
Output current (per channel):	5 mA max.
Counting frequency:	IM30: 20 kHz IM31, IM56: 100 kHz max.
Consumption:	60 mA (typical)
Option:	• Line Driver output circuit

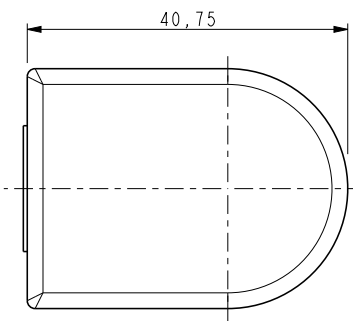
MATERIALS

Housing:	Polyethylene
Hub:	Aluminium or plastic
Disk:	Mylar

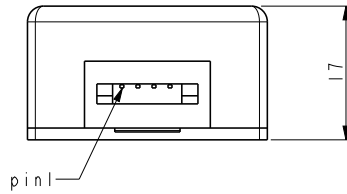
Specifications subject to changes without prior notice



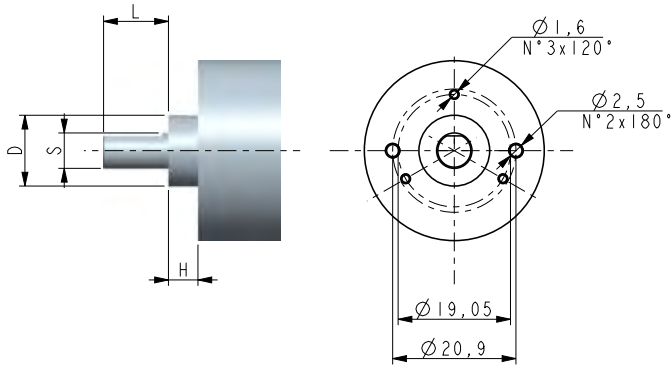
TOP VIEW (BASE PLATE ONLY)



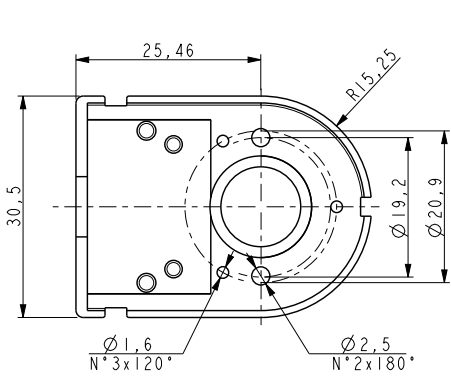
TOP VIEW



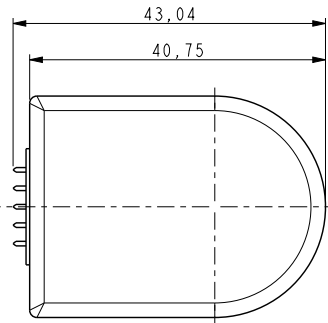
SIDE VIEW



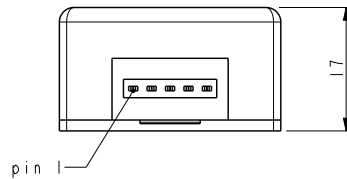
IM30



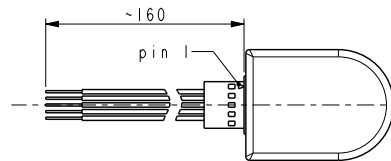
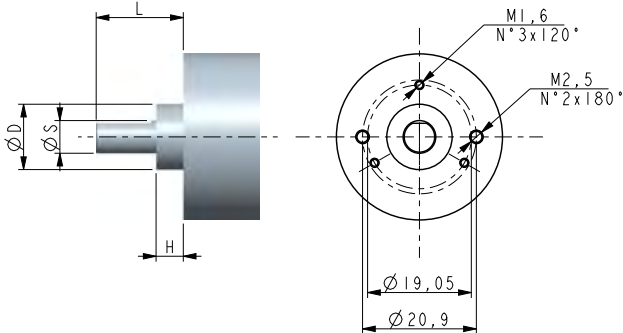
TOP VIEW (BASE PLATE ONLY)



TOP VIEW



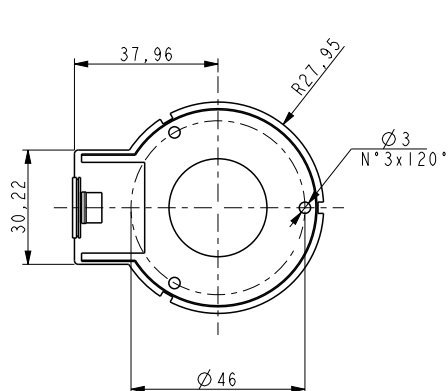
SIDE VIEW



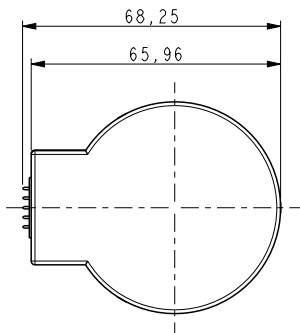
Cable: ~160mm length UL1007/AWG26
 Connector: AMP 103686-4, MOLEX 2695+2759

Voltage (5 pin)		
Pin	Color	Description
1	Black	Ground
2	Yellow	Index
3	White	Channel A
4	Red	DC +5V
5	Green	Channel B

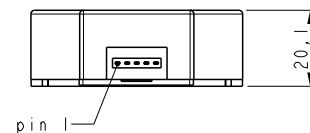
IM31



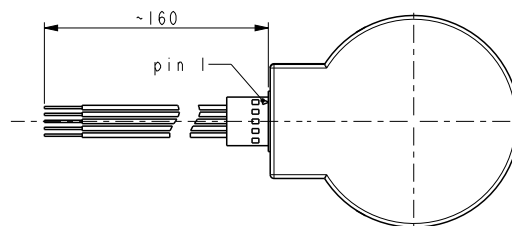
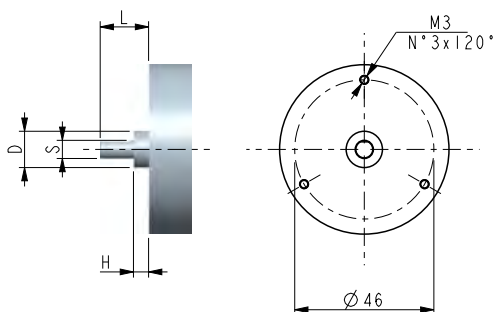
TOP VIEW (BASE PLATE ONLY)



TOP VIEW



SIDE VIEW



Cable: ~160mm length UL1007/AWG26
 Connector: AMP 103686-4, MOLEX 2695+2759

Voltage (5 pin)		
Pin	Color	Description
1	Black	Ground
2	Yellow	Index
3	White	Channel A
4	Red	DC +5V
5	Green	Channel B

Order code

IM30	-	X Ⓐ	-	XXXX Ⓑ	X Ⓒ	X Ⓓ	XX Ⓔ	X Ⓕ	X Ⓖ	/Sxxx Ⓗ
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Ⓐ OUTPUT CIRCUITS N = TTL Ⓑ RESOLUTION See electrical specifications	Ⓒ OUTPUT SIGNALS B = AB Ⓓ POWER SUPPLY 1 = +5Vdc ±5%	Ⓔ SHAFT DIAMETER 3 = 3 mm 4 = 4 mm 5 = 5 mm 6 = 6 mm P6 = 6.35 mm - 1/4" 8 = 8 mm	Ⓕ HUB STYLE A = Aluminium hub (standard) P = Push on hub Ⓖ OPERATING TEMPERATURE RANGE T = -40°C +85°C (-40°F +185°F) K = -40°C +100°C (-40°F +212°F)	Ⓗ CUSTOM VERSION
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Order code

IM31	-	X Ⓐ	-	XXXX Ⓑ	X Ⓒ	X Ⓓ	XX Ⓔ	X Ⓕ	X Ⓖ	/Sxxx Ⓗ
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Ⓐ OUTPUT CIRCUITS N = TTL (AB0) L = Line Driver (AB0 /AB0) Ⓑ RESOLUTION See electrical specifications	Ⓒ OUTPUT SIGNALS Z = AB0 Ⓓ POWER SUPPLY 1 = +5Vdc ±5%	Ⓔ SHAFT DIAMETER 3 = 3 mm 4 = 4 mm 5 = 5 mm 6 = 6 mm P6 = 6.35 mm - 1/4" 8 = 8 mm	Ⓕ HUB STYLE A = Aluminium hub (standard) P = Push on hub Ⓖ OPERATING TEMPERATURE RANGE T = -40°C +85°C (-40°F +185°F) K = -40°C +100°C (-40°F +212°F)	Ⓗ CUSTOM VERSION
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Order code

IM56	-	X Ⓐ	-	XXXX Ⓑ	X Ⓒ	X Ⓓ	XX Ⓔ	X Ⓕ	X Ⓖ	/Sxxx Ⓗ
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Ⓐ OUTPUT CIRCUITS N = TTL (AB0) L = Line Driver (AB0 /AB0) Ⓑ RESOLUTION See electrical specifications	Ⓒ OUTPUT SIGNALS Z = AB0 Ⓓ POWER SUPPLY 1 = +5Vdc ±5% Ⓔ SHAFT DIAMETER 8 = 8 mm	Ⓕ HUB STYLE A = Aluminium hub (standard) P = Push on hub Ⓖ OPERATING TEMPERATURE RANGE T = -40°C +85°C (-40°F +185°F) K = -40°C +100°C (-40°F +212°F)	Ⓗ CUSTOM VERSION
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ROTAPULS

The low-cost heavy duty solution

Series

SGSM • SGSD



- Low-cost heavy duty solution
- Sealed housing, IP68
- Redundant version SGSD
- Up to 50 mm hollow shaft
- Outdoor & mobile equipment applications



SGSM • SGSD

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range:	-40°C ÷ +85°C (-40°F +185°F)
Storage temperature range:	-40°C ÷ +100°C (-40°F +212°F)
Protection:	IP68

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	Ø 30, 50 mm
Shaft rotational speed:	10000 rpm max. (mechanical)
Gap sensor-ring:	0,1 ÷ 1,5 mm
Electrical connections:	M12 8 pin inline plug or Lika Hi-flex cable 2,0 m (6.56 ft)
Weight:	~ 200 g (7 oz)
Option:	• additional cable

ELECTRICAL SPECIFICATIONS

Resolution (PPR):	256, 512, 1024
Accuracy:	± 0,05°
Counting frequency:	100 kHz max.
Output circuits:	Line Driver, Push-Pull
Power supply:	+5Vdc ±5%, +10Vdc ÷ +30Vdc
Consumption:	70 mA max.
Output signals:	AB, /AB
Output current (per channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, EN 61000-4-2 EN 61000-4-4

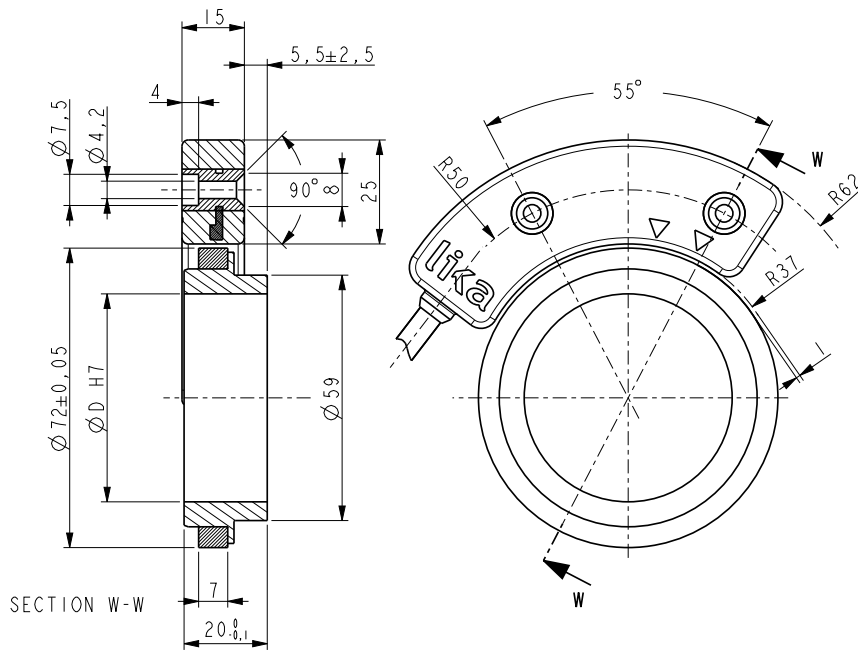
MATERIALS

Housing:	Macromelt OM 646-EN
Hub:	Anticorodal, UNI EN AW-6082
Ring:	Plastoferrite

ACCESSORIES

EM12F8:	M12 8 pin mating connector
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Specifications subject to changes without prior notice



SGSM • SGSD

Order code - Sensor

SGSM	-	X	-	X	-	XX	-	X	-	XX	/Sxxx
SGSD		(a)		(b)		(c)		(d)		(e)	(f)

<p>(a) OUTPUT CIRCUITS</p> <p>Y = Push Pull (AB, /AB)</p> <p>L = Line Driver (AB, /AB)</p>	<p>(c) RESOLUTION</p> <p>16 = 256 PPR</p> <p>32 = 512 PPR</p> <p>64 = 1024 PPR</p>	<p>(e) CONNECTIONS</p> <p>1 = cable output 1 m</p> <p>x = cable output x m</p> <p>M2 = 2 m cable + M12 8 pin inline plug (only SGSM)</p>
<p>(b) SUPPLY VOLTAGE VS OUTPUT CIRCUIT</p> <p>1 = +5V±5% (L output circuit)</p> <p>2 = +10V÷ +30V (Y output circuit)</p>	<p>(d) INDEX</p> <p>N = without Index</p>	<p>(f) CUSTOM VERSION</p>

Order code - Magnetic ring

MRI	/	XX	-	XX-X	-	XX	/Sxxx
		(a)		(b)		(c)	(d)

<p>(a) RING TYPE</p> <p>72 = size 72 with grub screw fixing</p>	<p>(b) MAGNETIC CODING</p> <p>64-3 = 64 poles</p>	<p>(c) SHAFT DIAMETER</p> <p>30 = 30 mm</p> <p>50 = 50 mm</p>
		<p>(d) CUSTOM VERSION</p>

ROTAMAG

Magnetic bearingless encoder

Series

MIK36 • MSK36



MIK36 • MSK36

- High speed rotary encoder
- Bearingless, non contact design
- IP67 or IP68 protection with sealed circuits
- Incremental and absolute version

ENVIRONMENTAL SPECIFICATIONS

Shock:	100 g, 6 ms
Vibrations:	10 g, 5-2000 Hz
Protection:	IP67
Operating temperature range:	-20°C +85°C (-4°F +185°F)
Storage temperature range:	-20°C +85°C (-4°F +185°F) (98% R.H. without condensation)
Option:	• IP68 protection with sealed circuits

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Shaft diameter:	Ø 6, 8, 10 mm
Shaft rotational speed:	30000 rpm max.
Electrical connections:	M12 8 pin inline plug or cable output 1 m (3.3 ft)
Weight:	~ 50 g (1,7 oz)
Option:	• additional cable

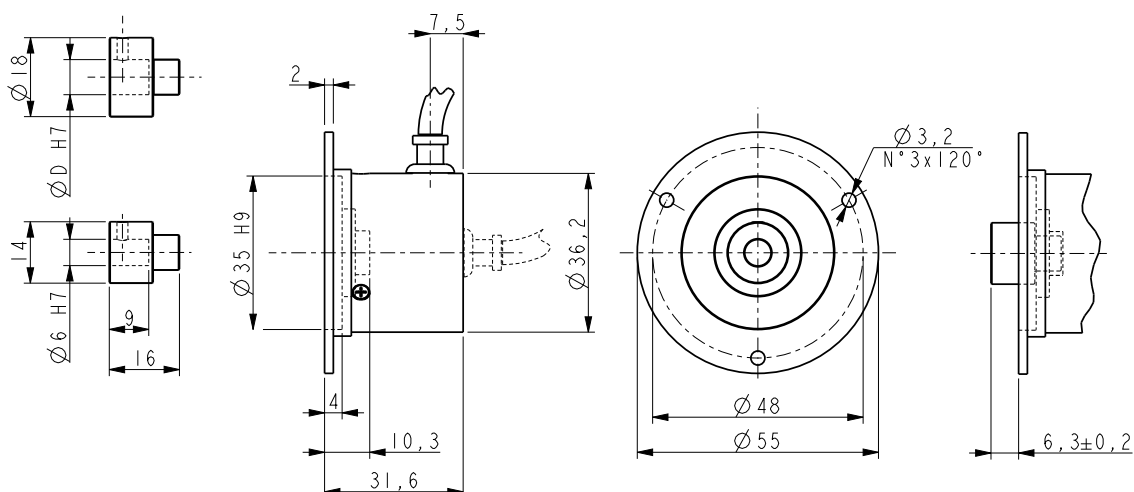
ELECTRICAL SPECIFICATIONS

Resolution:	MIK36 (PPR): 4-8-10-16-20-25-32-40-50-64-80-100 125-128-200-250-256-400-500-512-1024-2048 MSK36 (cpr): 8192
Accuracy:	± 0,9°
Counting frequency:	300 kHz max. (MIK36)
Output circuits:	MIK36: NPN, Push-Pull, Line Driver MSK36: SSI, 13 clock max. 1 MHz
Power supply:	5Vdc ±5%, +10Vdc +30Vdc
Consumption:	MIK36 50 mA max. MSK36 65 mA max.
Output current (each channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, according to: EN-61000-4-2 EN-61000-4-4

MATERIALS

Flange:	anticorodal, UNI EN AW-6082
Housing:	anticorodal, UNI EN AW-6082
Shaft:	anticorodal, UNI EN AW-6082

Specifications subject to changes without prior notice



MIK36 • MSK36

MIK36 Resolution	Rpm max.
> 128	30000
> 256	20000
> 512	10000
1024	5100
2048	2550

Order code - Incremental encoder

MIK36	-	X Ⓐ	-	XXXX Ⓑ	XXX Ⓒ	X Ⓓ	XX Ⓔ	X Ⓕ	X Ⓖ	XX Ⓗ	/Sxxx Ⓘ
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<p>Ⓐ OUTPUT CIRCUITS</p> <p>N = NPN Y = Push Pull L = Line Driver (RS422)</p>	<p>Ⓑ RESOLUTION (PPR)</p> <p>See electrical specifications</p>	<p>Ⓒ OUTPUT SIGNALS</p> <p>ZNF = ABO ZCU = ABO, /ABO</p>	<p>Ⓓ SUPPLY VOLTAGE</p> <p>1 = +5V±5% (L output circuit) 2 = +10V÷ +30V (Y or N output circuit)</p>	<p>Ⓔ SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm 10 = 10 mm</p>	<p>Ⓕ CONNECTION POSITION</p> <p>- = axial R = radial</p>	<p>Ⓖ PROTECTION</p> <p>- = IP67 J = IP68 with sealed circuits</p>	<p>Ⓗ CONNECTIONS</p> <p>L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m M0,5 = 0,5 m cable + M12 8 pin inline plug M2 = 2 m cable + M12 8 pin inline plug</p>	<p>Ⓘ CUSTOM VERSION</p>
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Order code - Absolute encoder

MSK36	XX Ⓐ	/	XX Ⓑ	-	XX Ⓒ	-	X Ⓓ	X Ⓔ	X Ⓕ	XX Ⓖ	/Sxxx Ⓗ
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<p>Ⓐ RESOLUTIONS</p> <p>13 = 8192 counts/rev.</p>	<p>Ⓑ OUTPUT CODE</p> <p>BS = Binary, SSI GS = Gray, SSI</p>	<p>Ⓒ SHAFT DIAMETER</p> <p>6 = 6 mm 8 = 8 mm 10 = 10 mm</p>	<p>Ⓓ CONNECTION POSITION</p> <p>- = axial R = radial</p>	<p>Ⓔ ZERO SETTING</p> <p>- = without (standard) E = zero setting</p>	<p>Ⓕ PROTECTION</p> <p>- = IP67 J = IP68 with sealed circuits</p>	<p>Ⓖ CONNECTIONS</p> <p>L1 = cable output 1 m (standard) L2 = cable output 2 m Lx = cable output x m M0,5 = 0,5 m cable + M12 8 pin inline plug M2 = 2 m cable + M12 8 pin inline plug</p>	<p>Ⓗ CUSTOM VERSION</p>
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ROTAPULS

Modular magnetic encoder for Heavy-Duty applications

Series

SMRI5 - MRI



- Bearingless encoder
- Non contact magnetic sensing
- Sensor/ring clearance up to 1.5 mm
- IP67 washdown protection (IP69K on request)



SMRI5 • MRI

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range:	-25°C +85°C (-13°F +185°F)
Storage temperature range:	-40°C +100°C (-40°F +212°F)
Protection:	IP67

MECHANICAL SPECIFICATIONS

Dimensions:	see drawing
Hollow shaft diameter:	see drawing (from Ø 6 to 250 mm)
Shaft rotational speed:	MRI/31, MRI/48: 25000 rpm max. (mechanical) MRI/57: 22000 rpm max. (mechanical) MRI/114, MRI/141: 15000 rpm max. (mechanical) MRI/284: 9000 rpm max. (mechanical)
Gap sensor-ring:	0,1 ÷ 1,5 mm (typical)
Electrical connections:	M12 8 pin inline plug or Lika Hi-flex cable 2,0 m (6.56 ft)
Option:	• additional cable

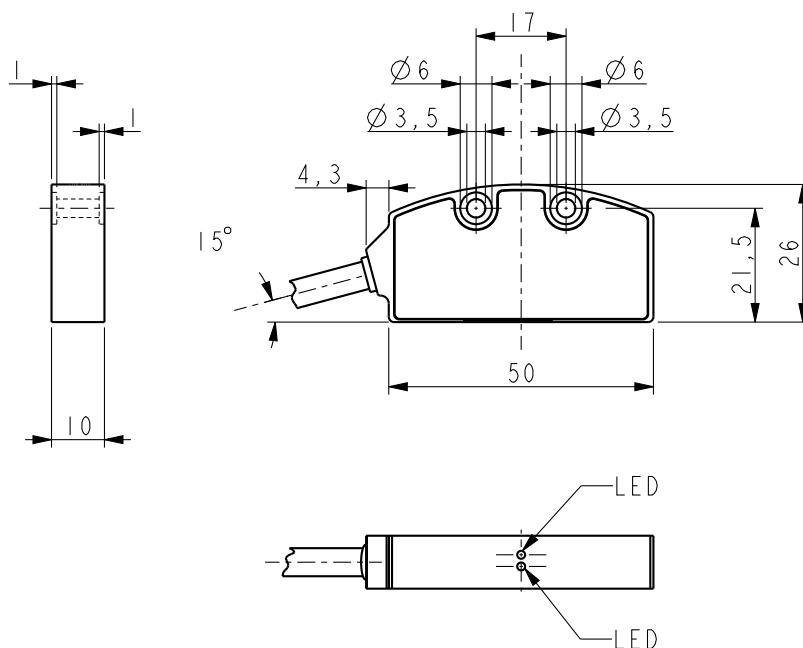
ELECTRICAL SPECIFICATIONS

Resolution (PPR):	see specifications
Accuracy:	± 0,05° (± 0,1° typical)
Output circuits:	Line Driver, Push-Pull
Power supply:	+5Vdc ±5%, +10Vdc ÷ +30Vdc
Consumption:	70 mA max.
Output signals:	AB /AB, ABO /ABO
Output current (per channel):	40 mA max.
Protection:	against inversion of polarity and short-circuit (except L circuit)
EMC:	electro-magnetic immunity, EN 61000-4-2 EN 61000-4-4

MATERIALS

Housing:	anticorodal, UNI EN AW-6082
Hub:	anticorodal, UNI EN AW-6082 or stainless steel
Ring:	ferrite or plastoferrite

Specifications subject to changes without prior notice

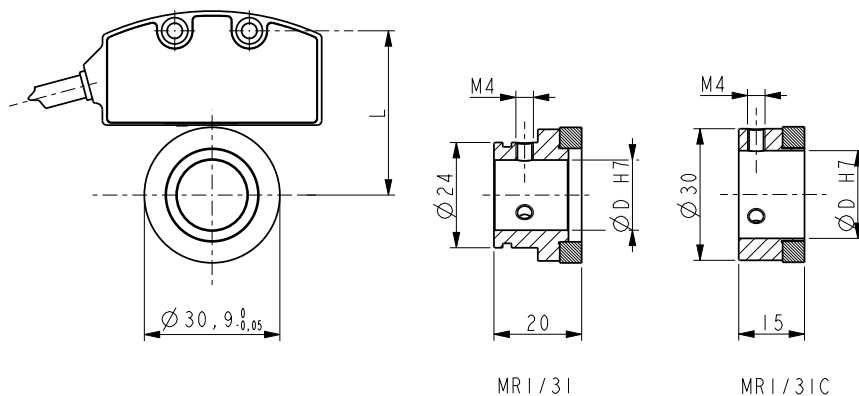


SMR15

Order code

SMR15	-	XX Ⓐ	-	X Ⓑ	-	XXX Ⓒ	-	XX Ⓓ	-	X Ⓔ	-	X Ⓕ	/Sxxx Ⓖ
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<p>Ⓐ OUTPUT CIRCUITS Y = Push Pull (AB) YC = Push Pull (AB, /AB) L = Line Driver (AB, /AB)</p> <p>Ⓑ POWER SUPPLY 1 = +5Vdc ±5% (L) 2 = +10Vdc ±30Vdc (Y and L)</p>	<p>Ⓒ RESOLUTION see Resolution vs rpm combinations (other resolutions on request)</p> <p>Ⓓ INDEX N = without R = with reference signal</p>	<p>Ⓔ CONNECTIONS Lx = cable output x m M0,5 = 0,5 m cable + M12 8 pin inline plug M2 = 2 m cable + M12 8 pin inline plug</p> <p>Ⓕ MIN. EDGE DISTANCE J = 0,5 μs (2 MHz)</p> <p>Ⓖ CUSTOM VERSION</p>
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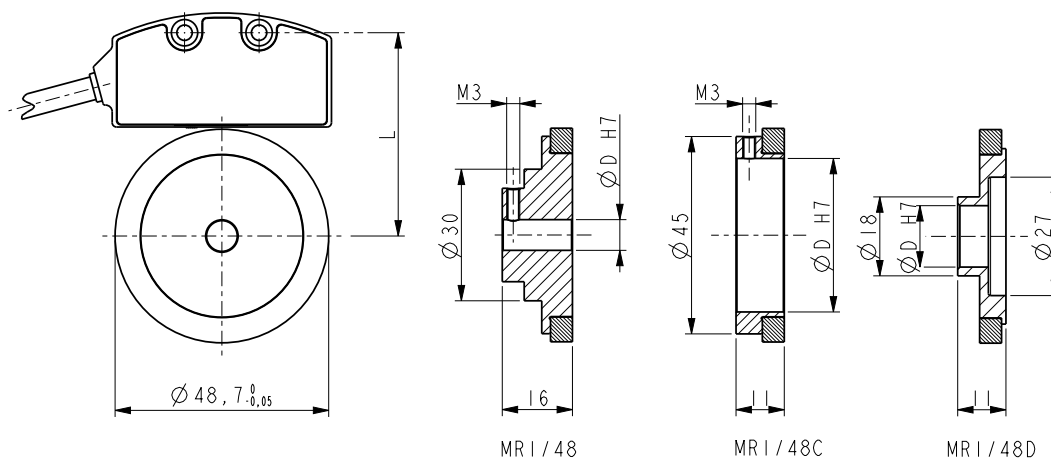


Resolution vs rpm combinations

Order code Resolution	PPR	Max. counting speed
100	500	21000 rpm
200	1000	21000 rpm
400	2000	11000 rpm
1K	5000	4000 rpm

Order code magnetic ring	D H7
MRI/31-20-5-16	Ø 16 mm
MRI/31-20-5-19	Ø 19 mm
MRI/31C-20-5-20	Ø 20 mm

All rings without reference



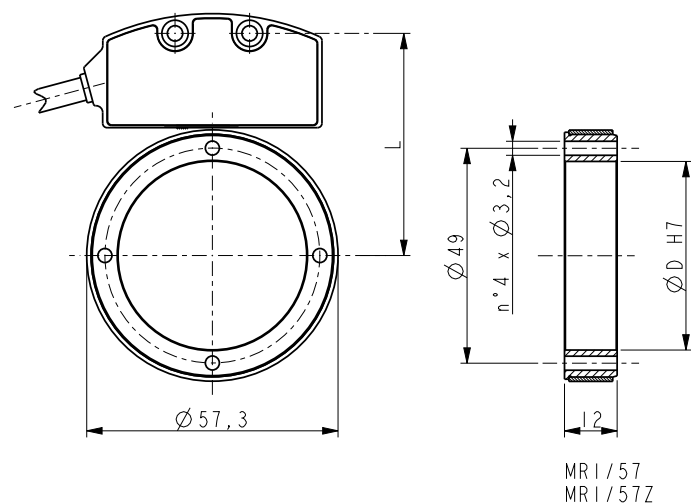
Resolution vs rpm combinations

Order code Resolution	PPR	Max. counting speed
32	256	82000 rpm (a)
64	512	41000 rpm (a)
128	1024	20000 rpm
256	2048	10000 rpm
512	4096	5000 rpm

Order code magnetic ring	D H7
MRI/48-32-5-6	Ø 6 mm
MRI/48C-32-5-35	Ø 35 mm
MRI/48D-32-5-14	Ø 14 mm

All rings without reference

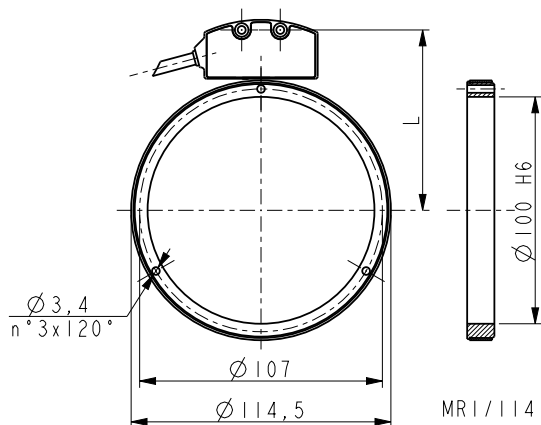
(a) limited by mechanical speed



Resolution vs rpm combinations

Order code Resolution	PPR	Max. counting speed
80	760	7000 rpm
100	950	11000 rpm
128	1216	17000 rpm
800	7600	3000 rpm

Order code magnetic ring	D H7
MRI/57-38-5-43 (without reference)	Ø 43 mm
MRI/57Z-38-5-43 (with reference)	Ø 43 mm



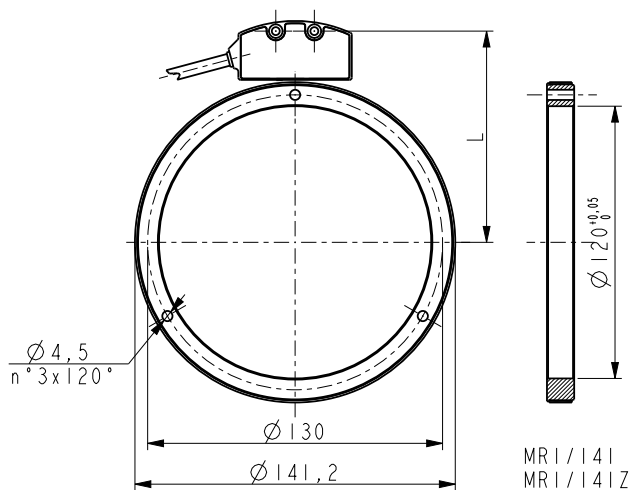
Resolution vs rpm combinations

Order code Resolution	PPR	Max. counting speed
100	1800	6000 rpm
200	3600	6000 rpm
400	7200	3000 rpm
500	9000	2500 rpm
1K	18000	1200 rpm

Order code magnetic ring D H6

MRI/114-72-5-100	$\varnothing 100$ mm
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Ring without reference

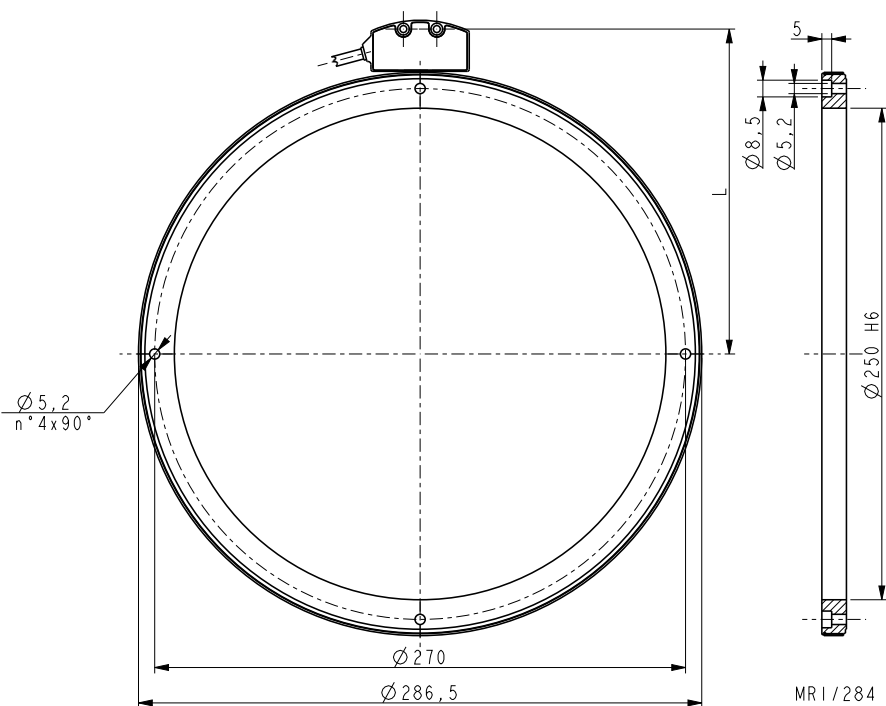


Resolution vs rpm combinations

Order code Resolution	PPR	Max. counting speed
40	900	3000 rpm
80	1800	3000 rpm
160	3600	3000 rpm
200	4500	5000 rpm
320	7200	3000 rpm
400	9000	2500 rpm

Order code magnetic ring D

MRI/141-90-5-120 (without ref.)	$\varnothing 120$ mm
MRI/141Z-90-5-120 (with reference)	$\varnothing 120$ mm



Resolution vs rpm combinations

Order code Resolution	PPR	Max. counting speed
8	360	58000 rpm (a)
32	1440	14000 rpm (a)
40	1800	1500 rpm
80	3600	1500 rpm
100	4500	2500 rpm
200	9000	2500 rpm

(a) limited by mechanical speed

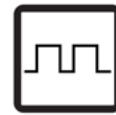
Order code magnetic ring D H6

MRI/284-180-5-250	$\varnothing 250$ mm
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Ring without reference

ROTAPULS

Incremental encoders standard connection schemes




Electrical connections


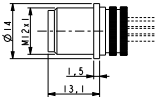
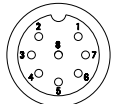

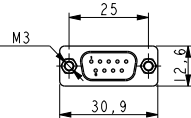
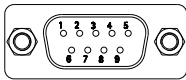

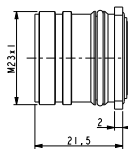
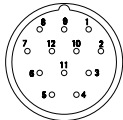

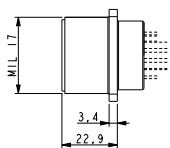
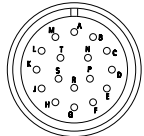
Connection Signal	I5 type cable	I8 type cable	M12 8-pin	DSub 9-pin	M23 12-pin (1)	M23 12-pin (2)	MIL 17-pin
A, cos +	Brown	Yellow	3	1	1	5	A
/A, cos -	-	Blue	4	2	2	6	N
B, sin +	Blue	Green	5	3	3	8	C
/B, sin -	-	Orange	6	4	4	1	R
0	White	White	7	5	5	3	B
/0	-	Grey	8	6	6	4	P
+Vdc	Red	Red	2	8	7	12	H
0Vdc	Black	Black	1	9	8	10	K - M
Shield	Shield	Shield	Case	Case	Case	Case	T - case

(1) All models except C100 and C101

(2) Only C100 and C101

Picture (example)	Cable type	Order code
	I5 5 x 0,22 mm ² (24/7 AWG) PVC	Lika encoder cable type I5
	I8 8 x 0,22 mm ² (24/7 AWG) PVC	Lika encoder cable type I8

All cable specifications on page 222-223

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		M12 8-pin plug Male, A coding IEC 61076-2-101 reference standard		E-M12F8
		DSub 9-pin plug EDE 9P		EDE 9S
		M23 12-pin plug EML 121		EPFL 121
		MIL 17-pin plug		n. a.



Electrical connections				
Connection	MIL 7-pin	MIL 10-pin	DIN 7-pin	DIN 12-pin
Signal				
A	A	A	1	C
/A	-	B	-	D
B	C	C	3	E
/B	-	D	-	F
0	E	E	5	G
/0	-	F	-	H
+Vdc	G	J	7	A
0Vdc	F	I	6	J
Shield	Case	Case	Case	Case

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		MIL 7-pin plug E7MLP		E7MLS
		MIL 10-pin plug E10MLP		E10MLS
		DIN 7-pin connector DIN7FP		DIN7M
		DIN 12-pin connector DIN12FP		DIN12M

ROTACOD

Absolute encoders standard connection schemes, SSI and BiSS interfaces



AS-AM, ES-EM, HS-HM (*), AST-AMT, HSCT-HMCT, AM9-AMC9, AS-AM36, MS-MM36, MH58S

Connection Signal	A8 type cable	M8 type cable	T12 type cable	M23 12-pin	M12 8-pin	M12 12-pin	MIL 10-pin	MIL 7-pin
Clock IN +	White	Yellow	Violet	2	3	3	A	A
Clock IN -	Brown	Blue	Yellow	1	4	4	B	B
Data OUT +	Green	Green	Grey	3	5	5	C	C
Data OUT -	Yellow	Orange	Pink	4	6	6	D	D
A, cos +	-	-	Green	5	-	9	-	-
A, cos -	-	-	Brown	6	-	10	-	-
B, sin +	-	-	Red	7	-	11	-	-
B, sin -	-	-	Black	10	-	12	-	-
Counting dir.	Blue	Grey	Blue	8	8	8	F	E
Zero setting	Pink	White	White	9	7	7	H	-
+Vdc	Red	Red	Brown/Green	11	2	2	J	G
0Vdc	Black	Black	White/Green	12	1	1	I	F
Shield	Shield	Shield	Shield	Case	Case	Case	Case	Case

* except for HMx58x P programmable encoders


Picture (example)	Cable type	Order code
	A8 4 x 2 x 0,25 mm ² (24 AWG), PVC	Lika SSI encoder cable A8
	M8 2 x 0,22 + 6 x 0,14 mm ² (24/26 AWG), TPU	Lika Hi Flex sensor cable M8
	T12 4 x 0,25 + 4 x 2 x 0,14 mm ² (24/26 AWG), TPU	Lika encoder cable type T12

All cable specifications on page 222-223


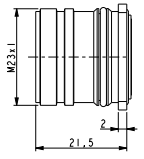
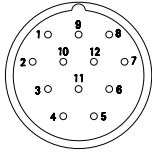

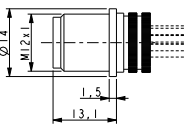
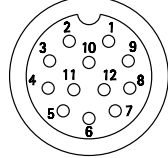
Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		M23 12-pin plug EML 121H		EPFL 121H
		M12 12-pin plug		E-M12F12
		M12 8-pin plug		E-M12F8
		MIL 10-pin plug E10MLP		E10MLS
		MIL 7-pin plug E7MLP		E7MLS

HM58 P, HM58S P, HMC58 P			
Cable / Connector	T12 type cable	M23 12-pin	M12 8-pin
Clock IN +	Violet	2	3
Clock IN -	Yellow	1	4
Data OUT +	Grey	3	5
Data OUT -	Pink	4	6
RD RS232	Green	5	9
0Vdc RS232	Brown	6	10
TD RS232	Red	7	11
Complementary	Blue	8	8
Zero setting	White	9	7
+Vdc	Brown/Green	11	2
0Vdc	White/Green	12	1
Shield	Shield	Case	Case

PC connection	
Encoder side	PC side DSub 9 pin female
TD RS-232	2
RD RS-232	3
0Vdc RS-232	5

Picture (example)	Cable type	Order code
	T12 4 x 0,25 + 4 x 2 x 0,14 mm ² (24/26 AWG) TPU	Lika encoder cable type T12

All cable specifications on page 222-223


Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		M23 12-pin plug EML 121H		EPFL 121H
		M12 12-pin plug		E-M12F12

ROTACOD


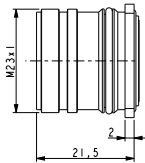
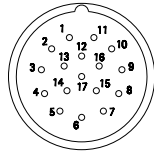

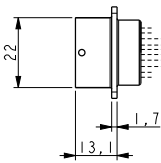
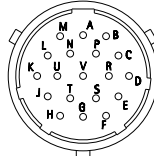

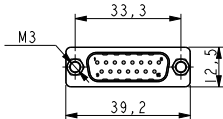
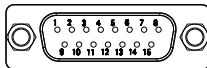
Single-turn encoders parallel interfaces

AS58, ES58, AST6 series

Cable / Connector	A16 type cable	A19 type cable	MIL 19-pin	DSub 15-pin	M23 17-pin
Bit 1	Brown	Brown	A	1	1
Bit 2	Red	Red	B	2	2
Bit 3	Pink	Pink	C	3	3
Bit 4	Yellow	Yellow	D	4	4
Bit 5	Green	Green	E	5	5
Bit 6	Blue	Blue	F	6	6
Bit 7	Violet	Violet	G	7	7
Bit 8	Grey	Grey	H	8	8
Bit 9	White	White	J	9	9
Bit 10	Black	Black	K	10	10
Bit 11	White/Green	White/Green	L	11	11
Bit 12	Brown/Green	Brown/Green	M	12	12
Bit 13	Red/Blue optional only one function available	Red/Blue	N	-	13
Zero setting		White/Pink	P	-	14
Latch		-	R	-	-
Tri-state		-	S	-	-
Counting direction	Grey/Pink	Grey/Pink	U	13	15
+Vdc	White/Yellow	White/Yellow	V	14	16
0Vdc	Yellow/Brown	Yellow/Brown	T	15	17
Shield	Shield	Shield	Case	Case	Case


Picture (example)	Cable type	Order code
	A16 16 x 0,14 mm ² PVC	Lika encoder cable type A16
	A19 19 x 0,14 mm ² PVC	Lika encoder cable type A19

All cable specifications on page 222-223


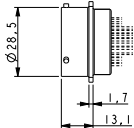
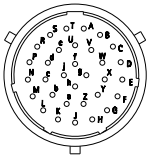

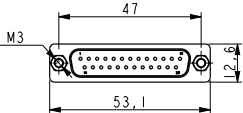
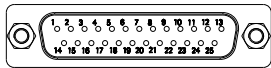
Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		M23 17-pin plug		EPFL 171H
		MIL 19-pin plug E19MLP		E19MLS
		DSub 15-pin plug EDA 15P		EDA 15S

AM36, AM58, EM58 series

Cable / Connector				Cable / Connector			
Signal	A32 type cable	MIL 32-pin	DSub 25-pin*	Signal	A32 type cable	MIL 32-pin	DSub 25-pin*
Bit 1	Brown	A	1	Bit 18	Yellow/Brown	U	18
Bit 2	Red	B	2	Bit 19	White/Blue	V	19
Bit 3	Pink	C	3	Bit 20	Brown/Blue	W	20
Bit 4	Yellow	D	4	Bit 21	White/Pink	X	-
Bit 5	Green	E	5	Bit 22	White/Grey	Y	-
Bit 6	Blue	F	6	Bit 23	Pink/Brown	Z	-
Bit 7	Violet	G	7	Bit 24	Grey/Brown	a	-
Bit 8	Grey	H	8	Bit 25	Brown/Black	b	-
Bit 9	White	J	9	Parity bit	White/Black	c	-
Bit 10	Black	K	10	Zero setting	Grey/Green	d	-
Bit 11	Brown/Red	L	11	Latch	Yellow/Grey	e	21
Bit 12	White/Red	M	12	Tri-state	Pink/Green	f	22
Bit 13	Blue/Red	N	13	Counting direction	Yellow/Pink	g	23
Bit 14	Pink/Grey	P	14	+Vdc	Green/Blue	h	24
Bit 15	White/Yellow	R	15	0Vdc	Yellow/Blue	i	25
Bit 16	Brown/Green	S	16	Shield	Shield	Case	Case
Bit 17	White/Green	T	17				

Picture (example)	Cable type	Order code
	A32 PVC	Lika encoder cable type A32

All cable specifications on page 222-223

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		MIL 32-pin plug E32MLP		E32MLS
		DSub 25-pin plug EDB 25P	*AMx-series only 	EDB 25S

ROTACOD

Programmable encoders with parallel interface


HM58 P, HM58S P, HMC58 P

HM58 P, HM58S P, HMC58 P			HM58 P, HM58S P, HMC58 P		
Cable / Connector	A40 type cable	MIL 41-pin	Cable / Connector	A40 type cable	MIL 41-pin
Signal			Signal		
Bit 1 LSB	Brown	A	Bit 22	White/Grey	Y
Bit 2	Red	B	Bit 23	Pink/Brown	Z
Bit 3	Pink	C	Bit 24	Grey/Brown	a
Bit 4	Yellow	D	Bit 25	Brown/Black	b
Bit 5	Green	E	Parity bit / Bit 28 MSB	White/Black	c
Bit 6	Blue	F	Preset	Grey/Green	d
Bit 7	Violet	G	Latch	Yellow/Grey	e
Bit 8	Grey	H	TD RS-232	Pink/Green	f
Bit 9	White	J	RD RS-232	Yellow/Pink	g
Bit 10	Black	K	0Vdc RS-232	Green/Blue	h
Bit 11	Brown/Red	L	Tri-state	Yellow/Blue	i
Bit 12	White/Red	M	-	Green/Red	j
Bit 13	Blue/Red	N	-	Yellow/Red	k
Bit 14	Pink/Grey	P	-	Green/Black	m
Bit 15	White/Yellow	R	Bit 26	Yellow/Black	n
Bit 16	Brown/Green	S	Bit 27	Pink/Blue	p
Bit 17	White/Green	T	-	-	q
Bit 18	Yellow/Brown	U	Counting direction	Grey/Red	r
Bit 19	White/Blue	V	+Vdc	Pink/Red	s
Bit 20	Brown/Blue	W	0Vdc	Grey/Blue	t
Bit 21	White/Pink	X	Shield	Shield	Case


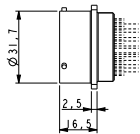
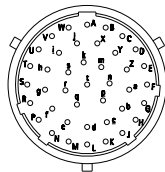
PC connection

Encoder side	PC side DSub 9 pin female
TD RS-232	2
RD RS-232	3
0Vdc RS-232	5

MIL 41-pin to USB connection cable available on request.
Order code: KIT HM58 PY

Picture (example)	Cable type	Order code
	A40 PVC	Lika encoder cable type A40

All cable specifications on page 222-223

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		MIL 41-pin plug		E41MLS



AS58 A, AM58 A – A11, A12, A13 current outputs

Cable / Connector	A8 type cable	M23 12-pin	M12 8-pin
Signal			
+Iout	Brown	5	5
Analogue 0Vdc	White	6	3
Counting direction	Green	8	6
Zero setting	Pink	9	4
+Vdc	Red	11	2
0Vdc	Black	12	1
Fault	Blue	3	8
Shield	Shield	Case	Case

AS58 A, AM58 A – AV1, AV2, AV3, AV4 voltage outputs

Cable / Connector	A8 type cable	M23 12-pin	M12 8-pin
Signal			
+Vout	Brown	7	5
Analogue 0Vdc	White	6	3
Counting direction	Green	8	6
Zero setting	Pink	9	4
+Vdc	Red	11	2
0Vdc	Black	12	1
Shield	Shield	Case	Case

Picture
(example)

Cable type

Order code



A8
4 x 2 x 0,25 mm² (24 AWG)
PVC

Lika SSI encoder cable A8

All cable specifications on page 222-223

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		M23 12-pin plug EML 121H		EPFL 121H
		M12 8-pin plug		E-M12F8



EM58 PA, EM58 TA series					
Cable / Connector	T12 type cable	M23 12-pin	M12 12-pin	A8 type cable	M12 5-pin
Signal					
TD RS-232	Brown	1	11	-	-
RD RS-232	Green	2	9	-	-
0Vdc RS-232	Red	4	10	-	-
Fault	Yellow	3	4	Blue	-
+Vout	Pink	7	6	Brown	1
+Iout	Grey	5	5		
Analogue 0VDC	Violet	6	3	White	-
Complementary	Blue	8	8	-	-
Zero setting	White	9	7	-	-
+Vdc	Brown/Green	11	2	Red	2
0Vdc	White/Green	12	1	Black	3
Shield	Shield	Case	Case	Shield	Case
SET 1	-	-	-	Pink	4
SET 2	-	-	-	Green	5

PC connection

Encoder side	PC side Sub-D 9 pin female
TD RS-232	2
RD RS-232	3
0Vdc RS-232	5

M23 to USB and M12 to USB connection cables available on request.

Order codes:
KIT EM58 PA M23
KIT EM58 PA M12

Picture (example)	Cable type	Order code
	A8 4 x 2 x 0,25 mm ² (24 AWG), PVC	Lika SSI encoder cable A8
	T12 4 x 0,25 + 4 x 2 x 0,14 mm ² (24/26 AWG), TPU	Lika encoder cable type T12

All cable specifications on page 222-223

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		M23 12-pin plug EML 121H		EPFL 121H
		M12 12-pin plug		E-M12F12
		M12 5-pin plug		E-M12FC

EM58 MB series		
Cable / Connector	CB type cable	M12 5-pin
Signal		
Shield	-	1
+Vdc	Red	2
0Vdc	Black	3
Modbus A (RS-485)	White	4
Modbus B (RS-485)	Blue	5
Shield	Shield	Case



M12 to USB connection cable available on request.
Order code:
KIT EM58 MB

AS58, AM58 series CB		
Cable / Connector	CB type cable	M12 5-pin
Signal		
CAN Shield	Shield	Case 1
+Vdc	Red	2
0Vdc	Black	3
CAN High	White	4
CAN Low	Blue	5



Picture	Cable type	Order code
	CB 2 x 2 x 0,24 mm ² + 1 x 0,22 mm ² PUR/TMPU	2 x 4 twisted wires cable


All cable specifications on page 222-223

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		M12 5-pin plug		E-M12FC


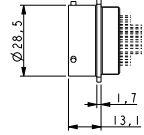
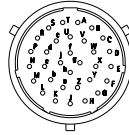

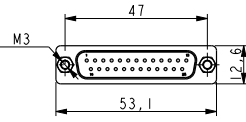
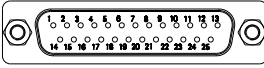

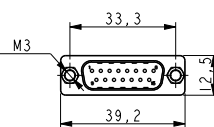
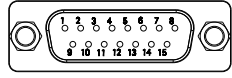
ROTACOD

ASR58 and AMR58 with integrated cam programmer electrical connections

ASR58 & AMR58 series									
Function	DSub 15 pin	DSub 25 pin	Cable A32 pin	MIL 32-pin	Function	DSub 15 pin	DSub 25 pin	Cable A32 pin	MIL 32-pin
OUT 1		1	Brown	A	Select Program 2 ¹		19	White/Blue	V
OUT 2		2	Red	B	Select Program 2 ²		20	Brown/Blue	W
OUT 3		3	Pink	C	Select Program 2 ³		21	White/Pink	X
OUT 4		4	Yellow	D	Zero setting		22	Grey/Green	d
OUT 5		5	Green	E	Counting direction		23	Yellow/Pink	g
OUT 6		6	Blue	F	+10Vdc +30Vdc	14	24	Green/Blue + Pink/Green	h
OUT 7		7	Violet	G	0Vdc	15	25	Yellow/Blue + Yellow/Grey	j
OUT 8		8	Grey	H	Data OUT +			Blue/Red	N
OUT 9		9			Data OUT -			Pink/Grey	P
OUT 10		10			Clock IN +			White/Yellow	R
OUT 11		11			Clock IN -			Brown/Green	S
OUT 12		12			Fault	7		White/Grey	Y
OUT 13		13			RD RS-232	12		Pink/Brown	Z
OUT 14		14			TD RS-232	13		Grey/Brown	a
OUT 15		15			0Vdc	6, 11		Brown/Black	b
OUT 16		16			0Vdc RS-232	8		White/Black	c
Load Program		17	White/Green	T	Shield			Shield	Case
Select Program 2 ⁰		18	Yellow/Brown	U	Analogue output	4			
					Speed	5			

Picture	Cable type	Order code
	A32	Lika encoder cable type A32

All cable specifications on page 222-223

Picture	Dimensions	Description Connector order code	Frontal view	Mating connector order code
		MIL 32-pin plug E32MLP		E32MLS
		DSub 25-pin plug EDB 25P		EDB 25S
		DSub 15-pin plug EDA 15P		EDA 15S

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Cable specifications

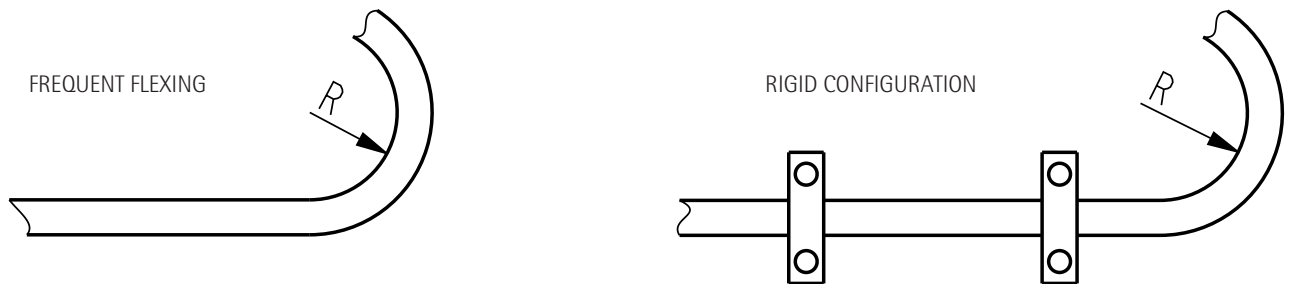
Order code Cable type	Description	Notes
I5 Incremental encoders ABO	Cross section: 5 x 0,22mm ² (24/7 AWG) Jacket: PVC, flame retardant Shield: AL/PET foil + copper conductor External-Ø: 4,5 ±0,1 mm Min. bending radius: fix min. 23 mm / flexible min. 45 mm Operating temperature: fix -20 +80°C / flexible -5 +80°C Conductor resistance: <90 Ω/km	RoHS Ref. standard UL1581
I8 Incremental encoders ABO /ABO	Cross section: 8 x 0,22mm ² (24/7 AWG) Jacket: PVC, flame retardant Shield: AL/PET foil + copper conductor External-Ø: 5,1 ±0,1 mm Min. bending radius: fix min. 25 mm / flexible min. 50 mm Operating temperature: fix -20 +80°C / flexible -5 +80°C Conductor resistance: <90 Ω/km	RoHS Ref. standard UL1581
A8 Absolute encoders SSI, Analogue output	Cross section: 4 x 2 x 0,25mm ² (24 AWG) Jacket: PVC, flame retardant Shield: tinned copper braid, coverage >75% External-Ø: 7,0 ±0,15 mm Min. bending radius: fix min. 40 mm / flexible min. 75 mm Operating temperature: fix -20 +80°C / flexible -5 +80°C Conductor resistance: <80 Ω/km	RoHS Ref. standard UL1581
T12 Absolute encoders BiSS/SSI + AB /AB output	Cross section: 4x0,25 + 4x2x0,14mm ² (24/26 AWG) Jacket: TPU, extraflexible Shield: tinned copper braid, coverage >85% External-Ø: 6,1 ±0,1 mm Min. bending radius: fix min. 25 mm / dynamic min. 45 mm Operating temperature: fix -40 +90°C / dynamic -50 +90°C Conductor resistance: <90 Ω/km - <148 Ω/km	RoHS Ref. standard UL1581 Halogen free Oil, hydrolisys, abrasion resistant Cable chain capable 10 m/s max, 6 m/s2 >1000000 cycles
M8 Absolute encoders SSI	Cross section: 2x0,22 + 6x0,14mm ² (24/26 AWG) Jacket: TPU, extraflexible Shield: tinned copper braid, coverage >85% External-Ø: 5,5 ±0,1 mm Min. bending radius: min 25 mm / dynamic min. 45 mm Operating temperature: fix -40 +90°C / dynamic -50 +90°C Conductor resistance: <90 Ω/km - <148 Ω/km	RoHS Ref. standard UL1581 Halogen free Oil, hydrolisys, abrasion resistant Cable chain capable 10 m/s max, 6 m/s2 >1000000 cycles
CB CAN, Modbus encoders	Cross section: 2x2x0,24 + 1x0,22mm ² Jacket: PUR/TMPU Shield: tinned copper braid, coverage >85% External-Ø: 6,6 ±0,5 mm Min. bending radius: fix 50 mm / dynamic 70 mm Operating temperature: fix -50 +80°C Characteristic impedance at 1 MHz: 120 Ω ±10%	RoHS Ref. standard UL758, UL1581 CSA/UL approval (AWM style 20417 60°C 30V)
A16 Absolute single turn encoder cable (bit parallel)	Cross section: 16 x 0,14mm ² Jacket: PVC, flame retardant Shield: tinned copper braid, coverage >85% External-Ø: 7,2 ±0,3 mm Bending radius: fix min. 45 mm / flexible min. 75 mm Conductor resistance: <148 Ω/km Operating temperature: fix min. -30 +70°C / -5 +70°C	RoHS

ROTAPULS • ROTACOD

Cable specifications

Order code Cable type	Description	Notes
A19 Absolute single turn encoder cable (bit parallel)	Cross section: 19 x 0,14mm ² Jacket: PVC, flame retardant Shield: tinned copper braid, coverage >85% External-Ø: 7,2 ±0,3 mm Bending radius: fix min. 45 mm / flexible min. 75 mm Conductor resistance: <148 Ω/km Operating temperature: fix -20 +80°C / -5 +80°C	RoHS
A32 Absolute multi turn encoder cable (bit parallel)	Cross section: 32 x 0,14mm ² (26 AWG) Jacket: PVC, flame retardant Shield: tinned copper braid External-Ø: 9,1 ±0,4 mm Bending radius: fix min. 45 mm / flexible min. 90 mm Conductor resistance: <150 Ω/km Operating temperature: fix min. -30 +70°C / -5 +70°C	RoHS
A40 HM58 P Programmable encoder cable (bit parallel)	Cross section: 40 x 0,14mm ² (26 AWG) Jacket: PVC, flame retardant Shield: tinned copper braid, coverage >85% External-Ø: 10,2 ±0,1 mm Bending radius: fix min. 50 mm / flexible min. 100 mm Conductor resistance: <250 Ω/km Operating temperature: fix -40 +80°C / -5 +80°C	RoHS

Cables having bending radius indicated with "flexible" can be used in low speed moving installations, while cables indicated with bending radius "dynamic" can be used in high speed and acceleration installations.



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Flexible couplings



			Allowable misalignment	Vibration absorption	Zero backlash	High torsional stiffness	Stainless steel	Electrical insulation
PAN		Flexible helix coupling. Aluminium body with grub screw fixing. Allows high misalignments combined with good stiffness.	●			●		
PGF		Double-loop coupling. Thermoplastic loops and metal hubs with grub screws. Allows very high radial and axial misalignments. Silent running and good vibration absorption.	○	●				○
MST - MSTS		Aluminium (MST) or stainless steel (MSTS) slit coupling. Grub screw or collar fixing. Keyway holes available. Medium flexibility, high torsional stiffness.	●		○	●	✓	
MSX		Duraluminium slit coupling with grub screws. High transmission accuracy in both directions. Zero backlash, excellent torsional stiffness. For encoder/servomotor applications.			○	○		
MOL - MOS		Oldham coupling, standard (MOL) and compact (MOS) version. Grub screw and collar fixing, keyway holes. Easy assembly of hubs with different diameters. Ideal for high misalignments at medium speed.	○	●				○
MSF		Soft flexible coupling with grub screws. Easy assembly of hubs with different diameters. For encoders and general purpose motors.	●	●				○
MFB - MFBS		Bellow couplings with grub screw or collar fixing. Stainless steel, corrosion resistant version (MFBS). Good response time and constant velocity.	●		○	●	✓	
MDW-MDS-XBW		Precision disk couplings for encoders and servomotors. Adjustable nr. of disk and length by 1 mm. High rotational speed and excellent response. Clean-room service on request.	●		○	○	✓	

○ = excellent

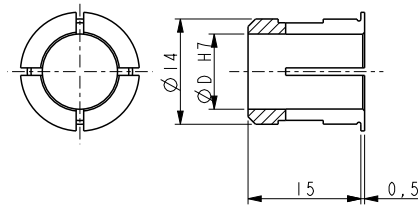
● = good

✓ = available

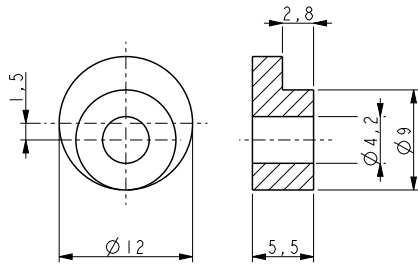
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Accessories

BR1 reducing sleeve	
BR1-12	∅ 12 mm h7
BR1-11	∅ 11 mm h7
BR1-10	∅ 10 mm h7
BR1-9.52	∅ 9.52 mm h7
BR1-8	∅ 8 mm h7
BR1-6	∅ 6 mm h7



BR1 reducing sleeve

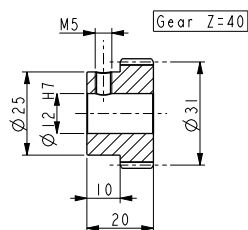
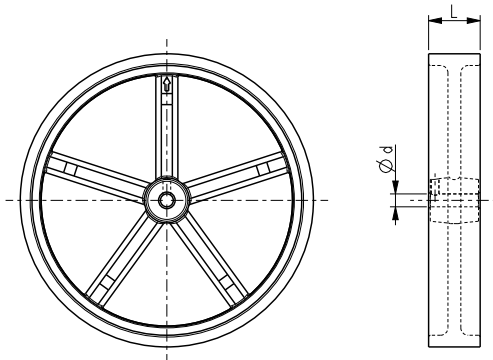


LKM-386 Fixing clamps

For all encoders with servo flange.
Kit LKM-386 is supplied as a set of 3 clamps, screws and nuts.

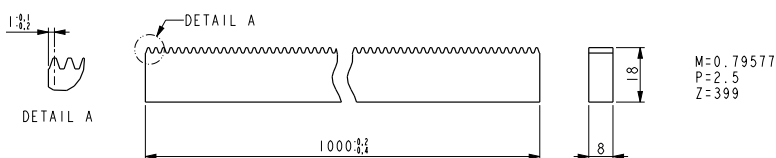
Mod.	Circ.	Surface	∅ d	L
RM200G	200 mm	rubber (smooth)	6 mm	12 mm
RM200Z	200 mm	metal (notched)	6 mm	12 mm
RM200GZ	200 mm	rubber (notched)	6 mm	12 mm
RM500G	500 mm	rubber (smooth)	8 mm	24 mm
RM500Z	500 mm	metal (notched)	8 mm	24 mm
RM500GZ	500 mm	rubber (notched)	8 mm	24 mm
RM500G-10	500 mm	rubber (smooth)	10 mm	24 mm
RM500GZ-10	500 mm	rubber (notched)	10 mm	24 mm

RM200, RM500 metric wheels



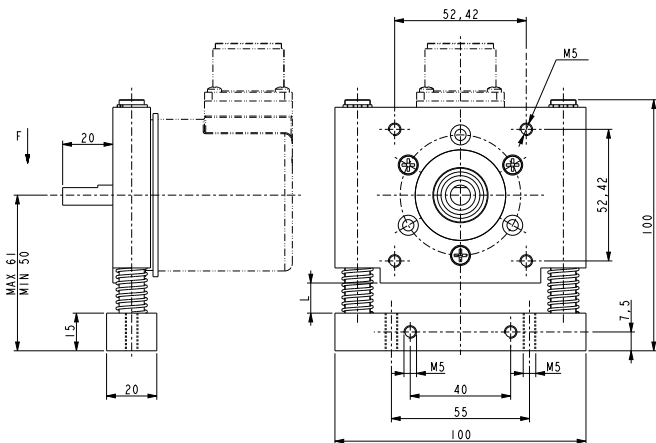
PF4260 (pinion) & LKM-1224 (rack)

For linear measurements.
1 turn of pinion equals 100 mm.
Suitable models: ICS, see PF0408.



ROTAPULS • ROTACOD

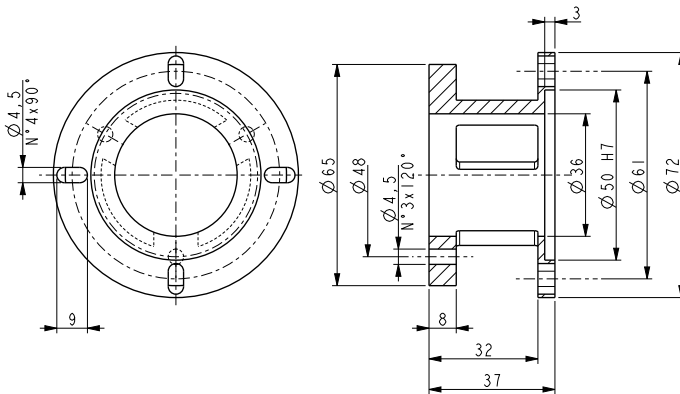
Accessories



PF0408 spring loaded fixing support

Can absorb misalignments when encoders are used with rack/pinions or metric wheels.

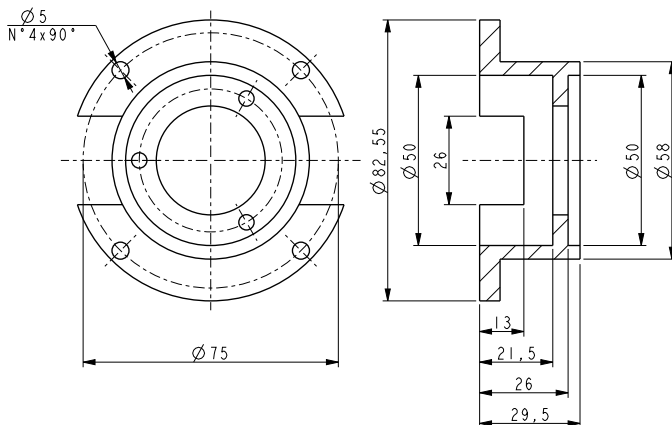
Suitable models: I58S, ES58S, EM58S, AS58S, AM58S.



PF4256 mounting bell

Suitable for all encoders having clamp flange (I58S, ES/EM58S, AS/AM58S).

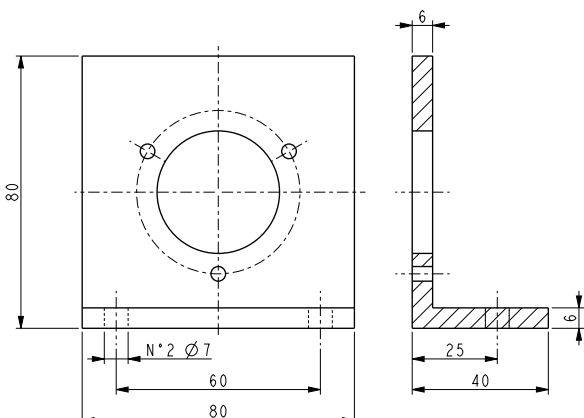
Fixing screws are supplied.



PF4264 mounting bell

Suitable for all encoders having servo flange (I58, ES/EM58, AS/AM58).

Fixing screws are supplied.



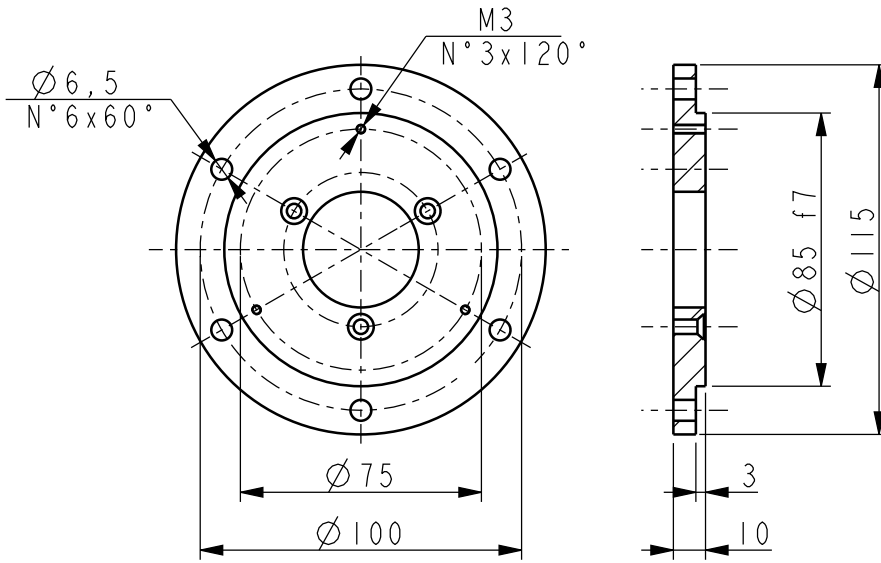
PF4257 mounting bracket

Suitable for all encoders having clamp flange (I58S, ES/EM58S, AS/AM58S).

Fixing screws are supplied.

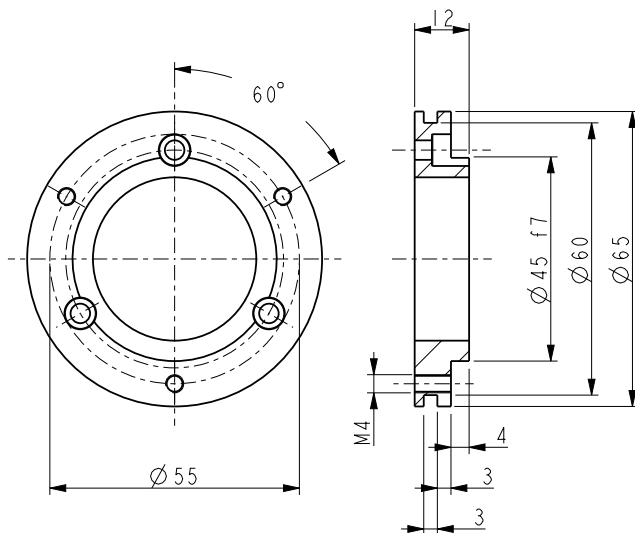
ROTAPULS • ROTACOD

Accessories



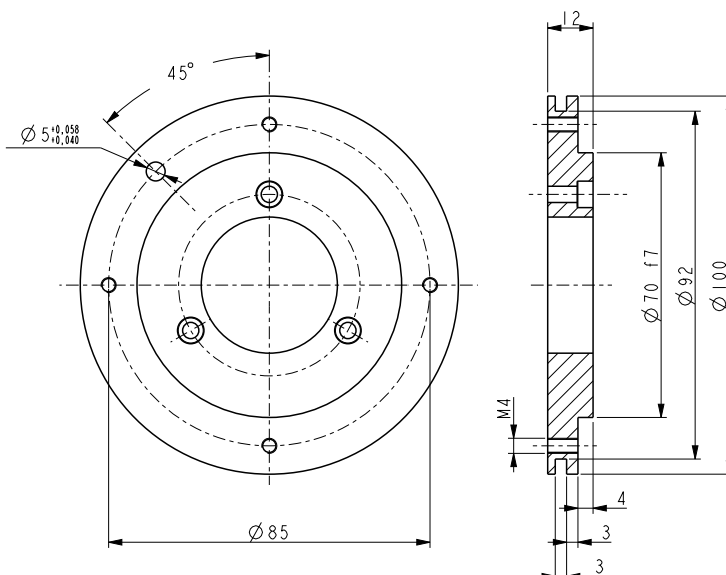
PF4258 adapter flange

Euroflange B10 adapter for:
I58S, I65, ES/EM58S, AS/AM58S encoders



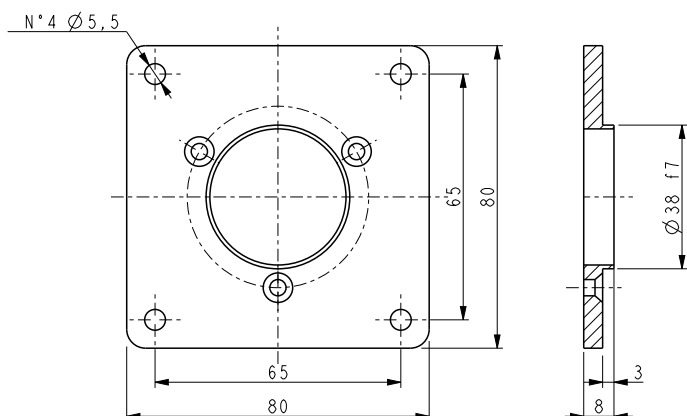
PF4263 adapter flange

Adapter flange to replace AS6 and AM6
encoders with AS58S and AM58S series.



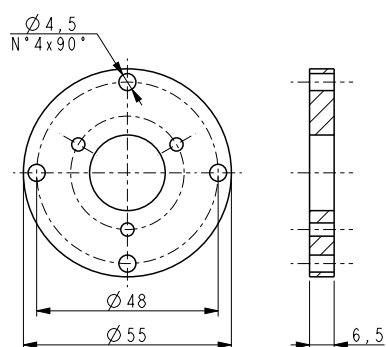
PF4262 adapter flange

Adapter flange to replace AS1 and AM1
encoders with AS58S and AM58S series.



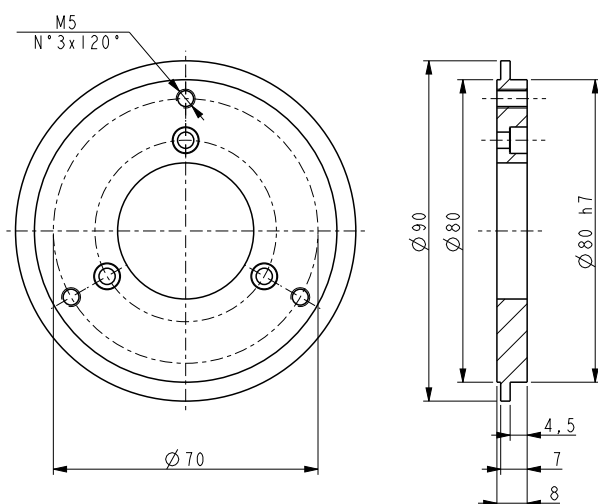
PF4259 square flange

Adapter for:
I58S, I65, ES/EM58S, AS/AM58S encoders.
Fixing screws are supplied.



PF4266 adapter flange

Adapter flange for:
I41 encoder for fixing on $\varnothing 48$ or $\square 34$ mm
Fixing screws are supplied.



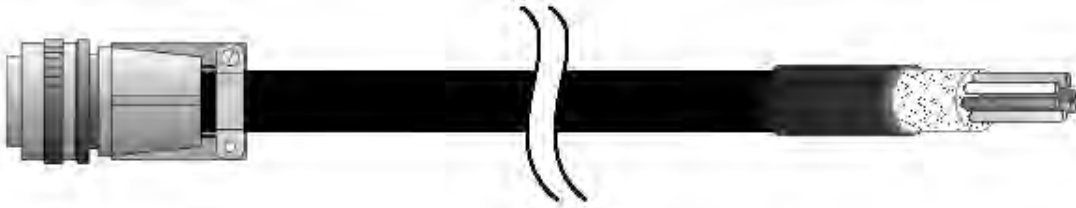
PF4274 adapter flange

Adapter flange for:
I58S, ES/EM58S, AS/AM58S encoders to
 $\varnothing 90$ mounting.
Fixing screws are supplied.

ROTAPULS • ROTACOD

Accessories

CONNECTOR 1

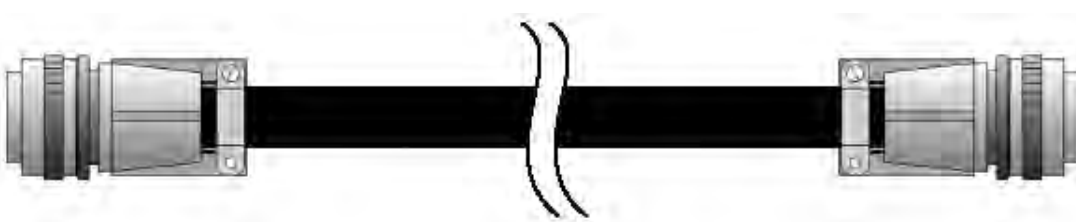


Example of cordset, EC-M7F-LK-I5-3:

MIL connector 7 pin, standard connection, 5 wires cable, 3 m length

EC

CONNECTOR 1



CONNECTOR 2

Example of extension cable, EXC-M7F-LK-I5-3-M7M-LK:

MIL connector 7 pin, standard connection, 5 wires cable, 3 meters length, 7 pin MIL plug, standard connection

EXC

Order code

Additional code for EXC

EC	-	XXXXX	-	XXX	-	XXX	-	X	X	-	X
EXC		(a)		(b)		(c)		(d)			

Ⓐ CONNECTOR 1

M7F = MIL connector 7 pin
M7FP = MIL connector 7 pin + PG
M10F = MIL connector 10 pin
M10FP = MIL connector 10 pin + PG
M19F = MIL connector 19 pin
M32F = MIL connector 32 pin
M41F = MIL connector 41 pin
M7M = MIL 7 pin plug
M10M = MIL 10 pin plug
M19M = MIL 19 pin plug
M32M = MIL 32 pin plug
M41M = MIL 41 pin plug
T7M = DIN 7 pin plug
T12M = DIN 12 pin plug
T8F = DIN 8 pin plug
C12F = M23 12 pin connector cw
CR12F = M23 12 pin connector ccw
C12M = M23 12 pin plug cw
CR17F = M23 17 pin connector ccw
D9M = DSub 9 pin plug
D15MV = DSub 15 pin plug, hi-density
D15M = DSub 15 pin plug
D25M = DSub 25 pin plug
D9F = DSub 9 pin connector
D15FV = DSub 15 pin connector, hi-density
D15F = DSub 15 pin plug
D25F = DSub 25 pin plug

Ⓑ ELECTRICAL CONNECTION 1

LK = Standard Lika
Sxx = Specific connections

Ⓒ CABLE SPECIFICATIONS

I5 = 5 wire cable (AB0)
I8 = 8 wire cable (AB0 /AB0)
A8 = 2 x 4 twisted wires cable (AS58, AM58, SSI series)
A19 = 19 wires cable (AS58 Bit parallel series)
A32 = 32 wires cable (AM58 Bit parallel series)
A40 = 40 wires cable (HM58 P Bit parallel series)
M8 = 8 wires hi-flex cable
T12 = 12 wires hi-flex twisted cable

Ⓓ CABLE LENGTH

1 = 1 m
3 = 3 m
5 = 5 m
10 = 10 m
15 = 15 m
... = ...
20 = 20 m

CONNECTOR 2

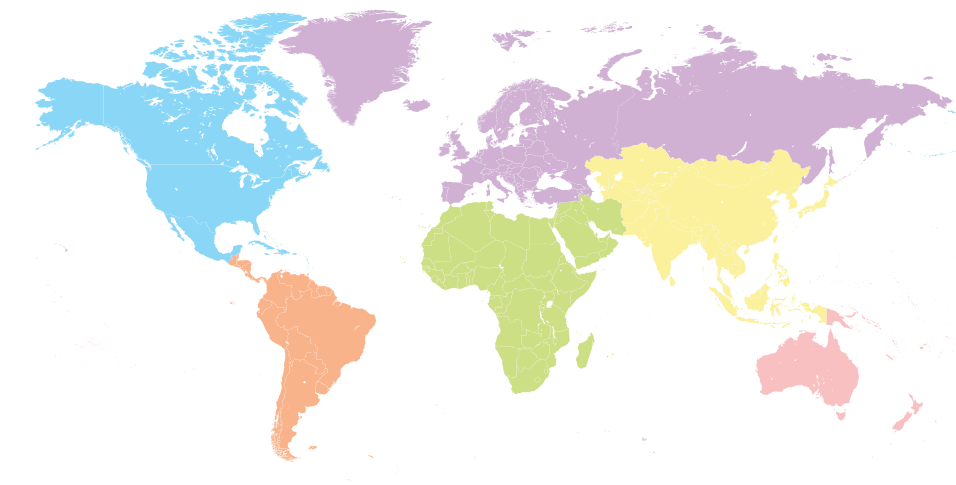
see connector 1

ELECTRICAL CONNECTIONS 2

see electrical connections 1

Note - connector: female connection
plug: male connection

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