MAIN CATALOGUE

Safety Product Handbook

ABB Jokab Safety

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Introduction

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Introduction
Company overview

ABB Jokab Safety has been helping machine builders to create production-friendly and safe work environments for operators since 1988.

We develop products and solutions for machine safety
We make it simple to build safety systems. Developing products and solutions for machine safety has been our business idea since the company Jokab Safety, now a part of ABB, was founded in Sweden in 1988.

Many industries around the world have discovered how much easier it has become to build protection and safety systems with our components and guidance. Our extensive program of products, safety solutions and our long experience in machine safety makes us a safe partner.

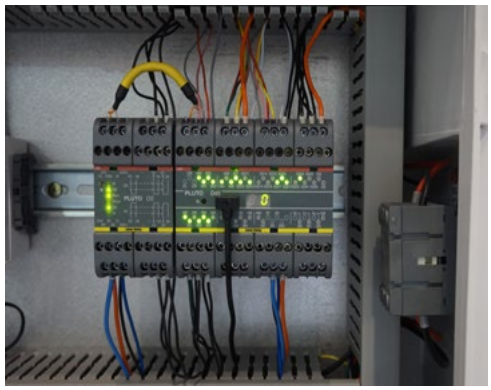
Together we create a safe world!

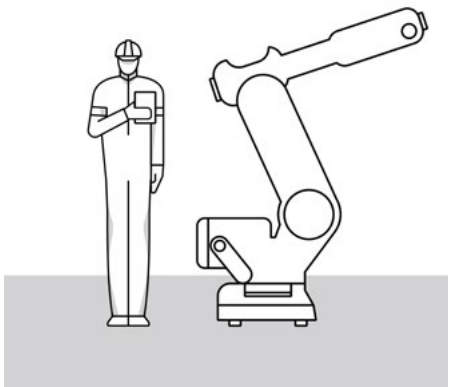
Products and systems
We deliver machine safety solutions for single machines or entire production lines. Our long experience of helping customers making solutions for demanding environments has made us experts in combining production demands with safety demands for production-friendly solutions.

We market a wide range of safety products, which makes it easy to build safety systems. We develop these intelligent products continuously, in cooperation with our customers.

Our experience of safety requirements and standards
Directives and standards are very important to machine builders and safety component manufacturers. We represent Sweden in several international committees that develop standards, for e.g. industrial robots, safety distances and control system safety features. We work daily with the practical application of safety requirements in combination with production requirements. We are happy to share our knowledge of standards with our customers. You can use our experience for training and advice.

Markets and industries
Solutions from ABB Jokab Safety can be found in all types of industries across the globe. But we pride ourselves in having products and solutions that are especially well suited for e.g.:
- Robotics
- Food and beverage
- General machinery (OEM)





Our range of safety products

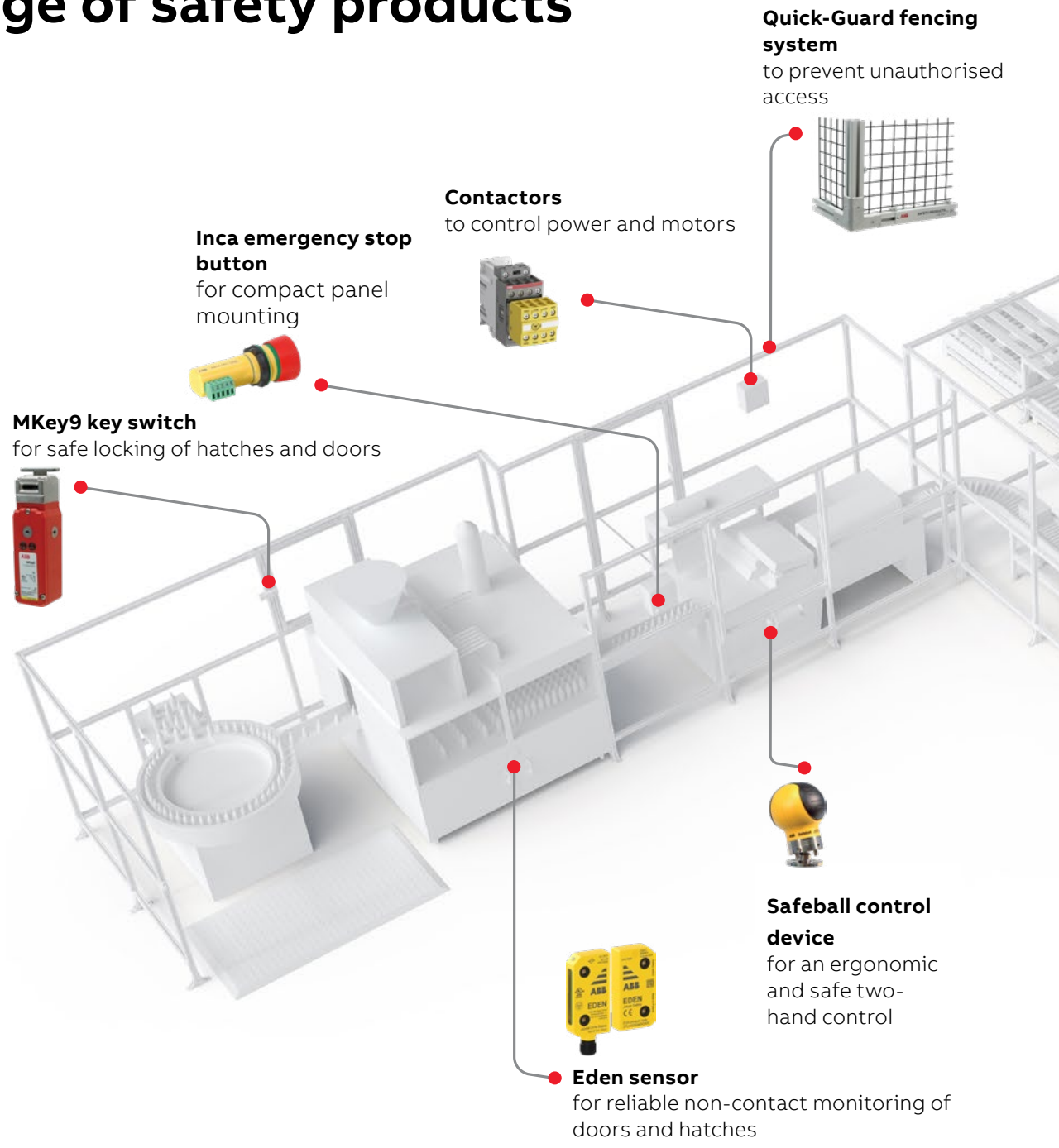


ABB is the only supplier that can deliver complete safety solutions (including output devices such as contactors and frequency converters) together with automation solutions such as robotics, motors, drives and PLCs.

Magne magnetic lock
to keep doors and hatches locked during a process

Pluto programmable safety controller,
Vital safety controller and Sentry safety relays
for flexible monitoring of safety devices

Smile emergency stop button
to safely stop machinery in hazardous situations

Orion light guards
for a production friendly safety detection

GKey safety lock
for safe locking of doors

JSDH4 three-position device
for safe and ergonomic inspection and troubleshooting

LineStrong pull wire emergency stop switch
for easy access of emergency stop function

European Directives and Standards

Directives and standards are of great importance for manufacturers of machines and safety components.

In the European Union, the EU Directives gives requirements for the minimum level of health and safety, and these are mandatory for manufacturers to fulfill. In every member country the Directives are implemented in national legislation.

Machines which have been placed on the market since 2010, must comply with the new Machinery Directive 2006/42/EC. Before that, the old Machinery Directive 98/37/EC was valid.

Although the requirements in the Directives are specific for Europe, they also apply to machines that are imported to Europe. And the Directives are supported by standards, of which many also are valid internationally.

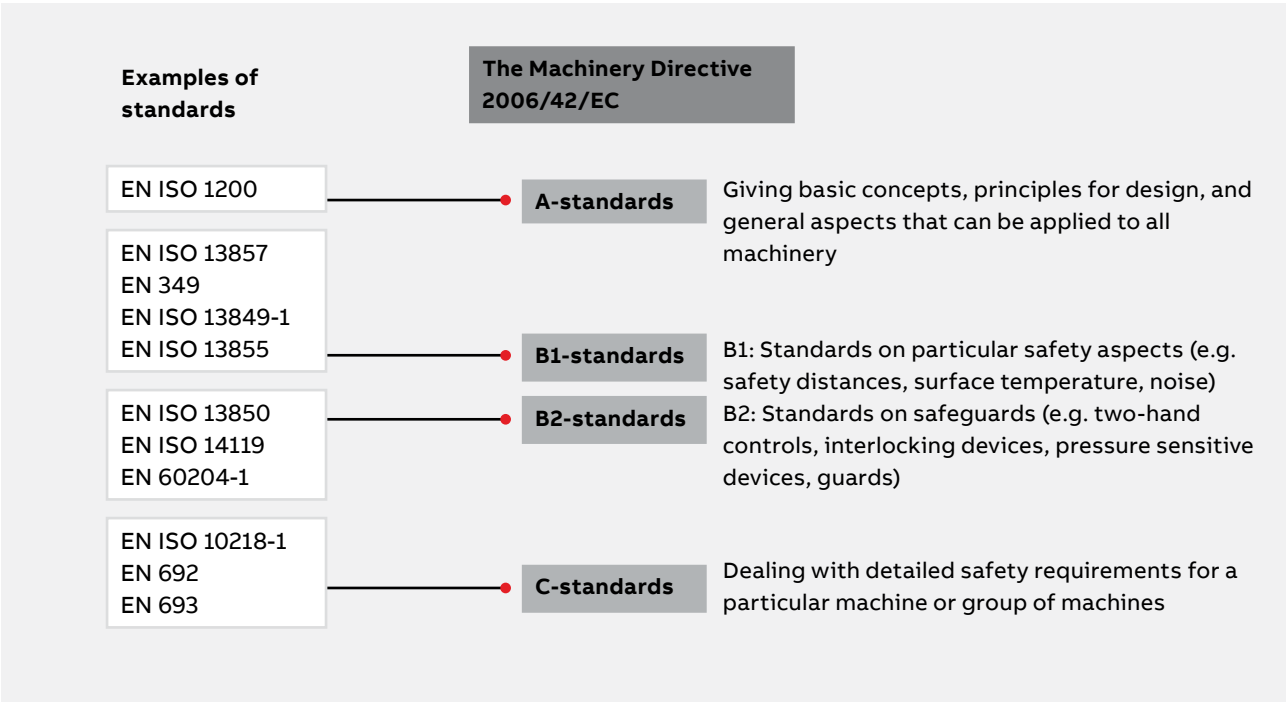
The objectives of the Machinery Directive, 2006/42/EC, are to maintain, increase and equalise the safety level of machines within the members of the European Community. Based on this, the free movement of machines/products between the countries in this market can be achieved. The Machinery Directive is developed according to "The New Approach" which is based on the following principles:

- The directives give the basic health and safety requirements, which are mandatory.
- Detailed solutions and technical specifications are found in harmonised standards.
- Standards are voluntary to apply, but products designed according to the harmonised standards will fulfill the basic safety requirements in the Machinery Directive.

Harmonised standards
Harmonised standards give support on how to fulfill the requirements of the Machinery Directive. The relationship between the Machinery Directive and the harmonised standards is illustrated by the diagram below.

Within ISO (The International Organization for Standardization) work is also going on in order to harmonise the safety standards globally in parallel with the European standardisation work.

ABB Jokab Safety takes an active part in the working groups both for the ISO and EN standards.



Machinery Directive

The Machinery Directive, for machines and safety components

From 2006/42/EC
1. This Directive applies to the following products:
a) machinery;
b) interchangeable equipment;
c) safety components;
d) lifting accessories;
e) chains, ropes and webbing;
f) removable mechanical transmission devices;
g) partly completed machinery.

The Machinery Directive gives a detailed definition of a machine, which can be simplified as something that has linked parts that are moving, where the energy source is not human effort. Two or more machines that are put together into a production line is also regarded as one machine.

CE-marking and Declaration of conformity
Machines manufactured or placed on the market from december 29, 2009, shall be CE-marked and fulfil the requirements according to the European Machinery Directive 2006/42/EC. This is also valid for old machines (manufactured before 1 January 1995) if they are manufactured in a country outside the EEA and imported to be used in a country in the EEA (European Economic Area).

For machines manufactured and/or released to the market between january 1, 1995, and december 28, 2009, the old Machinery Directive (98/37/EC) is valid.

NOTE!
Machines have to be accompanied by a Declaration of Conformity (according to 2006/42/EC, Annex II 1.A) that states which directive and standards the machine fulfills. It also shows if the product has gone through EC Type Examination.

Safety components have to be accompanied with a Declaration of Conformity.

CE

Requirements for the use of machinery
For a machine to be safe it is not enough that the manufacturer has been fulfilling all valid/necessary requirements. The user of the machine also has requirements to fulfill. For the use of machinery there is a Directive 2009/104/EC.

It requires that the work equipment that is provided to workers must comply with relevant Community directives.

This means that when repair/changes are made on the machine it shall still fulfill the requirements of the Machinery Directive. This doesn't have to mean that a new CE-marking is required (unless the changes are extensive).

NOTE!
This means that the buyer of a machine also has to make sure that a new machine fulfills the requirements in the directives. If the machine does not fulfill the requirements the buyer is not allowed to use it.

"Old" machines
For machines delivered or manufactured in the EEA before 1 January 1995 the following is valid.

From 2009/104/EC
b) work equipment which, if already provided to workers in the undertaking or establishment by 31 December 1992, complies with the minimum requirements laid down in Annex I no later than 4 years after that date;
c) without prejudice to point (a)(i), and by way of derogation from point (a)(ii) and point (b), specific work equipment subject to the requirements of point 3 of Annex I, which, if already provided to workers in the undertaking or establishment by 5 December 1998, complies with the minimum requirements laid down in Annex I, no later than 4 years after that date.

Annex I contains minimum requirements for health and safety. There can also be additional national specific requirements for certain machines.

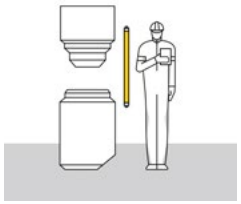
NOTE!
The point in time when the Machinery Directive was implemented in each Member Country varies. Therefore it is necessary to check with the national authorities in ones own country, to find out what is considered as "old" and respectively "new" machines.

Risk assessment

An important tool both when constructing a new machine and when assessing risks on older machines.

"Old" machines

Machinery that is placed on the market or put into service before 1995 in the EEA.

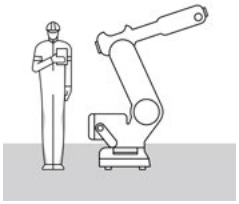


Use of work equipment
2009/104/EC

Possible national legislation on specific machines

"New" machines

1. Machinery that is placed on the market or put into service from 1995 in the EEA.
2. All machinery that are imported to the EEA irrespective of date of origin.



Use of work equipment
2009/104/EC
Note!
Not Annex 1 - instead use applicable directives.

The Machinery Directive
98/37/EC (1995 - 2009)
2006/42/EC (from 2010)

CE-marking + Declaration of conformity

EMC Directive
2014/30/EU

Low Voltage Directive
2014/35/EU

Possible more directives

Risk assessment
A well thought-out risk assessment supports manufacturers/users of machines to develop production friendly safety solutions. One result of this is that the safety components will not be a hindrance. This minimizes the risk of the safety system being defeated.

New machines
The following requirement is given by the Machinery Directive

From 2006/42/EC
The manufacturer of machinery or his authorised representative must ensure that a risk assessment is carried out in order to determine the health and safety requirements which apply to the machinery. The machinery must then be designed and constructed taking into account the results of the risk assessment.

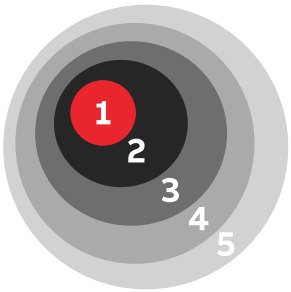
The standard EN ISO 12100 gives guidance on the information required to allow risk assessment to be carried out.The standard does not point out a specific method to be used. It is the responsibility of the manufacturer to select a suitable method.

Machines in use
A risk assessment must have been carried out on all machines that are in use; CE-marked as well as not CE-marked. A risk assessment must also be performed when making changes on a machine, to determine if the safety measures needs to be adapted.

Documentation of risk assessment
The risk assessment shall be documented. The risk assessment should take into consideration the severity of the potential injuries as well as the probability that they occur.

Protection or warning?
How is it possible to choose safety measures that are production friendly and in every way well balanced? The Machinery Directive gives an order of priority for the choice of appropriate methods to remove the risks. Here it is further developed in a five step method.

Prioritize safety measures according to the 5-step-method
1. Eliminate or reduce risks by design and construction
2. Move the work tasks outside the risk area
3. Use guards/safety devices
4. Develop safe working routines/information/education
5. Use warnings as pictograms, light, sound etc.



The further away from the center of the circle, the greater responsibility for the safety is placed onto the user of the machine. If full protection is not effectively achieved in one step, one has to go to the next step and find complementary measures. What is possible is dependant on the need for accessibility, the severity of the risk, appropiate safety measures etc.

Example on prioritizing according to the 5-step-method

Priority	Example of hazard and safety measure taken	
1. Make machine safe by design and construction	Hazard: Safety measure:	Cuts and wounds from sharp edges and corners on machinery Round off sharp edges and corners.
2. Move the work tasks outside the risk area	Hazard: Safety measure:	Crushing of fingers from machine movements during inspection of the production inside the risk area Installation of a camera.
3. Use guard/safety devices	Hazard: Safety measure:	Crushing injuries because of unintended start during loading of work pieces in a mechanical press Install a light curtain to detect operator and provide safe stop of the machinery.
4. Safe working routines/information	Hazard: Safety measure:	Crushing injuries because the machine can tip during installation and normal use. Make instructions on how the machine is to be installed to avoid the risks. This can include requirements on the type of fastening, ground, screw retention etc.
5. Warning	Hazard: Safety measure:	Burns because of hot surfaces in reach Warning signs

Combine the 5-step-method with production friendly thinking. This can give you e.g.
- fast and easy restart of machines after a safety stop
- enough space to safely program a robot
- places outside the risk area to observe the production
- electrically interlocked doors, instead of guards attached with screws, to be able to take the necessary measures for removing production disturbances
- a safety system that is practical for all types of work tasks, even when removing production disturbances

The likelihood that the safety solution will be well made, well received and suitable for the application increases if each risk is handled according to the 5-step-method.

Examples of regularly used EN/ISO standards

EN ISO 12100	**Safety of machinery - General principles for design - Risk assessment and risk reduction**	The primary purpose of this standard is to provide designers with an overall framework and guidance for decisions during the development of machinery to enable them to design machines that are safe for their intended use.
EN ISO 13857	**Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs**	This standard establishes values for safety distances to prevent danger zones being reached by the upper and lower limbs. The distances apply when adequate safety can be achieved by distances alone.
EN 349 (ISO 13854)	**Safety of machinery – Minimum gaps to avoid crushing of parts of the human body**	The object of this standard is to enable the user (e.g. standard makers, designers of machinery) to avoid hazards from crushing zones. It specifies minimum gaps relative to parts of the human body and is applicable when adequate safety can be achieved by this method.
EN ISO 13850	**Safety of machinery – Emergency stop – Principles for design**	This standard specifies design principles for emergency stop equipment for machinery. No account is taken of the nature of the energy source.
EN 574	**Safety of machinery – Two-hand control devices – Functional aspects – Principles for design**	This standard specifies the safety requirements of a two-hand control device and its logic unit. The standard describes the main characteristics of two-hand control devices for the achievement of safety and sets out combinations of functional characteristics for three types.
EN ISO 14120	**Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards**	This standard specifies general requirements for the design and construction of guards provided primarily to protect persons from mechanical hazards.
EN ISO 13849-1	**Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design**	This standard provides safety requirements and guidance on the principles for the design of safety-related parts of control systems. For these parts it specifies categories and describes the characteristics of their safety functions. This includes programmable systems for all machinery and for related protective devices. It applies to all safety-related parts of control systems, regardless of the type of energy used, e.g. electrical, hydraulic, pneumatic, mechanical. It does not specify which safety functions and which categories shall be used in a particular case.
EN ISO 13849-2	**Safety of machinery - Safety-related parts of control systems - Part 2: Validation**	This standard specifies the procedures and conditions to be followed for the validation by analysis and testing of: • the safety functions provided, and • the category achieved of the safety-related parts of the co trol system in compliance with EN 954-1 (ISO 13849-1), using the design rationale provided by the designer.
EN 62061	**Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems**	The standard defines the safety requirements and guiding principles for the design of safety-related electrical/electronic/programmable parts of a control system.
EN ISO 13855	**Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body**	This standard provides parameters based on values for hand/arm and approach speeds and the methodology to determine the minimum distances from specific sensing or actuating devices of protective equipment to a danger zone.
EN ISO 14119	**Safety of machinery - Interlocking devices associated with guards - Principles for design and selection**	This standard specifies principles for the design and selection — independent of the nature of the energy source — of interlocking devices associated with guards. The standard provides measures to minimize defeat of interlocking devices in a reasonably foreseeable manner.
EN 60204-1	**Safety of machinery - Electrical equipment of machines - Part 1: General requirements**	This part of IEC 60204 provides requirements and recommendations relating to the electrical equipment of machines so as to promote: • safety of persons and property; • consistency of control response; • ease of maintenance.

Standards for safety in control systems

Building a protection system that works in practice and provides sufficient safety requires expertise in several areas.

The design of the safety functions in the protection system in order to ensure they provide sufficient reliability is a key ingredient. As help for this there is, for example, the EN ISO 13849-1 standard. The purpose of this text is to provide an introduction to the standard and its application in conjunction with our products. Please note that outside of the European Union there are often other standards that are used in place of EN ISO 13849.

Introducing the standard
The generation change for standards on safety in control systems introduced new concepts and calculations for machine builders and machine users. The EN 954-1 standard has been phased out and is replaced by EN ISO 13849-1 (PL, Performance Level) and EN 62061 (SIL, Safety Integrity Level).

PL or SIL? What should I use?
The standard you should use depends on the choice of technology, experience and customer requirements.

Choice of technology
- PL (Performance Level) is a technology-neutral concept that can be used for electrical, mechanical, pneumatic and hydraulic safety solutions.
- SIL (Safety Integrity Level) can, however, only be used for electrical, electronic or programmable safety solutions.

Experience
EN ISO 13849-1 uses categories from EN 954-1 for defining the system structure, and therefore the step to the new calculations is not so big if you have previous experience of the categories. EN 62061 defines the structures slightly differently.

Customer requirements
If you or your end customer comes from an industry that is accustomed to using SIL (e.g. the process industry), requirements can also include safety functions for machine safety being SIL rated.

We notice that most of our customers prefer PL as it is technology-neutral and that they can use their previous knowledge in the categories. In this text we show some examples of how to build safety solutions in accordance with EN ISO 13849-1 and calculate the reliability of the safety functions to be used for a particular machine. The examples in this text are simplified in order to provide an understanding of the principles. The values used in the examples can change.

What is PL (Performance Level)?
PL is a measure of the reliability of a safety function. PL is divided into five levels (a-e). PL e gives the best reliability and is equivalent to that required at the highest level of risk.

To calculate which PL level the system achieves you need to know the following:
- The system's structure (categories B, 1-4)
- The Mean Time To dangerous Failure of the component ($MTTF_d$)
- The system's Diagnostic Coverage (DC)

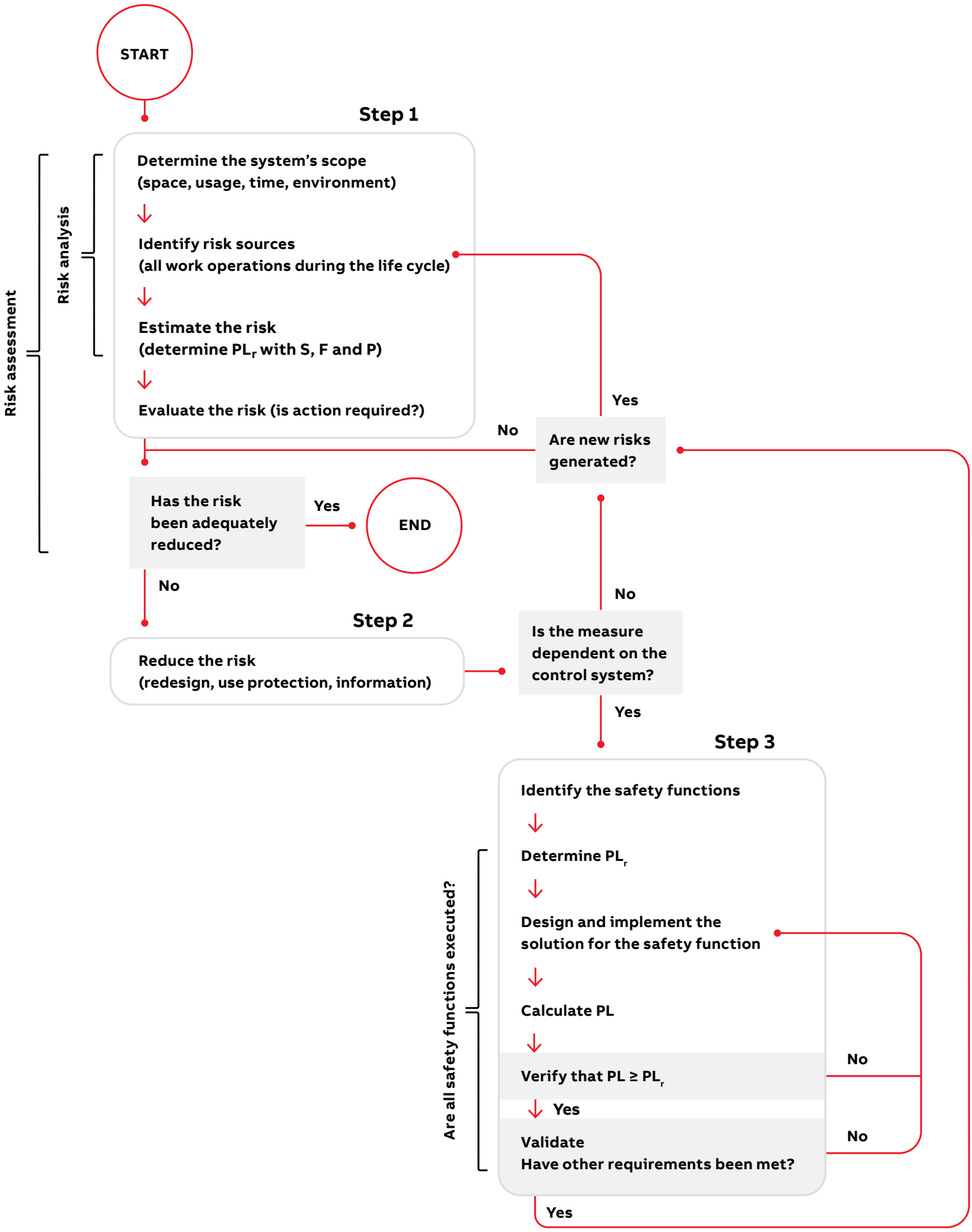
You will also need to:
- protect the system against simultaneous failure of both channels (CCF)
- protect the system from systematic errors built into the design
- follow certain rules to ensure software can be developed and validated in the right way

The five PL-levels (a-e) correspond to certain ranges of PFH_D-values (probability of dangerous failure per hour). These indicate how likely it is that a dangerous failure could occur over a period of one hour. In the calculation, it is beneficial to use PFH_D-values directly as the PL is a simplification that does not provide equally accurate results.

What is the easiest way of complying with the standard?
1. Use pre-calculated components.
As far as it is possible, use components with pre-calculated PL and PFH_D-values. You then minimise the number of calculations to be performed. All ABB Jokab Safety products have pre-calculated PFH_D-values.

2. Use a calculation tool.
With the calculation softwares FSDT or SISTEMA you avoid making calculations by hand. You also get help to structure your safety solutions and provide the necessary documentation.

3. Use Pluto or Vital
Use the Pluto programmable safety controller or Vital safety controller. Not only is it easier to make calculations and changes in the future, but above all it is easier to ensure a higher level of safety.


START
Step 1
Determine the system's scope (space, usage, time, environment)
Identify risk sources (all work operations during the life cycle)
Estimate the risk (determine PL_r with S, F and P)
Evaluate the risk (is action required?)
Risk analysis
Risk assessment
Yes
No
Are new risks generated?
Has the risk been adequately reduced?
Yes
END
No
No
Step 2
Reduce the risk (redesign, use protection, information)
Is the measure dependent on the control system?
Yes
Step 3
Identify the safety functions
Determine PL_r
Design and implement the solution for the safety function
Calculate PL
Verify that $PL \geq PL_r$
No
Yes
Validate
Have other requirements been met?
No
Yes
Are all safety functions executed?

Risk estimation
To calculate the performance level required (PL_r).

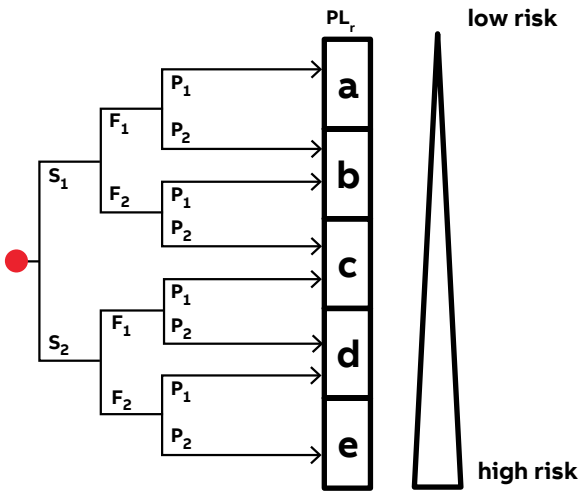
S	**Severity of injury**
S1	slight (normally reversible injury)
S2	serious (normally irreversible injury or death)
F	**Frequency and/or exposure to hazard**
F1	seldom to less often and/or exposure time is short
F2	frequent to continuous and/or exposure time is long
P	**Possibility of avoiding hazard or limiting harm**
P1	possible under specific conditions
P2	scarcely possible

Risk assessment and risk minimisation
According to the Machinery Directive, the machine builder (anyone who builds or modifies a machine) is required to perform a risk assessment for the machine design and also include an assessment of all the work operations that need to be performed. EN ISO 12100 stipulates the requirements for a risk assessment. It is this that EN ISO 13849-1 is based on, and a completed risk assessment is a prerequisite for being able to work with the standard.

Step 1 – Risk assessment
A risk assessment begins with determining the scope of the machine. This includes the space that the machine and its operators need for all of its intended applications, and all operational stages throughout the machine's life cycle.
All risk sources must then be identified for all work operations throughout the machine's life cycle.
A risk estimation is made for each risk source, i.e. indication of the degree of risk. According to EN ISO 13849-1 the risk is estimated using three factors: injury severity (S), frequency of exposure to the hazard (F) and the possibility you have of avoiding or limiting the injury (P). For each factor two options are given. Where the boundary between the two options lies is not specified in the standard, but the following are common interpretations and our recommendations:

S1	**bruises, abrasions, puncture wounds and minor crushing injuries**
S2	**skeletal injuries, amputations and death**
F1	**less frequent than once a week**
F2	**once a week or more often**
P1	**slow machine movements, plenty of space, low power**
P2	**quick machine movements, crowded, high power**

By selecting S, F and P for the risk, you will get the PL_r that is necessary for the risk source.
Finally, the risk assessment includes a risk evaluation where you determine if the risk needs to be reduced or if sufficient safety is ensured.



Step 2 – Reduce the risk
If you determine that risk reduction is required, you must comply with the priority in the Machinery Directive in the selection of measures:
1. Avoid the risk already at the design stage. (E.g. reduce power, avoid interference in the danger zone.)
2. Use protection and/or safety devices. (E.g. fences, light grids or control devices.)
3. Provide information about how the machine can be used safely. (E.g. in manuals and on signs.)

If risk reduction is performed using safety devices, the control system that monitors these needs to be designed as specified in EN ISO 13849-1.

Step 3 - Design and calculate the safety functions
To begin with you need to identify the safety functions on the machine. (Examples of safety functions are emergency stop and monitoring of gate.)

For each safety function, a PL_r should be established (which has often already been made in the risk assessment). The solution for the safety function is then designed and implemented. Once the design is complete, you can calculate the PL the safety function achieves. Check that the calculated PL is at least as high as PL_r and then validate the system as per the validation plan. The validation checks that the specification of the system is carried out correctly and that the design complies with the specification.You will also need to verify that the requirements that are not included in the calculation of the PL are satisfied, that is, ensure that the software is properly developed and validated, and that you have taken adequate steps to protect the technical solution from systematic errors.

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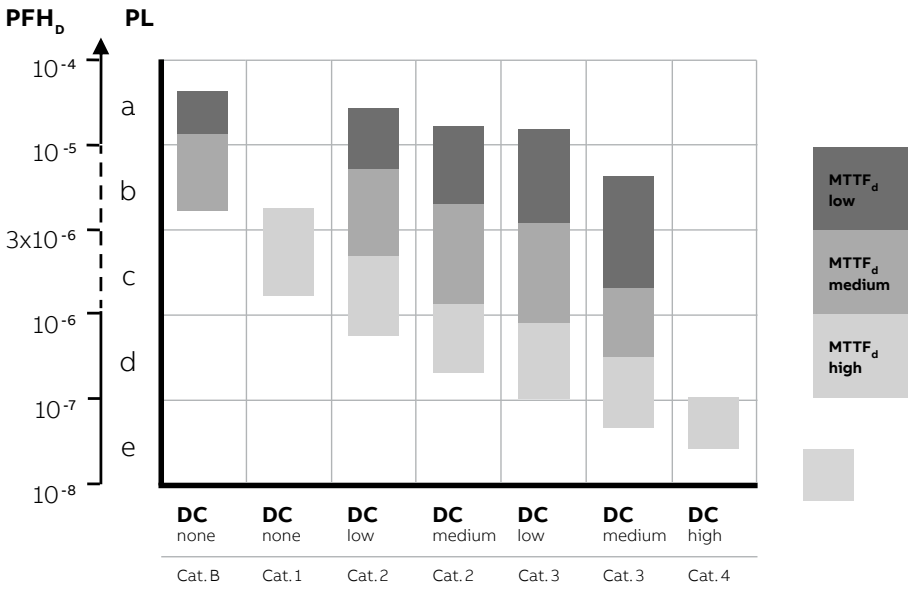
The relationship between categories, the DC_{avg}, $MTTF_d$ for each channel and PL. The table also shows the PFH_D-range that corresponds to each PL.



PL calculation in Step 3
When you calculate the PL for a safety function, it is easiest to split it into separate, well defined blocks (also called subsystems). It is often logical to make the breakdown according to input, logic and output (e.g. switch - safety relay - contactors), but there may be more or fewer than three blocks depending on the connection and the number of components used (an expansion relay could for example create an additional logic block).

For each block, you calculate a PL or PFH_D-value. It is easiest if you obtain these values from the component manufacturer, so you do not have to calculate yourself. The manufacturer of switches, sensors and logic devices often have PL and PFH_D-values for their components, but for mechanical devices (such as key switches or contactors) a PL-value cannot be supplied since it depends on how often the component will be used. You then need to calculate yourself according to EN ISO 13849-1 or use default values from the standard, if provided.

To calculate PL or PFH_D for a block, you need to know its category, DC and $MTTF_d$. In addition, you need to protect the system against systematic errors and ensure that an error does not knock out both channels, and generate and validate any software used correctly. The following text gives a brief explanation of what to do.

Safety function (SF)

Input		Logic		Output
	→		→	
PL/PFH_D		**PL/PFH_D**		**PL/PFH_D**

$PFH_{D,\ Total}$ = $PFH_{D,\ Input}$ + $PFH_{D,\ Logic}$ + $PFH_{D,\ Output}$

Category
The structure for the component(s) in the block is assessed to determine the category (B, 1-4) it corresponds to. For category 4, for example, individual failures do not result in any loss of the safety function. In order to achieve category 4 with contactors, you need to have two channels - i.e., two contactors - that can cut the power to the machine individually. The contactors need to be monitored by connecting opening contacts to a test input on, for example a safety relay. For monitoring of this type to work, the contactors need to have positive-guided contacts.

Diagnostic Coverage (DC)
A simple method to determine DC is explained in Appendix E in EN ISO 13849-1. It lists various measures and what they correspond to in terms of DC. For example, DC=99 % (which corresponds to DC high) is achieved for a pair of contactors by monitoring the contactors with the logic device.

Mean Time To dangerous Failure ($MTTF_d$)
The $MTTF_d$-value should primarily come from the manufacturer. If the manufacturer cannot provide values, they are given from tables in EN ISO 13849-1 or you have to calculate $MTTF_d$ using the B_{10d}-value, (average number of cycles until 10% of the components have a dangerous failure). To calculate the $MTTF_d$, you also need to know the average number of cycles per year that the component will execute.

Calculation of the average number of cycles is as follows:

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}}$$

where

$$n_{op} = \frac{d_{op} \times h_{op} \times 3600}{t_{cycle}}$$

n_{op} = Number of cycles per year
d_{op} = Operation days per year
h_{op} = Operation hours per day
t_{cycle} = Cycle time (seconds)

Example: d_{op}= 365 days, h_{op}= 24 hours and t_{cycle}= 1,800 seconds (2 times/hour) which gives n_{op}= 17,520 cycles. With a B_{10d}=2·106 this gives a $MTTF_d$=1,141 year which corresponds to $MTTF_d$=high.

Note that when you calculate $MTTF_d$ you have to calculate according to the total number of cycles the component will be working. A typical example of this is the contactors that frequently work for several safety functions simultaneously. This means that you must add the number of estimated cycles per year from all the safety functions that use the contactors. When $MTTF_d$ is calculated from a B_{10d}-value, also consider that if the $MTTF_d$-value is less than 200 years, the component needs to be replaced after 10% of the $MTTF_d$-value (due to the T_{10d}-value). That is, a component with $MTTF_d$ = 160 years needs to be replaced after 16 years in order for the conditions for achieving PL to continue to be valid. This is because EN ISO 13849-1 is based on a “mission time” of 20 years.

Common Cause Failure (CCF)
In Appendix F of EN ISO 13849-1 there is a table of actions to be taken to protect against CCF, to ensure a failure does not knock out both channels.

Systematic errors
Appendix G of EN ISO 13849-1 describes a range of actions that need to be taken to protect against incorporating faults into your design.

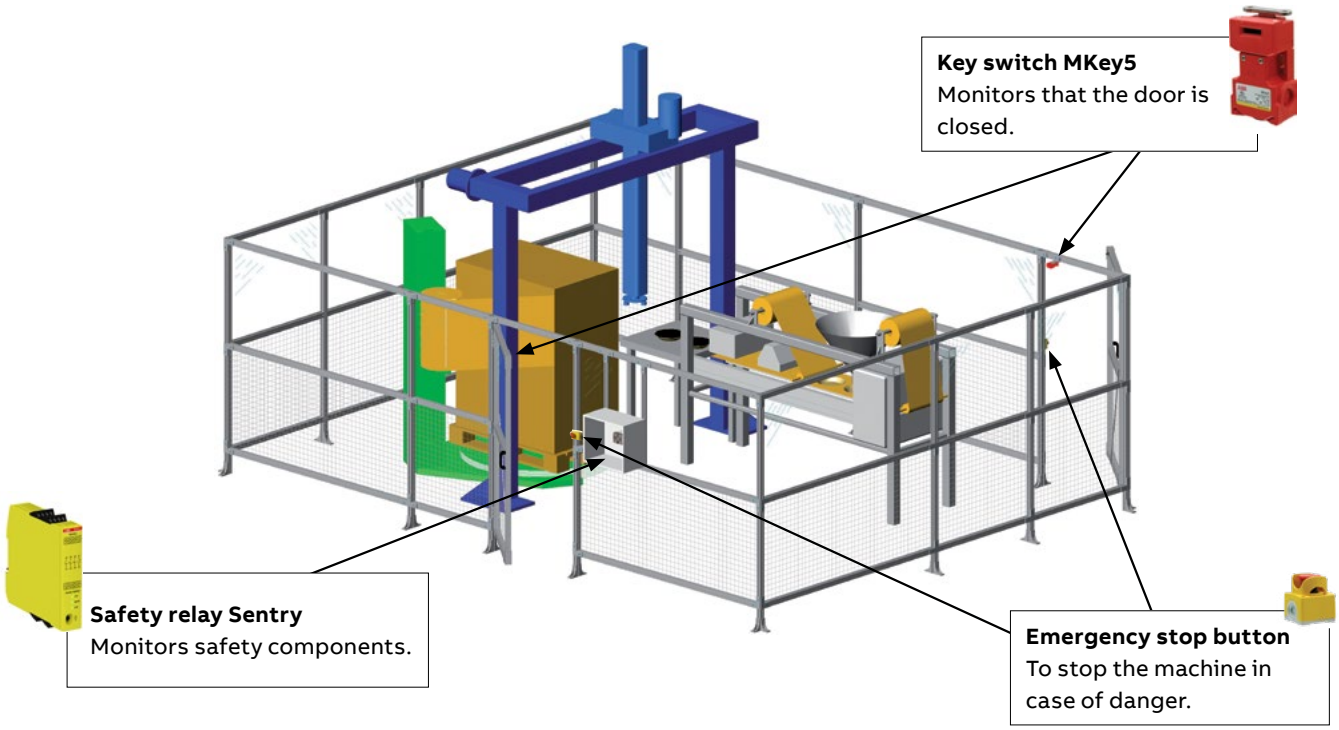
PL for safety functions
PL is given in the table on the previous page. If you want to use an exact PFH_D-value instead, this can be produced using a table in Appendix K in EN ISO 13849-1. Once you have produced the PL for each block, you can generate a total PL for the safety function in Table 11 of EN ISO 13849-1. This gives a rough estimate of the PL. If you have calculated PFH_D for each block instead, you can get a total of PFH_D for the safety function by adding together all the values of the blocks. The safety function’s total PFH_D corresponds to a particular PL in Table 3 of EN ISO 13849-1.

Requirements for safety-related software
If you use a safety PLC for implementing safety functions, this places requirements on how the software is developed and validated. To avoid error conditions, the software should be readable, understandable and be possible to test and maintain.
A software specification must be prepared to ensure that you can check the functionality of the program. It is also important to divide the program into modules that can be tested individually. Paragraph 4.6 and Appendix J of EN ISO 13849-1 specify requirements for safety related software.
The following are examples of requirements for software from EN ISO 13849-1:

- A development life cycle must be produced with validation measures that indicate how and when the program should be validated, for example, following a change.
- The specification and design must be documented.
- Function tests must be performed.
- Validated functional blocks must be used whenever possible.
- Data and control flow are to be described using, for example, a condition diagram or software flow chart.

Case study 1 - Safety relay Sentry

Protection layout for a packaging machine with low risks



Step 1 – Risk assessment

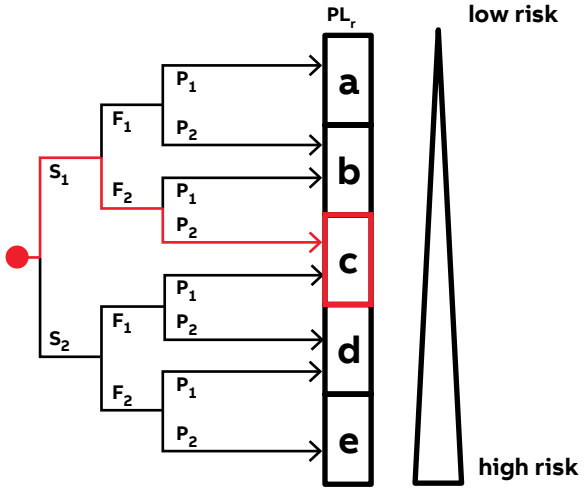
Food to be packaged is loaded into the cell manually through the rear door. A batch is prepared for the packing conveyor in the infeed hopper. The cell is reset and restarted. The packaging machine with conveyor belt only operates when both doors are closed and when the protection system has been reset.

In the risk assessment it was established that the machine is to be operated in three shifts (8 hours per shift) 365 days a year. The total access to the danger zone is estimated to be two times per hour (F2), including manual packaging and tending operational disturbances. Unexpected start-ups are not considered to cause serious injury but rather minor healable injuries (S1). The operator is considered not to have the possibility of avoiding injury as the machine moves quickly (P2).

The number of cycles for the safety function = 365 days/year x (3x8) hours/day x 2 cycles/hour = 17,520 cycles/year
The assessment for the safety function required for access to the machine is PL_r= c (S1, F2, P2). In addition to this safety function, an emergency stop function is needed. This is also assessed as PL_r=c.

Step 2 – Reduce the risk

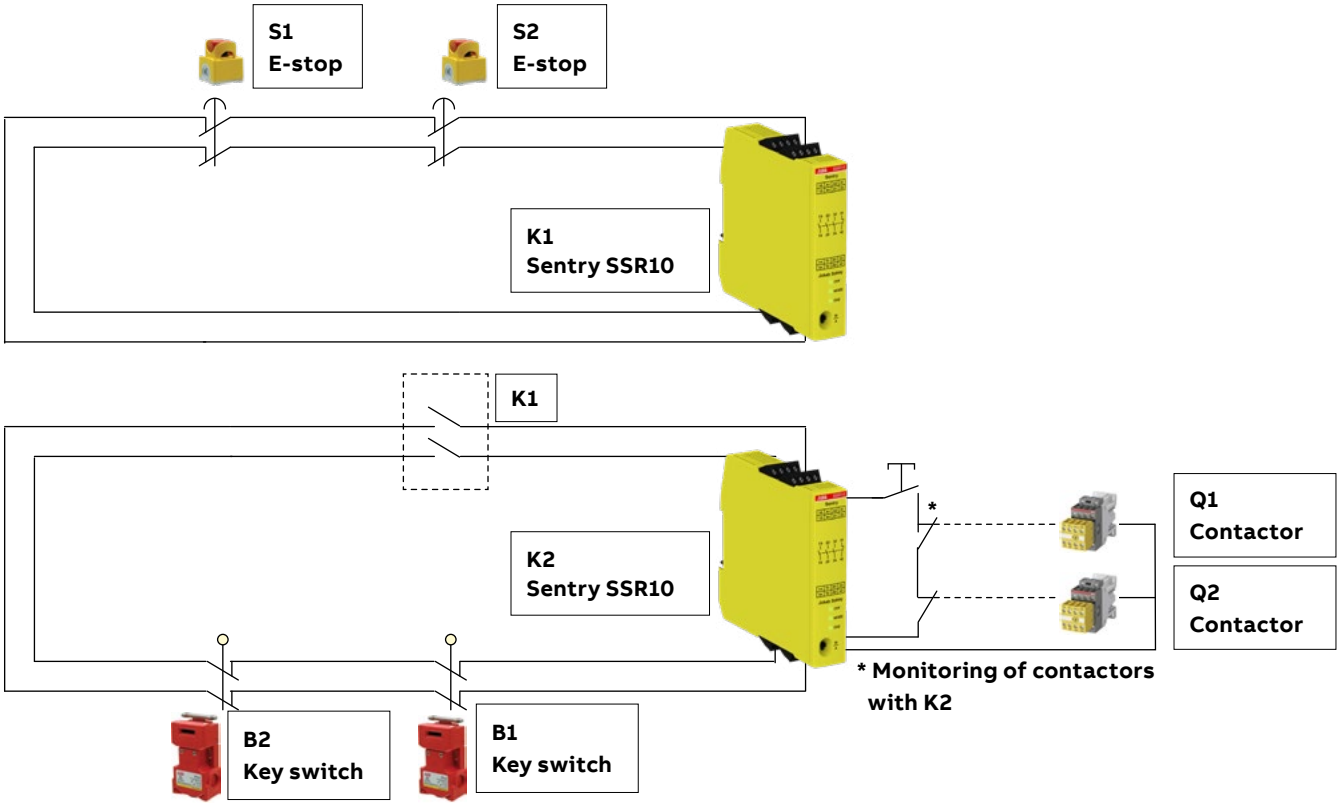
As protection, an interlocked door is selected with the key switch MKey5. Stopping time is short enough for the dangerous movement to have ceased before the operator can access it. The emergency stop is placed within easy reach, on both sides of the cell near the doors.



Determination of the PL_r necessary for the safety function with interlocked door for this example.

NOTE!

The assessment needs to be made for each safety function.



Step 3 - Calculate the safety functions
The output subsystem that is composed of double monitored contactors has been calculated at $2.47x10^{-8}$. The safety functions are represented by block diagrams.
Safety functions 1 and 2 are identical. Therefore, only safety function 1 is shown.
Safety functions 3 and 4 are identical. Therefore, only safety function 3 is shown.

How safe is a mechanical switch?
Mechanical switches have a tendency to break if misused. Manufacturer instructions must be followed, e.g. no excessive force or dirty environment. For interlocking switches in general EN ISO 14119 must be considered. It handles e.g. the possibility to defeat a switch and requirements on key switches. Connecting key switches in series gives a significant risk of masking errors, as stated in the technical report ISO/TR 24119, which limits the maximum achievable DC depending on the number of frequently used doors connected in series.

Safety function 1

	Input	Logic	Output	Result
PL_r=c →	**B1** MKey5 (PL c) →	**K2** Sentry (PL e) →	**Q1/Q2** Contactors (PL e) →	**PL c**

$PFH_{D,\ MKey5} + PFH_{D,\ Sentry} + PFH_{D,\ Contactors} = 1.14x10^{-6} + 4.9x10^{-9} + 2.47x10^{-8} = 1.17x10^{-6}$ → PL c

Safety function 3

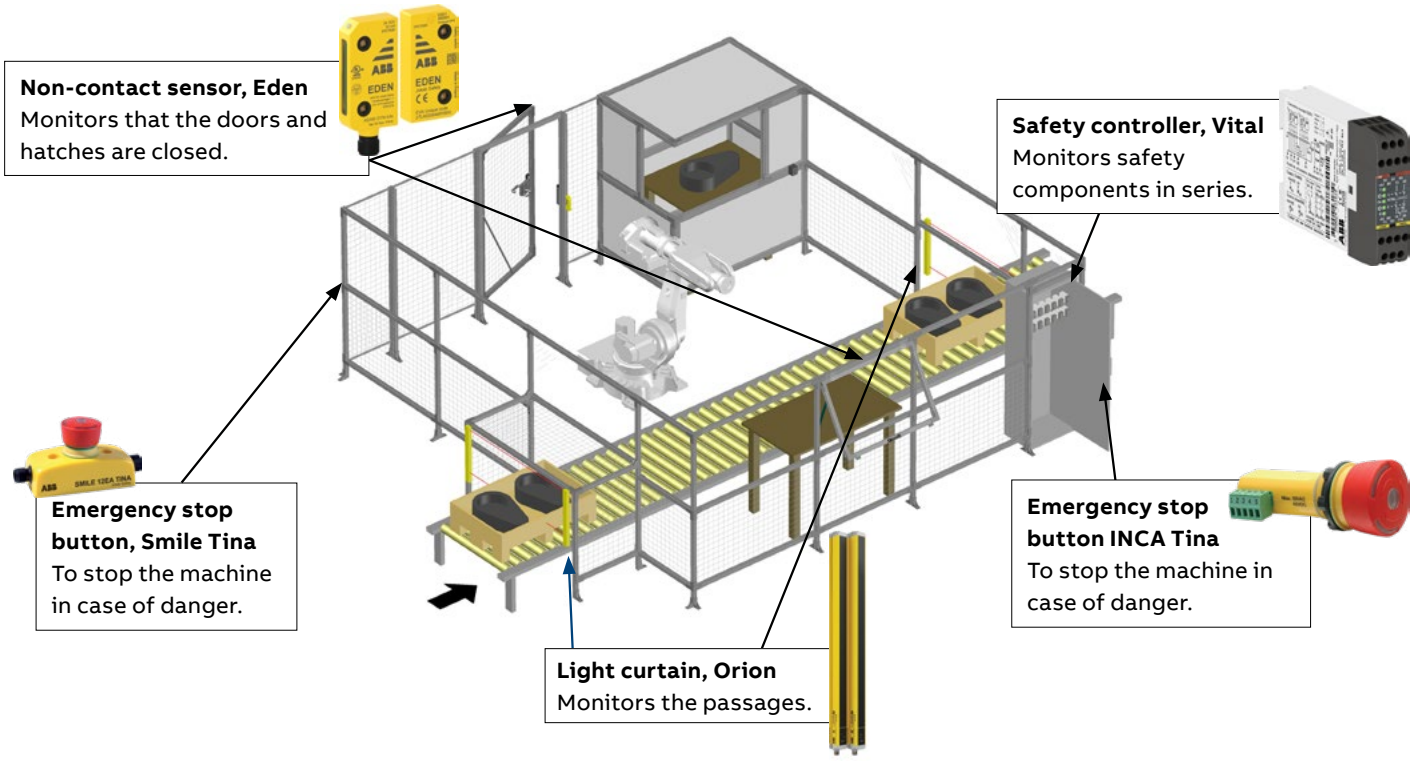
	Input	Logic	Logic	Output	Result
PL_r=c →	**S1** E-stop (PL e) →	**K1** Sentry (PL e) →	**K2** Sentry (PL e) →	**Q1/Q2** Contactors (PL e) →	**PL e**

$PFH_{D,\ E\text{-}stop} + PFH_{D,\ Sentry} + PFH_{D,\ Contactors} = 4.3x10^{-8} + 4.9x10^{-9} + 4.9x10^{-9} + 2.47x10^{-8} = 7.75x10^{-8}$ → PL e

The reason for not achieving more than PL c with Safety function 1 is that only one key switch is used per door, and a key switch is mechanically a Category 1 device. For e-stop devices though, a fault exclusion for the mechanical parts is allowed according to EN ISO 13849-2 if a maximum number of operations is considered. For this solution to reach a higher PL, EN ISO 14119 and ISO/TR 24119 need to be consulted.

Case study 2 - Safety controller Vital

Protection layout for a robot cell with high risks

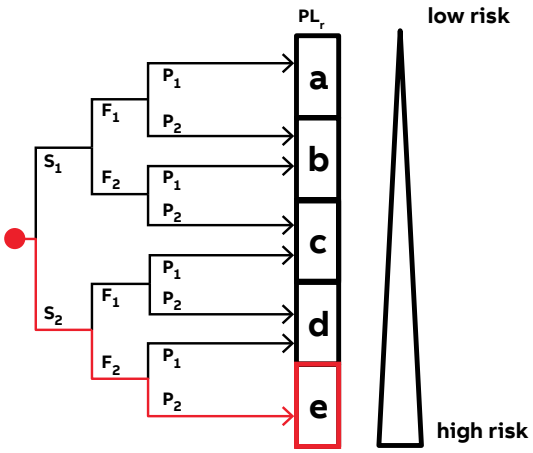


Step 1 – Risk assessment
The workpieces are transported into the robot cell where the robot places them in a test cabinet. Approved workpieces leave the cell on the conveyor belt, while workpieces that fail the tests are placed on the table for manual adjustments. The work that needs to be done in the robot cell is to correct operational disturbances for the test equipment and the conveyor belt (about once an hour), unloading from the manual station (about once an hour), program adjustments (once/week) and cleaning (once/week) (F2). Unexpected start-ups of the robot are considered to cause potentially serious injury (S2). The operator is considered not to have the possibility of avoiding injury as the robot moves quickly (P2). The risk estimation gives PLr=e (S2, F2, P2) for the safety functions required for access to the machine.

The standard for robot systems/cells (EN ISO 10218-2) specifies that safety functions shall comply with at least PL d, unless the risk assessment determines otherwise. In this case the risk assessment gives us PL_r= e.

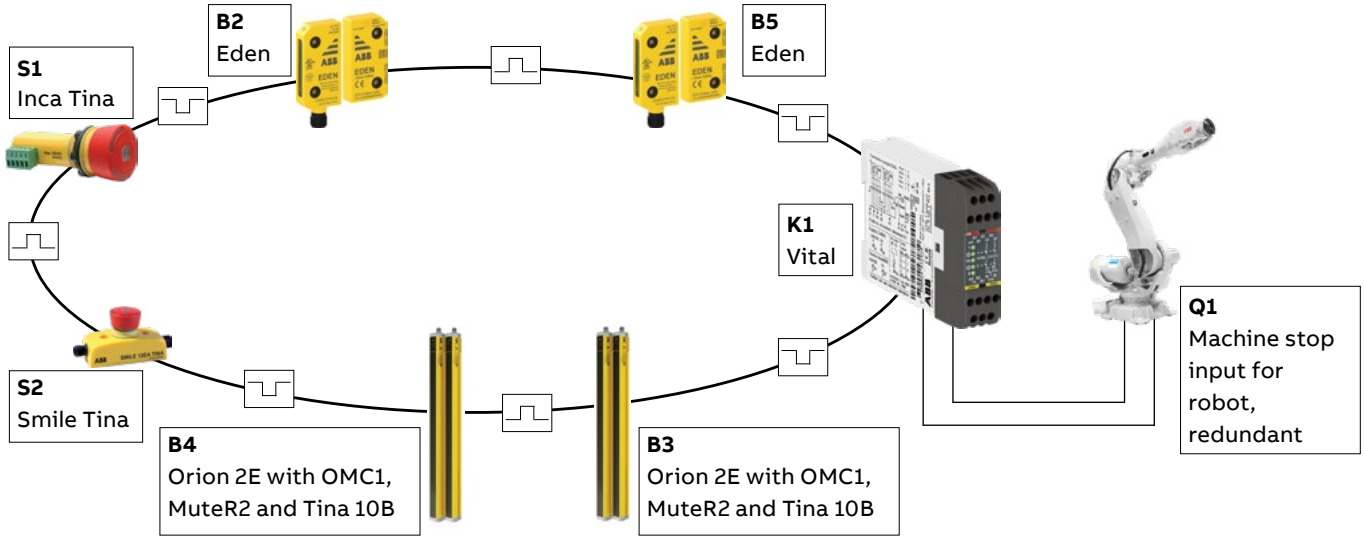
Step 2 – Reduce the risk
As protection, the door and hatch are interlocked with Eden non-contact sensors. To protect against entering the cell the wrong way, transport of materials in and out is protected with light curtains and provided with muting to distinguish between material and people. The emergency stop function is also a safety function that is required. The energy to all hazardous machine functions shall be removed by all safety functions.

The solution with Vital makes it possible to implement a robot application with only one safety controller, which does not need to be configured or programmed. Vital makes it possible to connect up to 30 safety functions in a single DYNlink loop, with PL e in accordance with EN ISO 13849-1.



Determination of PLr for the safety function with interlocked door.

NOTE!
The assessment needs to be made for each safety function.



Step 3 - Calculate the safety functions
The PFH_D-value of the robot's safety stop input is $5.79x10^{-8}$ (the value applies to ABB industrial robots with IRC5 controller). The safety functions are represented by block diagrams.

Safety function 3 - muting of light guards
If the logic of the muting function is included in the light guard, the PFH_D-value of the light guard should include the PFH_D-values for the muting components. If the logic is external (i.e. safety PLC) the muting sensors should be added as separate blocks in the safety function.

Safety function 1

	Input	Logic	Output	Result
PL_r=e →	B1 Eden (PL e) →	K1 Vital (PL e) →	Q1 Robot (PL e) →	PL e

$PFH_{D, Eden} + PFH_{D, Vital} + PFH_{D, Robot} = 4.5x10^{-9} + 2.74x10^{-8} + 5.79x10^{-8} = 8.98x10^{-8}$ → PL e

Safety function 2

	Input	Logic	Output	Result
PL_r=e →	S2 Smile Tina (PL e) →	K1 Vital (PL e) →	Q1 Robot (PL e) →	PL e

$PFH_{D, Smile\ Tina} + PFH_{D, Vital} + PFH_{D, Robot} = 4.66x10^{-9} + 2.74x10^{-8} + 5.79x10^{-8} = 9.0x10^{-8}$ → PL e

Safety function 3

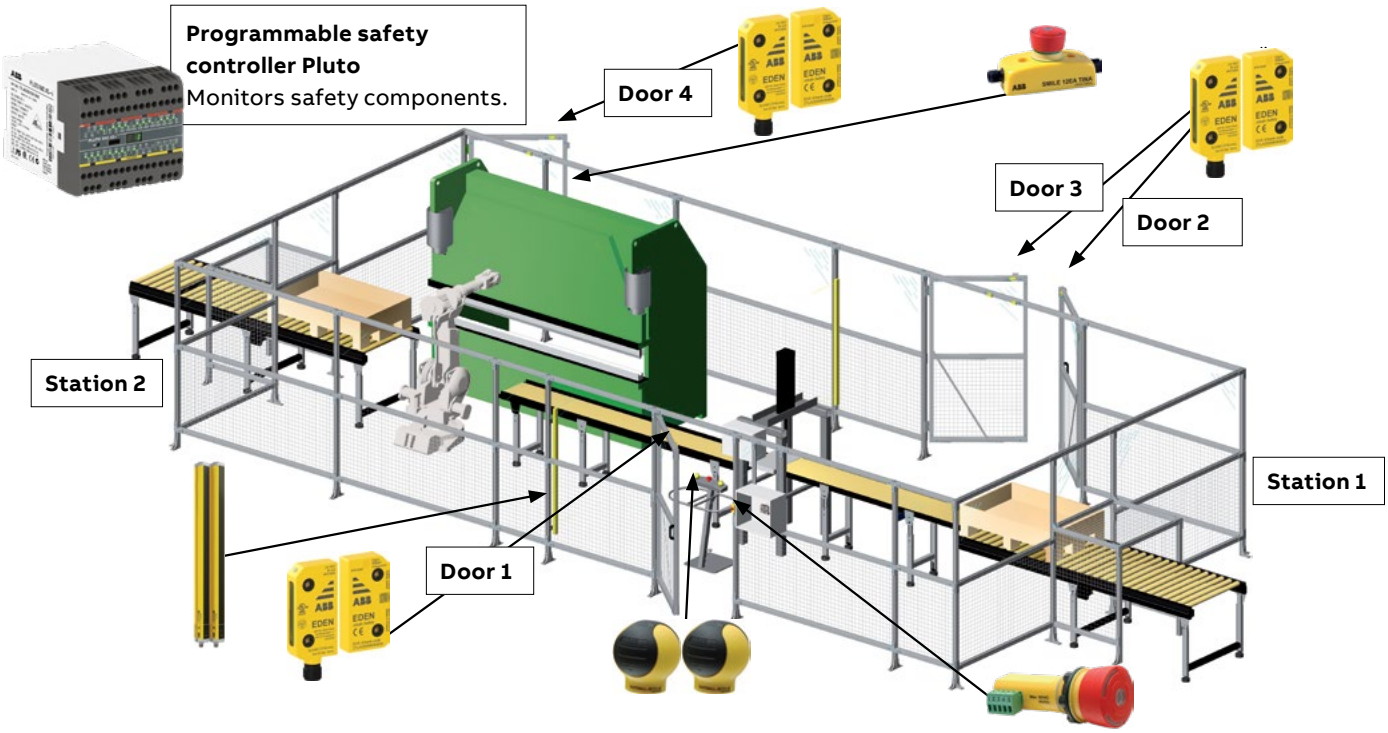
	Input		Logic	Output	Result
PL_r=e →	B3 Orion with muting (PL e) →	Tina 10B (PL e) →	K1 Vital (PL e) →	Q1 Robot (PL e) →	PL e

$PFH_{D, Orion} + PFH_{D, Tina\ 10} + PFH_{D, Vital} + PFH_{D, Robot} = 2.64x10^{-9} + 4.5x10^{-9} + 2.74x10^{-8} + 5.79x10^{-8} = 9.24x10^{-8}$ → PL e

These safety functions with Vital meet PL e in accordance with EN ISO 13849-1. Note that the above functions are only selected examples of the safety functions in the robot cell.

Case study 3 - Programmable safety controller Pluto

Protection layout for a production cell with high risks



Step 1 – Risk assessment

The workpieces are fed into the cell through a conveyor belt and positioned by the operator in the pneumatic machining tool in station 1. The operator starts station 1 manually. The operator then places the workpiece on the conveyor belt for transfer to station 2. A light curtain prevents the operator from entering station 2 unnoticed. The robot in station 2 places the workpiece in the hydraulic press. The workpiece leaves the cell by transport out onto the conveyor.

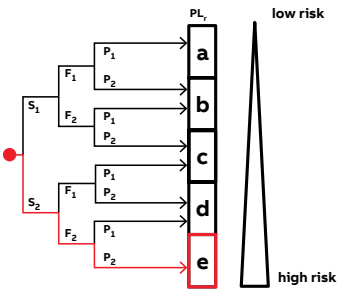
The work that needs to be done in station 2 is, e.g. to address operational disturbances in the press and the robot a few times a week (F2). Unexpected start-ups of the robot are considered to cause serious injury (S2). The operator is considered not to have the possibility of avoiding injury as the robot moves quickly (P2). The risk estimation for the safety function required for access to station 2 is PL_r=e (S2, F2, P2). This estimation would still be the same for the press. For the safety function for the risks associated with the conveyor belt, the estimation S1, F2, P1 is made giving PL_r= b.

Step 2 – Reduce the risk

As protection, interlocked doors are selected with the Eden non-contact sensor. Station 1 with the pneumatic machining tool is operated by a two-hand device. When the two-hand device is released, the dangerous movement will be stopped safely. Station 2 can be in automatic mode, when a light curtain (Orion) and a non-contact sensor at door 4 (Eden) protects the entry. If the door is opened or the light curtain is interrupted, energy to the hazardous functions in station 2 is removed. By opening doors 2 and 3 (also monitored by Eden sensors) the conveyor belt and the pneumatic machining tool will stop safely. Manual reset must always be done after actuation of any safety device.

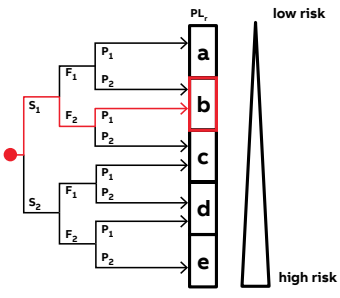
When the protection system requires a number of safety devices and that multiple machines must be stopped, Pluto programmable safety controller is the most effective solution. If the protection system also has to work by zones and in different modes of operation, this is another good reason to use Pluto. With Pluto, PL e can be achieved regardless of the number of connected safety devices.

Robot

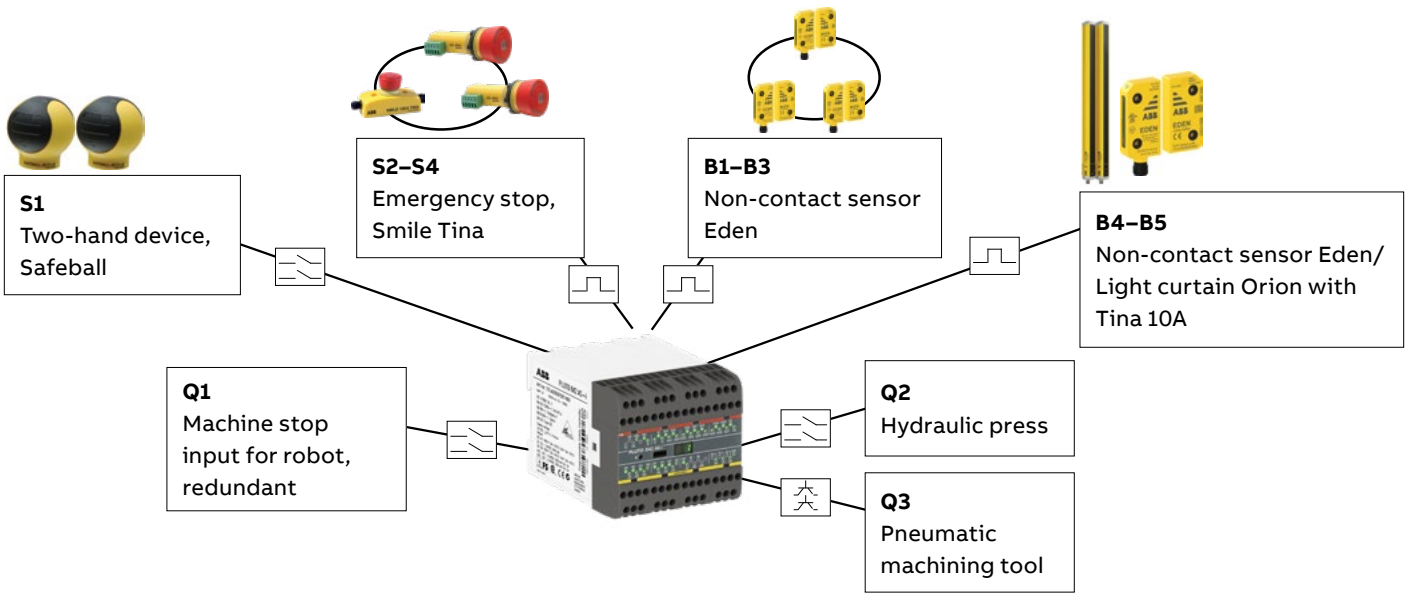


PL_r= e for the robot and hydraulic press.

Conveyor belt



PL_r=b for the conveyor belt.



Step 3 - Calculate the safety functions for the robot cell
The PFH_D-value for the robot's safety stop input is $5.79x10^{-8}$ (the value applies to ABB industrial robots with IRC5 controller).

Only safety functions to help remove energy to the industrial robot are shown below. This is only a subset of the safety functions. When energy is removed to multiple machines in a cell, the safety functions can be defined in different ways depending on the risk assessment. The safety functions are represented by block diagrams.

Safety function 1

	Input	Logic	Output	Result
PL_r=e →	**B1** Eden (PL e) →	**K1** Pluto, relay outputs (PL e) →	**Q1** Robot (PL e) →	**PL e**

$PFH_{D,\ Eden} + PFH_{D,\ Pluto} + PFH_{D,\ Robot} = 4.5x10^{-9} + 2x10^{-9} + 5.79x10^{-8} = 6.44x10^{-8}$ → PL e

Safety function 2

	Input	Logic	Output	Result
PL_r=e →	**S2** Smile Tina (PL e) →	**K1** Pluto, relay outputs (PL e) →	**Q1** Robot (PL e) →	**PL e**

$PFH_{D,\ Smile\ Tina} + PFH_{D,\ Pluto} + PFH_{D,\ Robot} = 4.66x10^{-9} + 2x10^{-9} + 5.79x10^{-8} = 6.46x10^{-8}$ → PL e

Safety function 3

	Input		Logic	Output	Result
PL_r=e →	**B5** Orion (PL e) →	Tina 10A (PL e) →	**K1** Pluto, relay outputs (PL e) →	**Q1** Robot (PL e) →	**PL e**

$PFH_{D,\ Orion} + PFH_{D,\ Tina\ 10} + PFH_{D,\ Pluto} + PFH_{D,\ Robot} = 2.5x10^{-9} + 4.5x10^{-9} + 2x10^{-9} + 5.79x10^{-8} = 6.69x10^{-8}$ → PL e

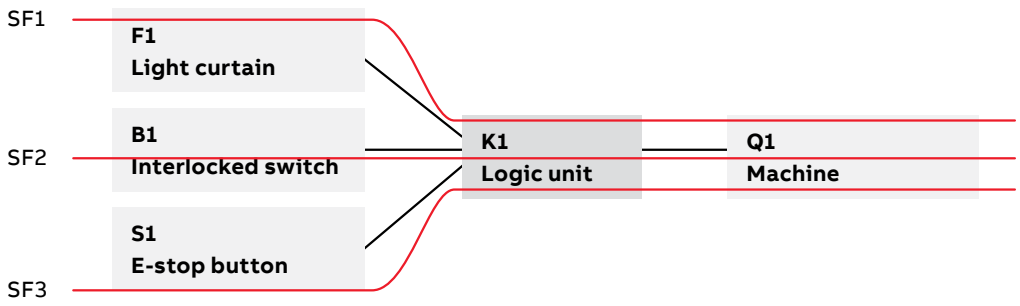
These safety functions with Pluto meet PL e in accordance with EN ISO 13849-1. Note that the above functions are only selected examples of the safety functions in the robot cell.

What defines a safety function?

Calculating that you have achieved the PL_r that is required is not difficult, especially if you use "pre-calculated" safety devices and logic units. But which parts should be included in each safety function? This must be resolved before you start the calculations. To summarise in simple terms you can say that each safety device should be a part of the safety function for each machine that is affected by the safety device in question. Three safety devices that all remove the energy to three machines in a cell is therefore equal to nine safety functions. In the section that follows, we explain the background.

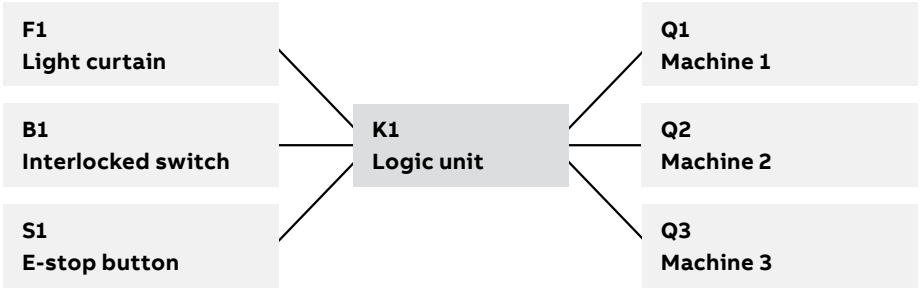
Multiple safety functions for a machine
Multiple safety devices are often used on a machine in order to provide satisfactory and practical protection for the operators. In the following example, a machine is protected by three safety devices connected to a logic device. The following figure illustrates this interconnection schematically.

Three safety functions (SF) are defined for the machine and are calculated as:
SF1: $PFH_{D, F1} + PFH_{D, K1} + PFH_{D, Q1} = PFH_{D, SF1}$
SF2: $PFH_{D, B1} + PFH_{D, K1} + PFH_{D, Q1} = PFH_{D, SF2}$
SF3: $PFH_{D, S1} + PFH_{D, K1} + PFH_{D, Q1} = PFH_{D, SF3}$

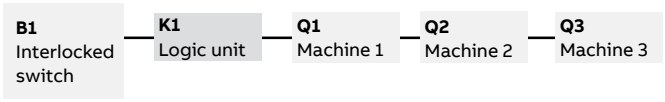


Multiple safety functions for multiple machines in a cell
It is quite common for several machines in a single cell/zone to be protected by multiple safety devices. The following figure illustrates the interconnection schematically for an example. Each of the machines Q1 – Q3 is shut down separately and independently by K1.

If the operator enters the cell, he is exposed in this case to the same type of risk from all three machines. The power to all three machines must be cut e.g. when the operator enters the cell through the door interlocked by B1.



Theoretical approach for multiple machines
The theoretical approach to calculate the safety function is as follows:



For the full safety function to be performed you require all the components to be working. Note that if B1 or K1 has a dangerous malfunction, the entire safety function is disabled. However, if for example machine Q1 has a dangerous malfunction, and is not shut down, machines Q2 and Q3 will still be shut down. One disadvantage in considering the safety function in this way is that you may have trouble achieving the PL_r required. But if you achieve the PL_r required, you can use the theoretical approach.

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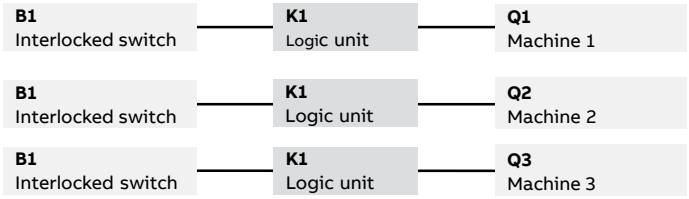
Sources:
http://www.dguv.de/medien/ifa/en/pra/en13849/safety_functions.pdf

Practical approach for multiple machines
A more practical approach is to divide the safety function into three parts, one for each of the three machines.



This is an approach that can provide a more accurate way of looking at the safety functions, especially where a different PL_r is required for the safety functions above. If machine Q1 is a robot and machine Q2 is a conveyor which is designed to have negligible risks, the different PL_r required to protect against risks from Q1 and Q2 will also be different. This practical approach is therefore the one recommended. The interpretation is based on information provided by IFA (Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung). For more information on this and other issues, see Sources.

Example of safety functions for multiple machines in a cell
For a cell with three machines (one robot, one hydraulic press and one pneumatic machining tool) a risk assessment is made resulting in different PL_r for the individual machines. The robot and the hydraulic press requires PL_r = e, while the pneumatic machining tool requires PL_r = d.
One of the safety functions is that a non-contact sensor (Eden) supervised by a safety PLC (Pluto) shall disconnect the energy to all three machines in the hazard zone:
Eden B1 ($PFH_{D, B1} = 4.5x10^{-9}$)
Pluto K1 ($PFH_{D, K1} = 2x10^{-9}$)
Robot Q1 ($PFH_{D, Q1} = 5.79x10^{-8}$)
Hydraulic press Q2 ($PFH_{D, Q2} = 8x10^{-8}$)
Pneumatic machining tool Q3 ($PFH_{D, Q3} = 2x10^{-7}$).

Practical approach
If you use the practical approach the safety functions are as follows:
Robot:
$PFH_{D, B1} + PFH_{D, K1} + PFH_{D, Q1} = 4.5x10^{-9} + 2•10^{-9} + 5.79x10^{-8} = 6.44x10^{-8} \longrightarrow$ PL e
Hydraulic press:
$PFH_{D, B1} + PFH_{D, K1} + PFH_{D, Q2} = 4.5x10^{-9} + 2•10^{-9} + 8x10^{-8} = 8.65x10^{-8} \longrightarrow$ PL e
Pneumatic machining tool:
$PFH_{D, B1} + PFH_{D, K1} + PFH_{D, Q3} = 4.5x10^{-9} + 2x10^{-9} + 2x10^{-7} = 2.07x10^{-7} \longrightarrow$ PL d
This is to be done in a similar way with other safety functions for the cell. For each safety device, you define the machines it affects, and establish the various safety functions according to this.

Theoretical approach
What would the result be using the theoretical approach? Would the safety function achieve PL e?
All machines:
$PFH_{D, B1} + PFH_{D, K1} + PFH_{D, Q1} + PFH_{D, Q2} + PFH_{D, Q3}$
$= 4.5x10^{-9} + 2x10^{-9} + 5.79x10\text{-}8 + 8x10^{-8} + 2x10^{-7} = 3.44x10^{-7} \longrightarrow$ PL d
In this case, the safety function would not achieve a total PL e, which was required for the risks associated with the robot and hydraulic press.

Conclusions
- Use the practical approach for multiple machines.
- Use safety devices/logic units with high reliability (low PFH_D) to make it easy to achieve the PL_r required.
- With Vital or Pluto, it is easier to achieve the PL_r required.

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Please note that the examples on these pages are simplified in order to explain the principles. Values of products can also change.

FSDT and SISTEMA
Tools for determining performance level (PL)

Tools to simplify the process of safety function design
FSDT is an ABB software for determining PL and SIL of safety functions and generating technical documentation. The tool helps simplifying the process of safety function design, verification and documentation. It supports the compliance of the requirements of both EN ISO 13849-1 and IEC 62061 as well as the European Machinery Directive. Please turn to your local ABB contact in order to purchase FSDT.

Another commonly used software tool for the calculation of PL according to EN ISO 13849-1 is SISTEMA, developed by IFA (The Institute for Occupational Safety and Health) in Germany. With SISTEMA it is possible to “build” safety functions, verify them and generate the technical documentation required. The tool is freeware and can be downloaded from the IFA website.

To simplify the use of FSDT and SISTEMA with our products we have created a library containing all of our safety products.

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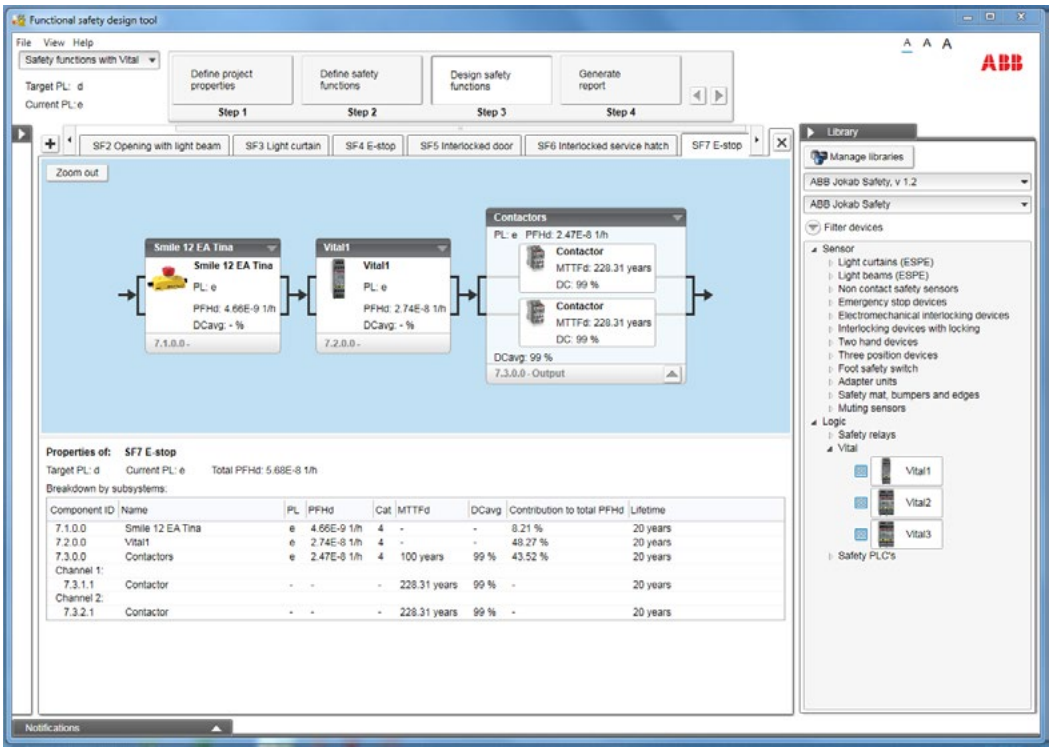

Applying IEC/EN 62061

If a safety function is designed in accordance with IEC/EN 62061, the level of reliability is expressed as the Safety Integrity Level, SIL. There are a total of 4 levels, but in the IEC/EN 62061 standard SIL 3 is the highest level. SIL is similar to PL (performance level) and uses the same PFH_D (probability of dangerous failure per hour) to express the reliability of components and systems.

Safety Integrity Level, SIL	Probability of dangerous Failure per Hour (PFH_D)
3	$\geq 10^{-8}$ to $<10^{-7}$
2	$\geq 10^{-7}$ to $<10^{-6}$
1	$\geq 10^{-6}$ to $<10^{-5}$

There is a method in IEC/EN 62061 for assigning the Safety Integrity Level.

Severity (Se)	Class (Cl)				
	3-4	5-7	8-10	11-13	14-15
4	SIL2	SIL2	SIL2	SIL3	SIL3
3		(OM)	SIL1	SIL2	SIL3
2			(OM)	SIL1	SIL2
1				(OM)	SIL1

Cl=Fr+Pr+Av
OM=Other Measures

The severity of injury that can occur is divided into four levels. Class is the addition of the values of frequency (Fr, stated as a value between 1 and 5, where 5 represents the highest frequency), probability that a dangerous event will occur (Pr, stated as a value between 1 and 5, where 5 represents the highest proability) and the possibility of avoiding or limiting injury (Av, stated as a value of 1, 3 or 5, where 5 represents the least chance of avoiding or limiting an injury).

The safety function that is to be designed must at least fulfill the SIL that has been assigned to it in the risk assessment. The safety function consists of a number of sub-elements. Example: a door is interlocked by a non-contact sensor which is in turn monitored by a Pluto safety PLC, with outputs that break the power to two supervised contactors. The sensor is sub-element 1, Pluto is sub-element 2 and the two supervised contactors are sub-element 3. If in the assessment it has been established that SIL2 shall be used, every individual sub-element in the safety function must fulfill the SIL2 requirements. And the safety function must in its entirety fulfill the SIL2 requirements.

Definition of protective safety in accordance with IEC/EN 62061
"Function of a machine whose failure can result in an immediate increase of the risk(s)"

If the SIL requirements are not fulfilled in any of the sub-elements or by the safety function in its entirety, a re-design must be made.

Finally
This is just a brief introduction to the EN ISO 13849-1 and IEC/EN 62061 standards. You are welcome to contact us for more information and we are happy to guide you in how to apply the standards to our products.

The information given in this document is not intended to replace the standards - we strongly encourage you to purchase the standards if you are working with machine safety.

2

Safety controllers

Safety controllers

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Introduction and overview
Selection guide

The safety controllers from ABB can monitor anything from a single safety function to complete manufacturing lines.

	Sentry	**Vital**	**Pluto**
Type	Safety relay	Safety controller	Programmable safety controller
Description	Powerful and easy-to-install safety relays suitable for all common types of safety devices.	A configurable safety controller that can monitor all safety devices on smaller machines.	A cost-effective, powerful and compact programmable safety controller for all types of safety applications.
Application(s)	Monitoring safety devices with one safety function, as well as expansion of safety outputs, with or without time delay.	Monitoring multiple safety devices with all the advantages of the DYNlink system.	Monitoring of multiple safety devices and several safety functions, as well as control of machines and/or processes. Many I/Os and programmable logic.
Compatible safety devices	All types of conventional safety devices	DYNlink devices	All types of conventional safety devices and DYNlink devices
Advantages	• Easy to install • Universal models for all common applications • Extensive status information • Advanced timer functions • Multireset of up to 10 safety relays	• Monitor up to 30 sensors in series maintaining Cat. 4/PL e • No programming	• Easy-to-use while still allowing advanced programming • Free software • Easy system modification • Gateway communication with all main fieldbuses

Overview
Selection orientation and standards

Conventional safety devices
By conventional safety devices, we mean safety devices with one or two channels with contacts (e.g. key switches and emergency stop buttons), devices with OSSD outputs (e.g. light guards and Eden OSSD), safety devices with solid state outputs (e.g. safety magnetic sensors) and pressure sensitive devices (e.g. safety mats, safety edges and bumpers).
A safety controller compatible with conventional safety devices can be used with most safety devices on the market, independently of the brand.

The DYNlink solution
The DYNlink solution is a unique ABB Jokab Safety feature allowing to connect safety devices in series and still reach category 4/PL e/SIL 3 with only one channel (instead of two with conventional safety devices). This saves cabling and hardware.

For a small machine, the Vital safety controller can be a very cost effective solution since up to 30 DYNlink devices can be connected to one Vital and still reach category 4/PL e/SIL 3. With conventional safety devices this would require one safety relay per safety device.

When Pluto programmable safety controller is used, only one safety input is necessary for each DYNlink circuit instead of two inputs for a traditional safety device, which means that less I/Os are necessary.

Tina adapters allow the use of conventional safety devices in a DYNlink solution and transform between DYNlink signals and conventional safety signals, while maintaining the highest level of safety. This means that most conventional safety devices can be used in a DYNlink solution when used together with a suitable Tina adapter.

Programmable logic
Quite often, there is a need for logic between the different safety functions. For instance:
IF (“door A” AND “door B” are open) OR (“door C” is open) THEN “Action 1”.
A logic like this can be hardwired without using programmable safety controllers, but the cabling becomes much more complicated, modifications are time consuming, errors happen more often and are difficult to find.
With a programmable safety controller, the safety devices are simply connected to the safe inputs of the controller and the logic is made in the program of the safety controller. The logic is then easy to modify without changing anything in the cabling. The Pluto Manager programming software allows you to view the active logic and see on screen if there are any problems, which means much faster troubleshooting.

Standards
Some of the more important safety standards to follow when designing safety solutions are:
- CSA Z1002-12 risk assessment and control
- CSA Z432-16 Safeguarding of machinery
- EN ISO 12100 - Risk assessment
- EN ISO 13849 - Performance Level
- EN ISO 62061 - SIL
- ISO/TR 23849 - Guidance on the use of the PL and SIL standards
- EN 60204 - Electrical equipment

Safety relay
Sentry

The Sentry safety relays are powerful and easy to use safety relays, suitable for all common types of safety applications.

The Sentry series contains basic models for simple applications and easy output expansion, as well as highly flexible models with extremely accurate timer functions.

Sentry safety relays are used in both simple and more advanced safety solutions when safety devices need to be monitored according to the requirements of functional safety standards.

Continuous operation

LEDs and display
3-colour LEDs allow for more status messages and simplify troubleshooting. Models with display offer preset configurations and extensive fault information.

Advanced timer functions
Timer functions with an accuracy of ± 1% minimize unnecessary downtime.

Multi-reset
The multi-reset function enables reset of up to 10 Sentry safety relays using just one reset button.

Optimized logistics

Universal models
A single safety relay for all common safety applications reduces stock and saves warehouse space.

Multi-voltage
Multi-voltage models offer more flexibility and less stock.

Compact size
All models are only 22.5 mm wide, even models with 2 NO + 2 NO outputs.

Easy to install

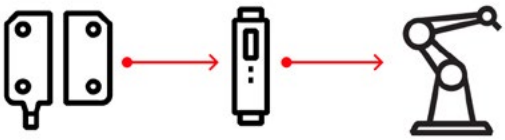
Detachable terminal blocks
Detachable terminal blocks speed up connection and replacement.

Switch for reset selection
Manual or automatic reset easily selectable by switch.

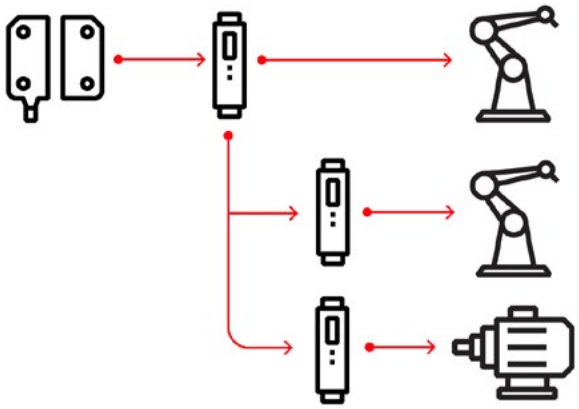
Powerful outputs
Powerful outputs allow you to drive larger contactors and simplify installation by saving the use of an intermediary contactor.

Applications
Sentry

Monitoring of safety devices
Sentry safety relays make it easy to reach the required level of safety when monitoring safety devices like emergency stop buttons, door switches, light guards, etc.

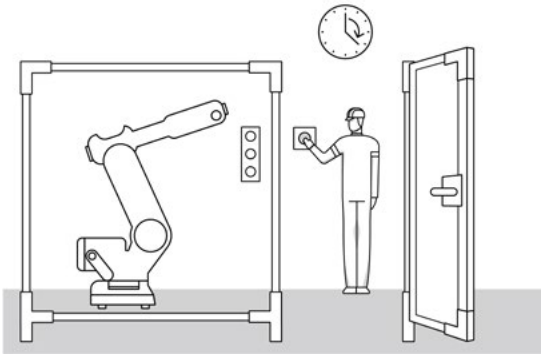


Expansion of safety outputs
Sentry expansion modules are used to increase the number of safety outputs of a safety control module in order to control more machinery.



Features
Sentry

Timer functions with an accuracy of ± 1%
Several timer functions are available: On/Off-delay, time bypass and time reset.
On/Off-delay are used to postpone the activation/deactivation of the safety outputs with a preset time delay. This is used in e.g. Category 1 stops.
Time bypass activates the safety outputs for a maximum predefined time when the safety inputs are closed. Inching is an example of application.
Time reset activates the safety outputs for a maximum predefined time when the safety inputs are opened. Pre-reset is an example of application.
An accuracy of ± 1% allows a very precise time to be set in order to increase safety and minimize unnecessary downtime.



Multi-reset
The multi-reset function enables reset of up to 10 Sentry safety relays using just one reset light-button. This simplifies connection, minimizes cabling and unnecessary downtime. The multi-reset function is available for all +24 VDC Sentry models offering manual reset.

Light-button function
The light-button function is used for the multi-reset function, but can also be used for a standard reset button.
The function of the LED in the light-button is the following:
- on - at least one input is not accepted
- flashing - all inputs are accepted, reset possible
- off - all inputs accepted, reset performed, outputs active

Note: if an input is accepted it means that the door is closed, the light curtain is not interrupted, etc.

Configurable models with display
The models with display are configurable and the user can choose between preset configurations and a custom configuration that can be protected by password.

Faster troubleshooting with display
The display minimizes troubleshooting by giving extensive information about internal faults, I/O faults, system faults, function faults and a log of the last 10 errors.

Switch for selection of the reset function
All models can be used in automatic reset and some models allow you to choose manual reset, either by switch or by configuration, which simplifies connection. In order to prevent mistakes, it is not possible to change reset function during operation by just flipping the switch.

Powerful outputs
The outputs have a switching capacity of up to 6A DC-13. This allows Sentry to drive larger contactors and saves the use of an intermediary contactor.

Delayed outputs
Some Sentry models have delayed outputs in order to e.g. give a machine time to apply breaking force before power is disconnected. For models with 2 NO + 2 NO outputs, it is only the second pair of NO outputs that is delayed. For models with 3 NO + 1 NC, all outputs are delayed.

Single function or universal models
Sentry **SSR** models are single function safety relays designed for a specific application such as 1 and 2 channel devices, OSSD devices or two-hand devices. Sentry **USR** models are universal safety relays. They are capable of handling most types of applications and safety devices, i.e. 1 and 2 channel devices, OSSD-devices, two-hand devices and contact mats/bumpers/edges. This means that only one type of relay is necessary as a spare, which reduces stock and saves warehouse space.

Ordering information

Sentry

Ordering details

Expansion	Safety devices							Test/ Reset	Safety relay outputs				Timer function			Feature	Power supply		Type	Order code
Expansion of safety controller outputs	1 channel	2 channels with equivalent contacts	2 channels with antivalent contacts	OSSD outputs / PNP outputs	Contact mats, bumpers and safety edges c)	Two-hand devices	Manual reset (all models have auto reset)	Start/Test	3 NO + 1 NC	4 NO	2 NO + 2 delayed/delayable NO	4 NO + 1 NC	Off-delay 0.5 s	Off-delay 1.5 s	Advanced timer functions 0 – 999 s d)	Configuralble with display	85-265 VAC / 120-375 VDC	+24 VDC	P=push-in terminals	
a)	●	b)						●	●									●	BSR10	2TLA010040R0000
																			BSR10P	2TLA010040R0001
a)	●	b)						●		●								●	BSR11	2TLA010040R0200
																			BSR11P	2TLA010040R0201
a)												●						●	BSR23 e)	2TLA010041R0600
																			BSR23P e)	2TLA010041R0601
●	●	●		●			●		●									●	SSR10	2TLA010050R0000
																			SSR10P	2TLA010050R0001
●		●					●		●								●		SSR10M	2TLA010050R0100
																			SSR10MP	2TLA010050R0101
						●	●		●									●	SSR20	2TLA010051R0000
																			SSR20P	2TLA010051R0001
						●	●		●								●		SSR20M	2TLA010051R0100
																			SSR20MP	2TLA010051R0101
	●	●		●			●				●		●					●	SSR32	2TLA010052R0400
																			SSR32P	2TLA010052R0401
	●	●		●			●				●			●				●	SSR42	2TLA010053R0400
																			SSR42P	2TLA010053R0401
●	●	●		●					●				●	●	●	●		●	TSR10	2TLA010060R0000
																			TSR10P	2TLA010060R0001
●	●	●		●					●				●	●				●	TSR20	2TLA010061R0000
																			TSR20P	2TLA010061R0001
●		●							●				●	●			●		TSR20M	2TLA010061R0100
																			TSR20MP	2TLA010061R0101
	●	●	●	●	●	●	●		●				●	●	●	●		●	USR10	2TLA010070R0000
																			USR10P	2TLA010070R0001
	●	●	●	●	●	●	●				●		●	●	●	●		●	USR22	2TLA010070R0400
																			USR22P	2TLA010070R0401

a) These models can also be used for expansion of Pluto safe transistor outputs (-24 VDC)
b) No monitoring of two-channel fault, i.e. max Category 3 without fault exclusion.
c) The safety relay detects a short-circuit, not a change in resistance.
d) Off-delay, On-delay, Time bypass or Time reset.
e) BSR23 must be monitored by another device in order to reach higher than Category 1/PL c according to EN ISO 13849-1, for example a safety relay, a safety PLC or an Orion light guard (EDM function).

Accessories

Description	Type	Order code
Screw terminal block for Sentry safety relays. One piece.	S30A	2TLA010099R0000
Push-in terminal block for Sentry safety relays. One piece.	S30C	2TLA010099R0001
Coding kit for terminal blocks. One kit for one Sentry relay.	S30B	2TLA010099R0100

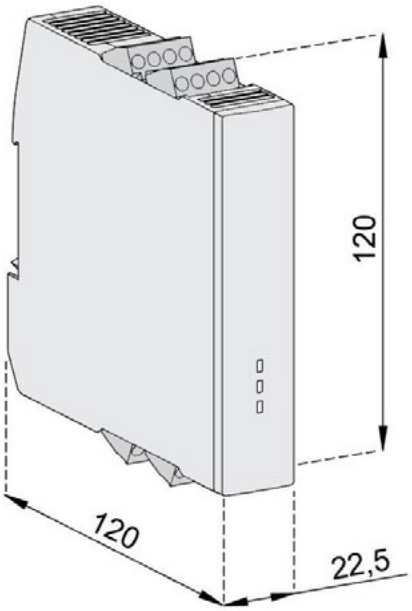
Technical data
Sentry

Technical data				
Approvals				
Conformity	CE			
	2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS			
	EN ISO 12100:2010, EN ISO 13849-1:2015, EN 62061:2005+A2:2015, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 61508:2010			
Functional safety data				
	BSR10	BSR11, BSR23	SSR10, SSR10M, SSR20, SSR20M, TSR10, TSR20, TSR20M, USR10	SSR32, SSR42, USR22
EN/IEC 61508:2010	SIL3, PFHD = 3.0 x 10-9	SIL3, PFHD = 4.1 x 10-9	SIL3, PFHD = 4.9 x 10-9	SIL3, PFHD = 9.3 x 10-9
EN/IEC 62061:2005+A1:2013	SILCL3, PFHD = 3.1 x 10-9	SILCL3, PFHD = 4.1 x 10-9	SILCL3, PFHD = 4.9 x 10-9	SILCL3, PFHD = 3.9 x 10-9
EN ISO 13849-1:2008	PL e, Cat. 4, PFHD = 3.1 x 10-9	PL e, Cat. 4, PFHD = 4.1 x 10-9	PL e, Cat. 4, PFHD = 4.9 x 10-9	PL e, Cat. 4, PFHD = 3.9 x 10-9
	Note! The relays must be cycled at least once a year.			
Electrical data				
Operating voltage	+24 VDC (19.2-27.6 VDC) PELV / SELV			
	Mains models: 85-265 VAC (50 / 60 Hz) or 120-375 VDC			
Response time at deactivation	20 ms			
Maximum switching capacity				
DC13, DC1	Up to 6 A (except relays with 2 NO + 2 NO outputs that switch 3 A)			
AC15, AC1	Up to 5 A (except relays with 2 NO + 2 NO outputs that switch 3 A)			
Mechanical data				
Operating temperature	BSR10, BSR11, BSR23, SSR10M, SSR20M, TSR20M -10 °C to 55 °C SSR10, SSR20, SSR32, SSR42, TSR10, TSR20, USR10, USR22 -10 °C to 65 °C			
Humidity range	25% ... 90%			
Protection class	IP20 (enclosure/electrical cabinet must have at least an IP54)			
Mounting	35 mm DIN rail (DIN 50022)			
Minimum space between relays in the enclosure	0 mm			

***More information**
Fore more information, e.g. the complete technical information, see product manual:
Sentry 2TLC010002M0201
Connection diagrams
For Sentry connection diagrams please see https://library.abb.com/

Dimension drawing

Sentry



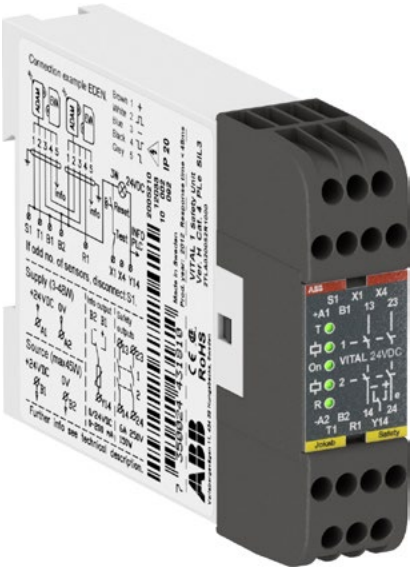
All dimensions in mm

Safety controller
Vital

Vital is a configurable safety controller that does not require programming. It uses the DYNlink system, which allows up to 30 safety devices to be connected in series to the same circuit, while achieving PL e.

This enables a single Vital to supervise all safety functions on many machines that otherwise would have required a programmable safety controller or multiple safety relays.

Vital is also commonly used to supervise all emergency stops for larger machine lines.



Speed up your projects

Easy connection
Reduced installation and engineering time thanks to simple installation with serial connection using M12 connectors.

No programming required
The use of only one safety module without any programming simplifies engineering, commissioning and replacement.

Less components
Significantly less components needed to achieve PL e/SIL 3.

Continuous operation

LED diagnostics
Integrated LED diagnostics reduces down time when troubleshooting.

Detachable connection blocks
Detachable connection blocks simplify replacement.

Exchange without configuration
The configuration is made with jumpers in the detachable connection blocks. In case of exchange, the new unit automatically gets the correct configuration.

Safety and protection

Easy to reach highest safety level
The DYNlink solution makes it possible to maintain the highest level of safety with up to 30 sensors connected in series.

Extensive fault detection
The DYNlink solution enables unique fault detection features and prevents 2-channel faults.

Applications and features
Vital

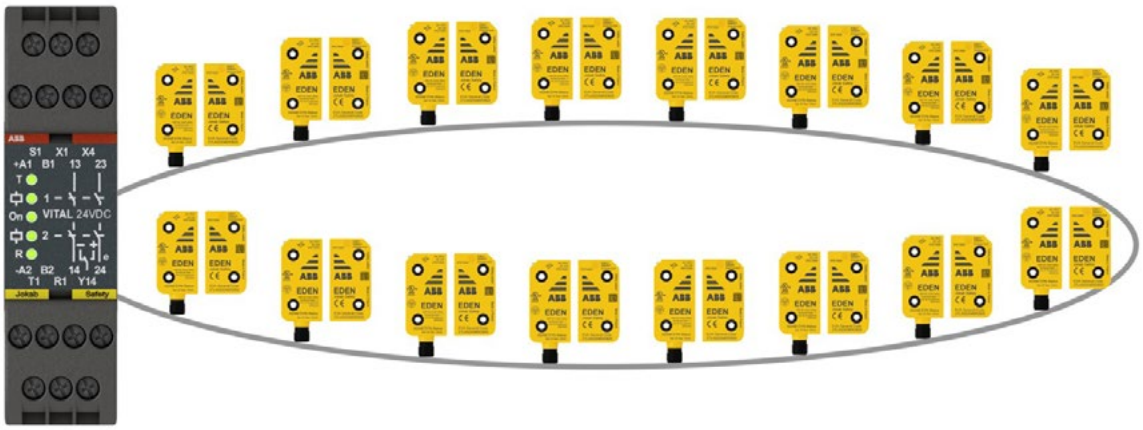
Applications

Vital safety controller excels at supervising multiple safety devices on the same machine, since up to 30 safety devices can be connected in series to the same input while achieving up to PL e. Typical applications are machines with multiple doors/hatches or emergency stop buttons.

Features

DYNlink
The DYNlink circuit is a unique solution that uses one single channel to achieve up to Cat. 4/PL e. Vital sends out a square wave signal that is inverted by each safety device. A connection between B1 and S1 sets if Vital should receive a non-inverted signal, i.e. an even number of devices are connected (no shunt indicates an odd number). Vital checks the returning signal 200 times/second and a fault such as a short circuit will be detected before any safety device is used.

Vital can only be used with DYNlink safety devices, such as Eden DYN, and devices with a Tina adapter.



Ordering information
Vital

Description

DYNlink circuits	Maximum DYNlink devices	Safe outputs	Type	Order code
1	30	2 NO	Vital 1	2TLA020052R1000

Tina adaptation units to DYNlink

The Tina devices adapt the DYNlink signals from Pluto to safety components with mechanical contacts, such as E-stops, switches and light beams/curtains with dual outputs. Tina is available in several versions depending on the type of safety component that is connected to the DYNlink solution. Also available is connector blocks and a blind plug.

Type of safety device	Type of connection to the DYNlink loop	Description	Type	Order code
Devices with positively driven force-guided contacts like E-stop buttons and key switches	Via the device connection	Mounted directly on the device enclosure to a M20 cable entry.	Tina 2A	2TLA020054R0100
		Placed inside the safety device enclosure	Tina 2B	2TLA020054R1100
	M12-5 male connector	Mounted directly on the device enclosure to a M20 cable entry.	Tina 3A	2TLA020054R0200
	M12-5 male connector with extra conductor for the supply of the safety device	Two circuits and with supply voltage for the safety sensor. Connects to a M20 cable entry.	Tina 3Aps	2TLA020054R1400
Devices with positively driven force-guided contacts like E-stop buttons and key switches	Removable terminal blocks	Mounted on a DIN rail in the electrical cabinet. Note that thte connected safety device(s) must be mounted on the same cabinet.	Tina 7A	2TLA020054R0700
Devices with OSSD outputs like Orion light guards	M12-5 male connector	Adaptation of OSSD to DYNlink. Two M12 connectors.	Tina 10A v2	2TLA020054R1210
		Adaptation of OSSD to DYNlink with possibility to connect a local reset button. Three M12 connectors.	Tina 10B v2	2TLA020054R1310
		Adaptation of OSSD to DYNlink with possibility to power the transmitter. Three M12 connectors.	Tina 10C v2	2TLA020054R1610

Connection blocks for serial connection of DYNlink devices (or devices with Tina adapter)

Description	Type	Order code
Tina 1A is a blind plug connected to the unused M12 connectors of the connection blocks Tina 4A and Tina 8A.	Tina 1A	2TLA020054R0000
Connection block for the serial connection of up to 4 DYNlink devices with M12-5 connectors	Tina 4A	2TLA020054R0300
Connection block for the serial connection of up to 8 DYNlink devices with M12-5 connectors	Tina 8A	2TLA020054R0500
Connection block for the serial connection of two DYNlink devices with M12-5 connectors	Tina 11A	2TLA020054R1700
Connection block for the serial connection of two DYNlink devices with M12-8 connectors, e.g. Magne.	Tina 12A	2TLA020054R1800

Technical data
Vital

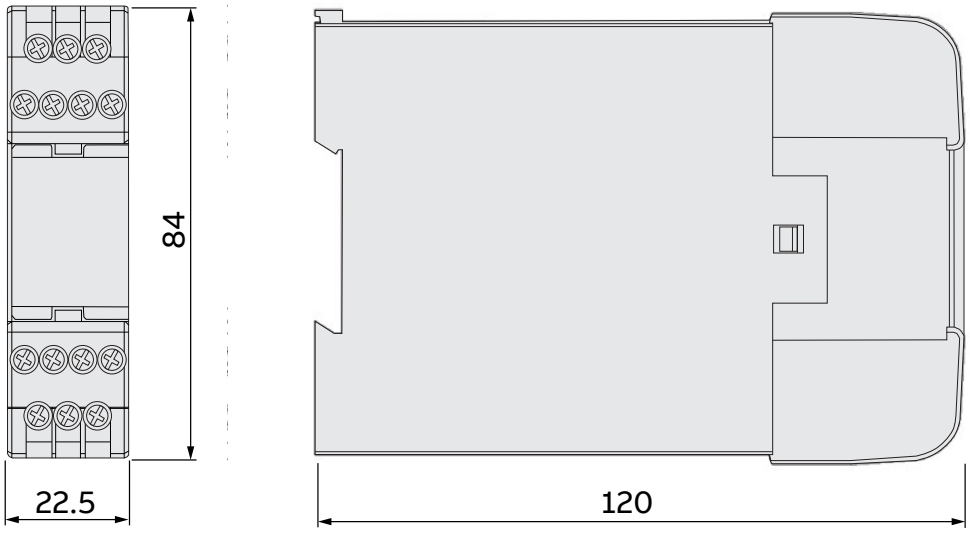
Technical data	
Approvals	TÜV NORD
Conformity	CE 2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS EN ISO 12100:2010, EN ISO 13849-1:2015, EN 62061:2005+A1:2013, EN 60204-1:2006+A1:2009+Cor.:2010, EN 60664-1:2007, EN 61000-6-2:2016, EN 61000-6-4:2007, EN 61496-1:2013
Functional safety data	
EN 61508:2010 EN 62061:2005+A1:2013 EN ISO 13849-1:2008	SIL3
	SILCL3
	PL e, Cat. 4
PFHD Relay output	2.74 × 10-8
Electrical data	
Power supply	+24 VDC ± 15%
AC-1	250 VAC / 6 A / 1500 VA
AC-15	240 VAC / 2 A
DC-1	24 VDC / 6 A / 150 W
DC-13	24 VDC / 1 A
Number of sensors	
Max. number of Eden DYN or Tina units per input	30
Total max. cable length (depending on the number of Eden/Tina units)	1000 m
Operating temperature	-10 °C to +55 °C

More information
Fore more information, e.g. the complete technical information, see product manual for:
Vital 1: 2TLC172156M0201
Connection diagrams
For Vital connection diagrams please see https://library.abb.com/

Dimension drawings

Vital

Vital 1



Notes

Programmable safety controller
Pluto

The safety controllers from ABB can monitor anything from a single safety function to complete manufacturing lines.

Pluto is a cost effective, powerful and compact programmable safety controller used in a variety of applications: in large and small systems, for process and functional safety, and even on trains.

Pluto can control most types of safety devices on the market, as well as ABB Jokab Safety DYNlink safety devices, analog sensors, encoders, contactors, valves and many more. Programming is done easily in the complimentary software, Pluto Manager.

The models with safety bus communication simplify the design of safety systems, thanks to our All-Master concept. A wide range of gateways allows communication with other networks and also remote monitoring of a Pluto system.

Speed up installation

Great flexibility
Up to 32 Pluto units can exchange data on the same safety bus, and the unique All-Master system allows simple scaling, splitting and modification.

Powerful yet compact
Unexpected features for its size, like real programming and speed monitoring, enables replacement of more complex PLC systems in some applications.

More sensors and less cabling
The DYNlink solution allows series connection of up to 10 safety devices on each input. StatusBus and light button feature also reduces cabling to a minimum.

Optimum interface

Programming software free of charge
Pluto Manager is an easy to use PC based programming software provided free of charge.

Easy programming
Ready-made TÜV approved function blocks for safety functions make it easy to reach PL e/SIL3. Ladder logic and text programming allow the design of more advanced functions and the control of complete machines.

Communication with external networks
Pluto gateways provide a two-way communication between the Pluto safety bus and other field buses.

Continuous operation

Easy modification
Easy and quick replacement of units without any configuration.

Flexible monitoring
Online monitoring from any Pluto in the system and remote monitoring and control with an Ethernet gateway.

Features
Pluto

I/Os
Failsafe inputs (I) are used to connect the safety devices to be monitored. Some of them can be used as analog inputs and counter inputs. The choice is made in the Pluto program when the I/Os are configured. Depending on the model, the analog inputs can be low resolution 0-27 V or high resolution 0-10 V/4-20 mA. The fast counter inputs can handle frequencies up to 14 kHz.

Failsafe inputs/non-failsafe outputs (IQ) are terminals that can be used as failsafe inputs or communication outputs (non-failsafe). The choice is made in the Pluto program when the I/Os are configured. A specific configuration is “light button” which means that both the contact and the LED indicator of an illuminated push-button are connected to only one IQ, thus saving one I/O.

Failsafe outputs (Q) are individually safe and independently programmable outputs. There are both relay and transistor outputs. The transistor outputs deliver a negative voltage (-24 VDC) that facilitates the detection of a short circuit with other voltage potentials and increases safety. The transistor outputs are primarily intended for electromechanical components such as contactors and valves.

DYNlink solution
The DYNlink circuit is a unique solution that allows up to 10 DYNlink devices to be connected in series to a Pluto input while still reaching up to Cat. 4/PL e/SIL3. This saves inputs and cabling, since to reach the same level with standard two-channel safety devices, two inputs are necessary and series connection is not possible. The DYNlink solution checks the signal 200 times/second and a fault such as a short circuit will be detected before any safety device is used. Examples of DYNlink devices are Eden and Smile Tina. Most two-channel safety devices can be connected to the DYNlink solution using Tina adapters.

StatusBus functionality
The StatusBus functionality is available with some DYNlink devices and allows to collect the status of each individual safety device, even when connected in series. A single input on Pluto can collect the status of up to 30 safety devices. The devices are connected using standard cable and M12-5 connectors. No specific bus cable or extra communication module is necessary. All Pluto models offer the StatusBus functionality.

StatusBus logotype

Safety bus with All-Master function
The unique All-Master system allows simple scaling, splitting and modification of the safety system.

In a traditional safety PLC network, there is one Master and additional Slave units. But for Plutos connected to a safety bus, all units are Masters and make their own decisions, while still having the possibility to listen to what is happening to the other Plutos on the safety bus. This enables great flexibility when it comes to modification of the safety system. It also enables very simple replacement of a broken Pluto, since all Plutos have a copy of the application software of all other Plutos on the safety bus stored locally. If the replacement Pluto is given the same ID as the broken Pluto (using IDFIX), the software is downloaded from the safety bus with a simple button on the front of Pluto.

Up to 32 Pluto units can be connected to the Pluto safety bus. The Pluto S20 and S46 are stand-alone models and cannot be connected to the Pluto safety bus. All other models have bus functionality. The Safety bus functionality is necessary in order to use a Pluto gateway.

Features
Pluto

Pluto Manager
Pluto Manager is the programming software for Pluto, downloaded free of charge from our website http://new.abb.com/low-voltage/products/safety-products/programmable-safety-controllers/pluto
An update function in Pluto Manager helps you to always have the latest version installed as long as you have an Internet connection. Pluto Manager is a user friendly PC software that allows a simple configuration of the Pluto I/Os and programming in ladder logic and with TÜV approved function blocks.

Examples of what the available function blocks can handle:
- Two-channel safety devices, with or without Reset and Monitoring
- Single channel functions with Reset
- Muting functions
- Encoders and counters
- Communication with Gateways and StatusBus

Examples of ladder logic functions provided:
- Boolean instructions, Edge/inverted edge detection, Latch function, Toggle
- Timers
- Addition, Subtraction, Multiplication, Division
- Remanent memories
- Registers: 16 and 32 bit
- Sequence programming
- Option handling
- Online monitoring

In Pluto Manager there is a unique Option handling function suitable for series production of machines with different customer options. All versions of a machine type can have the same PLC program. To handle the different customer options, check boxes are used to set memories that activate the different functions of the code.

Current monitoring
Pluto A20 has a special current monitoring function. The function is mainly used to check if the connected muting lamps are working.

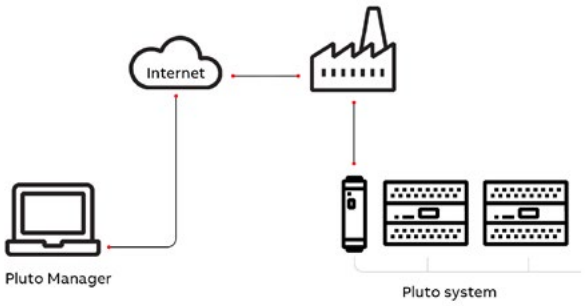
Harsh Environment
Pluto D20 and D45 are available in models that are suited for harsh environments and railway rolling stock in particular. These models have certificates for railway standards (e.g. EN 50126) and comply with standards for railway applications (EN 50155) that includes requirements on important electrical and mechanical aspects, as well as fire and smoke protection standard (EN 45545).

Remote monitoring and control
Remote monitoring allows the connection to a remote Pluto system via the Internet and an Ethernet gateway. Pluto Manager is used for the monitoring.
This function can be used for:
- Support of local maintenance personnel during trouble-shooting
- Regular monitoring of the status of the machine or process
- Follow-up of operational data like number of cycles/day or
- runtime.

Pluto Manager also offers remote control of a Pluto system using the Internet and an Ethernet gateway.
With the remote control function it is possible to:
- Download a program from PC to the remote Pluto
- Configure addressing of StatusBus slaves, write IDFIX code

The security of the remote control function is guaranteed by the use of the K-button on the Pluto. A change in a remote Pluto system cannot be made without a person at the remote Pluto confirming the action by pressing the K-button.

Configuration of the gateway itself, e.g. switching remote control on/off, can only be made via the programming port on the gateway and not via the Ethernet port.



Accessories

Pluto

Pluto gateways
Pluto gateways provide two-way communication between the Pluto safety bus, i.e. all the Pluto units connected to it, and other field buses. Several models are available for the most common field buses. Ready-made function blocks in Pluto Manager facilitate the communication. A gateway can be located anywhere on the Pluto safety bus.

Pluto safe encoders
Rotary absolute encoders can be used for safe position determination. Our safe encoders are intended to be connected to the Pluto safety bus. They are available in single and multi-turn versions, with shaft or hollow shaft. Up to 16 absolute encoders can be connected to a Pluto safety bus. In Pluto Manager, specific function blocks make it easy to read and evaluate the values of two encoders forming a PL e/SIL3 solution. Apart from position, the speed values are available which means that also zero speed and overspeed can be monitored.

Examples of applications are gantry robots, industrial robots, and also eccentric shaft presses, where the encoders can replace existing cam mechanisms.

Operator panels
An operator panel can be connected to the programming port of Pluto with a specific cable and communicate with Pluto in MODBUS ASCII. We recommend the ABB CP600 series operator panels that offer the appropriate communication driver. An operator panel can also communicate with Pluto via a GATE-MT gateway.

Ordering information

Pluto

Pluto ordering table

Pluto is available in different models depending on the needs of your application.
Optional features includes bus communication, high resolution analog inputs, current monitoring and adaption for harsh environments.

Safety bus	Failsafe outputs a)	Failsafe inputs (max) b)	Analog inputs (max) b)	Fast counter inputs (max) b)	StatusBus inputs (max) b)	Non failsafe outputs (max) b)	Width mm	Type	Order code
No	4	16	1 c)	-	4	8	45	Pluto S20	2TLA020070R4700
	6	40	3 c)	-	4	16	90	Pluto S46	2TLA020070R1800
Yes	-	22	1 c)	-	4	8	45	Pluto B22 e)	2TLA020070R4800
	2	4	-	-	2	2	45	Pluto O2 f)	2TLA020070R8500
	4	16	1 c)	-	4	8	45	Pluto A20 g)	2TLA020070R4500
								Pluto B20	2TLA020070R4600
			4 d) + 1 c)	-	4	8	45	Pluto D20	2TLA020070R6400
								Pluto D20 (Harsh Env) h)	2TLA020070R6401
	6	40	3 c)	-	4	16	90	Pluto B46	2TLA020070R1700
		39	8 d)	4	4	15	90	Pluto D45	2TLA020070R6600
								Pluto D45 (Harsh Env) h)	2TLA020070R6601

a) Failsafe outputs

2 failsafe outputs:
- -2 independent individually safe potential free relay outputs (Q0 and Q1) with 3 contacts each

4 failsafe outputs:
- -2 independent individually safe potential free relay outputs (Q0 and Q1)
- -2 independent individually safe transitor outputs (-24 VDC) (Q2 and Q3)

6 failsafe outputs:
- -2 independent individually safe potential free relay outputs (Q0 and Q1)
- -2 independent individually safe potential free relay outputs with common supply (Q4 and Q5)
- -2 independent individually safe transistor outputs (-24 VDC) (Q2 and Q3)

b) -The number of failsafe inputs available decreases with the number of used non-failsafe outputs, analog inputs, fast counter inputs and StatusBus inputs.
-The number of analogue inputs available decreases with the number of used fast counter inputs.
-The number of non-failsafe outputs available decreases with the number of StatusBus inputs used.
Check the Pluto hardware manual for more information.

c) 0-27 V analog inputs

d) 0-10 V/4-20 mA (high resolution) analog inputs

e) Expansion model with failsafe inputs and no failsafe outputs.

f) Expansion model with 2 failsafe outputs with 3 contacts each. Also possible to use as stand-alone unit.

g) Model with current monitoring

h) Pluto D20 (Harsh Env) and Pluto D45 (Harsh Env) have coated circuit boards and can be used in severe environments where cold and condensation can cause problems, like on trains and other vehicles and in the wind energy segment.
- They comply with railway standard EN 50155
- They can be used on all trains up to the highest hazard level (HL3) according to the fire and smoke protection standard EN 45545.

Ordering information

Pluto accessories

IDFIX identifiers

IDFIX is an identification circuit that is connected to Pluto. It must be used:
when several Pluto are connected to the Pluto Safety bus (IDFIX-R or IDFIX-RW)

Description	Type	Order code
Pre-programmed unique identification number.	IDFIX-R	2TLA020070R2000
Programmable identification number, i.e. the user can choose the identification number.	IDFIX-RW	2TLA020070R2100
Storage of the Pluto program, 10 Kbyte. Especially useful for stand-alone Pluto.	IDFIX-PROG 10k	2TLA020070R2600

Pluto cables and connection accessories

Description	Type	Order code
Pluto programming and on-line monitoring cable. For a PC serial port, 9-pole D-sub connector.	Pluto cable serial	2TLA020070R5600
Pluto programming and on-line monitoring cable. For a PC USB port.	Pluto cable USB	2TL A020070R5800
Cable for connecting a HMI-panel to the Pluto programming port. Connector on HMI-side: 15-pole D-sub. On Pluto side: 90 degrees angled Modbus contact.	Pluto cable HMI	2TLA020070R5700
Cable for connecting HMI-panel ABB CP400 to Pluto programming port. Connector on HMI-side: 9-pole D-sub.	Pluto cable CP400	2TLA020070R6700
Cable for connecting HMI-panel ABB CP600 to Pluto programming port. Connector on HMI-side: 9-pole D-sub.	Pluto cable CP600	2TLA020070R6900
Bus cable for Pluto safety bus, 2 x 0.75 mm2. 100-meter ring.	PCABLE-100	2TLA020070R6810
Bus cable for Pluto safety bus, 2 x 0.75 mm2. 500-meter drum.	PCABLE-500	2TLA020070R6850

Other accessories

Description	Type	Order code
Set of function blocks for mechanical presses.	Pluto press block	2TLA020070R4100
Smile reset button for light button function with M12-5 connector.	Smile 11 RB	2TLA030053R0100
Handheld terminal StatusBus. Used for e.g. addressing and test. Connection to PC via USB-micro cable	FIXA	2TLA020072R2000
Terminating resistor for Pluto safety bus. Necessary for each stand-alone Pluto and on the Pluto units at each end of the Pluto safety bus. Should be removed from the other Pluto units.	R120 Resistor	2TLA020070R2200

Ordering information

DYNlink solution

Tina adaptation units to DYNlink

The Tina devices adapt the DYNlink signals from Pluto to safety components with mechanical contacts, such as E-stops, switches and light beams/curtains with dual outputs. Tina is available in several versions depending on the type of safety component that is connected to the DYNlink solution. Also available is connector blocks and a blind plug.

Type of safety device	Type of connection to the DYNlink loop	Description	Type	Order code
Devices with positively driven force-guided contacts like E-stop buttons and key switches	Via the device connection	Mounted directly on the device enclosure to a M20 cable entry.	Tina 2A	2TLA020054R0100
		Placed inside the safety device enclosure	Tina 2B	2TLA020054R1100
	M12-5 male connector	Mounted directly on the device enclosure to a M20 cable entry.	Tina 3A	2TLA020054R0200
	M12-5 male connector with extra conductor for the supply of the safety device	Two circuits and with supply voltage for the safety sensor. Connects to a M20 cable entry.	Tina 3Aps	2TLA020054R1400
Devices with positively driven force-guided contacts like E-stop buttons and key switches	Removable terminal blocks	Mounted on a DIN rail in the electrical cabinet. Note that the connected safety device(s) must be mounted on the same cabinet.	Tina 7A	2TLA020054R0700
Devices with OSSD outputs like Orion light guards	M12-5 male connector	Adaptation of OSSD to DYNlink. Two M12 connectors.	Tina 10A v2	2TLA020054R1210
		Adaptation of OSSD to DYNlink with possibility to connect a local reset button. Three M12 connectors.	Tina 10B v2	2TLA020054R1310
		Adaptation of OSSD to DYNlink with possibility to power the transmitter. Three M12 connectors.	Tina 10C v2	2TLA020054R1610

Connection blocks for serial connection of DYNlink devices (or devices with Tina adapter)

Description	Type	Order code
Tina 1A is a blind plug connected to the unused M12 connectors of the connection blocks Tina 4A and Tina 8A.	Tina 1A	2TLA020054R0000
Connection block for the serial connection of up to 4 DYNlink devices with M12-5 connectors	Tina 4A	2TLA020054R0300
Connection block for the serial connection of up to 8 DYNlink devices with M12-5 connectors	Tina 8A	2TLA020054R0500
Connection block for the serial connection of two DYNlink devices with M12-5 connectors	Tina 11A	2TLA020054R1700
Connection block for the serial connection of two DYNlink devices with M12-8 connectors, e.g. Magne.	Tina 12A	2TLA020054R1800

Ordering information
Accessories

Pluto gateways

With the use of a gateway, Pluto can communicate with other control systems and form a part of a larger network.
The gateway models GATE-D2 and C2 can also be used as an extension of the safety bus cable to extend the Pluto network.

Fieldbus	Ethernet	Type	Order code
CANopen		GATE-C2	2TLA020071R8100
DeviceNet		GATE-D2	2TLA020071R8200
PROFIBUS-DP		GATE-P2	2TLA020071R8000
EtherCAT	x	GATE-EC	2TLA020071R9100
Ethernet/IP	x	GATE-EIP	2TLA020071R9000
Modbus TCP	x	GATE-MT	2TLA020071R9400
PROFINET	x	GATE-PN	2TLA020071R9300
SERCOS III	x	GATE-S3	2TLA020071R9200

For more information,
see the gateway manuals:
Pluto gateways 2TLC172009M0210,
Pluto Ethernet gateways 2TLC172285M0203

Pluto safe encoders

The safe encoders can be used together with Pluto to safely determine the position of machine movements.

Function	Shaft	Shaft diameter (mm)	Type of connection	Type	Order code
Single-turn	Solid	10	Connector male 12 poles	RSA 597 connector	2TLA020070R3600
		6	1.5 m cable	RSA 597 1.5 m cable	2TLA020070R3300
	Hollow	12	2 m cable	RHA 597 2 m cable	2TLA020070R3400
			10 m cable	RHA 597 10 m cable	2TLA020070R5900
Multi-turn	Solid	10	M12 connector	RSA 698 10 mm solid	2TLA020070R3700

For more information,
see the manual:
Pluto safe encoders 2TLC172006M0206

Pluto safe encoders accessories

Description	Type	Order code
Female 12 pole connector to be used with absolute encoder “RSA 597 connector”. Connector to be mounted on the cable.	Connector for absolute encoder	2TLA020070R3900
M12 plug with Pluto safety bus termination resistor. To be used when the encoder is at one end of the Pluto safety bus.	M12-CANend	2TLA020061R0300

Operator panels

An operator panel (also called HMI) can be connected to the Pluto programming port (on the Pluto front) with a special cable and communicate with Pluto using MODBUS ASCII. We recommend the ABB CP600 series that offer the appropriate communication driver. An operator panel can also communicate with Pluto via a GATE-MT gateway.

Description	Type	Order code
Operator panel, 4.3” touch screen, 480 x 272 pixels	CP604	1SAP504100R0001
Eco cont panel, 7” tft hmi	CP607	1SAP507100R0001
Eco cont panel, 10.1” tft	CP610	1SAP510100R0001
Cont panel, 4.3” tft hmi	CP620	1SAP520100R0001
Cont panel, 5.7” tft hmi	CP630	1SAP530100R0001
Cont panel, 7” tft hmi	CP635	1SAP535100R0001
Cont panel, 10.4” tft hmi	CP651	1SAP551100R0001
Cont panel, 12.1” tft hmi	CP661	1SAP561100R0001
Cont panel, 13.3” tft hmi	CP665	1SAP565100R0001
Cont panel, 15” tft hmi	CP676	1SAP576100R0001

Technical data

Pluto

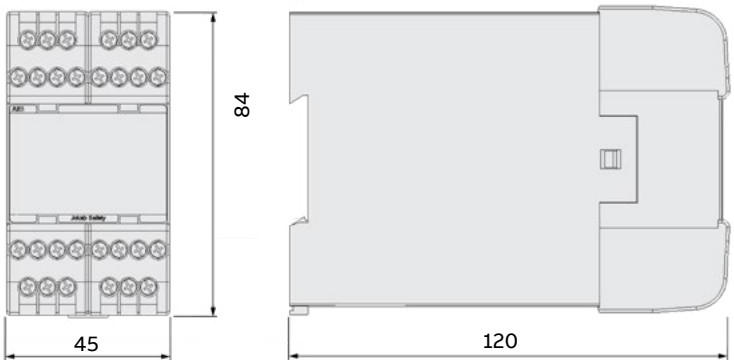
Technical data			
Approvals	Railway: TÜV Rheinland InterTraffic		
Conformity	2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS EN ISO 13849-1:2015, IEC 62061:2015+Corr.1:2015, EN 61496-1:2013(in extracts), EN 574:1996+A1:2008(in extracts), EN 692, EN 60204-1:2006+A1:2009+AC:2010, EN 50178:1997, EN 61000-6-2, EN 61000-6-4, EN 61000-4-1...6, IEC 61508:2010, IEC 61511-1, EN 50156-1, EN 50156-2:2015, ISO 13851:2002 (in extracts)		
Functional safety data			
		PFHD Failsafe relay outputs	PFHD Failsafe transistor outputs
EN 61508:2010	SIL3	2.00 × 10-9	1.5 × 10-9
EN 62061:2005+A1:2013	SILCL3	2.00 × 10-9	1.5 × 10-9
EN ISO 13849-1:2008	PL e/Cat.4	2.00 × 10-9	1.5 × 10-9
Electrical data			
Electrical insulation	Category II in accordance with IEC 61010-1		
Operating voltage	+24 VDC ± 15%		
Failsafe outputs Q	Transistor, -24 VDC, 800 mA		
Q2, Q3		Pluto O2	Pluto O2
Q0, Q1, (Q4, Q5)	Relay outputs AC-12: 250 V / 1.5 A VAC-15: 250 V /1.5 A VDC-12: 50 V /1.5 A DC-13: 24 V / 1.5 A	Relay outputs AC-12: 250 V / 5 A AC-15: 250 V / 3 A DC-12: 60 V / 5 A DC-13: 24 V / 3 A	Relay outputs (33-34) AC-12: 24 V / 1.5 A AC-15: 24 V / 1.5 A DC-12: 24 V / 1.5 A DC-13: 24 V / 1.5 A
Installation	35 mm DIN rail		
Ambient temperature	–10 ˚C to +50 ˚C		
Pluto safety bus			
Max. number of Pluto units	32		
Cable length	Up to 600 m		

More information
For more information, e.g. the complete technical information, see product manual:
Pluto hardware 2TLC172001M0211
Connection diagrams
For Pluto connection diagrams please see https://library.abb.com/

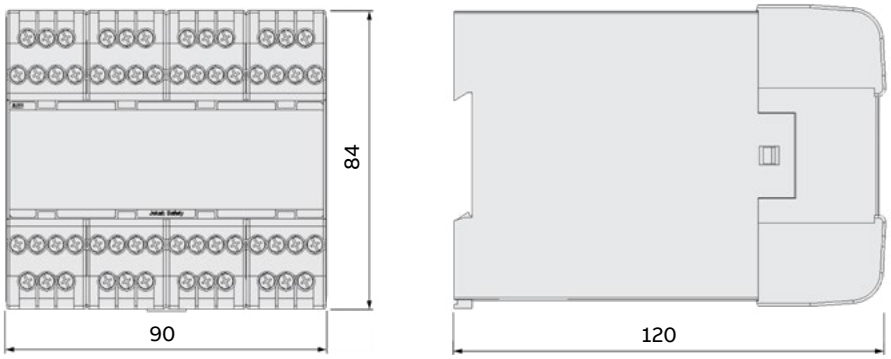
Dimension drawings

Pluto

Single size



Double size



All dimensions in mm

3

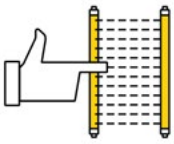
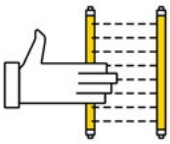
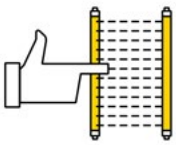
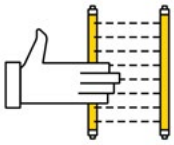
Optical safety devices

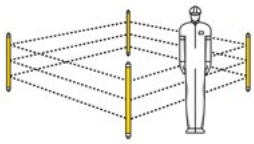
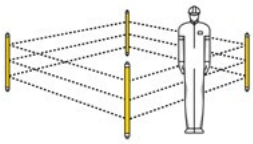
Optical safety devices

Introduction and overview	54
Safety light curtain - Orion1 Base	60
Safety light curtain - Orion1 Extended	68
Safety light grid - Orion2 Base	78
Safety light grid - Orion2 Extended	86
Safety light grid - Orion3 Base	94
Safety light grid - Orion3 Extended	102

Introduction and overview
Selection guide

Light curtains and light grids that cover most types of applications.

	Orion1			
Function	Light curtain, Transmitter + Receiver, Slim profile			
Type	**Orion1 Base**		**Orion1 Extended**	
Type of detection				
	Finger	Hand	Finger	Hand
Resolution	14 mm	30 mm	14 mm	30 mm
Protected height	15-180 cm	15-180 cm	30-180 cm	30-180 cm
Applications	Manually serviced machines with short safety distances.		Manually serviced machines with short safety distances. With advanced features like muting, blanking and cascading.	
Functions				
Range	6 m	19 m	7 m	20 m
Auto/Manual reset	•	•	•	•
EDM	•	•	•	•
Muting			•	•
Override			•	•
Integrated muting lamp				
Blanking			•	•
No dead zone			•	•
Coding			•	•
Cascading			•	•

	Orion2		Orion3	
Function	Light grid, Transmitter + Receiver, Slim profile		Light grid, Active + Passive units, Sturdy profile	
Type	**Orion2 Base**	**Orion2 Extended**	**Orion3 Base**	**Orion3 Extended**
Type of detection	 Body		 Body	
Resolution	2, 3 or 4 beams			
Protected height	50-120 cm			
Applications	Perimeter guarding over long distances	Perimeter guarding over long distances with muting	Perimeter guarding with one-sided connection	Perimeter guarding with one-sided connection and muting
Functions				
Range	50 m	50 m	Up to 8 m	Up to 8 m
Auto/Manual reset	•	•	•	•
EDM	•	•	•	•
Muting		•		•
Override		•		•
Integrated muting lamp		•		•
Blanking				
No dead zone				
Coding				
Cascading				

Introduction and overview
Selection orientation and standards

Choose the right resolution for your application

Finger detection

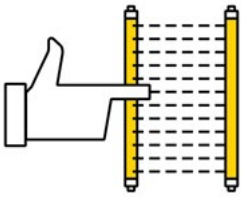
Light curtains with 14 mm resolution are intended for finger detection when the light guard needs to be very close to the machine in order to give the operator a good view and easy accessibility to the machine.

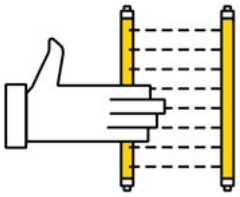
Hand detection

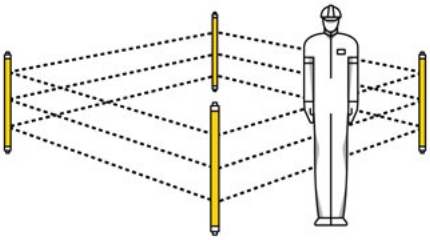
Light curtains with 30 mm resolution are intended for hand detection and area protection and is often a good compromise between cost and accessibility to the machine. They offer a better sensing range than finger detection light curtains, but require a slightly greater safety distance.

Body detection

Light grids have a resolution adapted for detection of the whole body and are intended for perimeter guarding where there is a requirement for high accessibility. They offer a very good sensing range, but require a much greater safety distance than light guards for finger and hand detection.







Resolution and safety distance

The optical safety device must be installed so that no-one can reach the hazardous area without first passing through the detection zone of the light guard. The distance from the hazardous area to the detection zone of the optical safety device must be large enough in order for the machine to have time to stop before someone can reach the hazardous area.
This distance is called the safety distance, and it shall be calculated using the formula from EN ISO 13855.

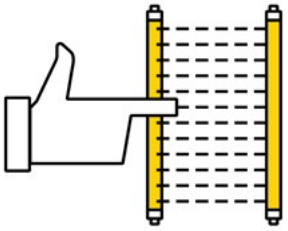
The safety distance is influenced by the distance between each beam in the light guard. The closer the beams are together, the smaller the safety distance can be, which is why light curtains for finger detection can be placed much closer to the hazardous area than light grids for body detection.

Safety distance according to EN ISO 13855

The distance 'S' is the minimum distance between a light curtain and a hazardous area. This is calculated with the formula from EN ISO 13855 - Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body.

$$S = (K \times T) + C$$

S = minimum distance in mm
K = approach speed (of hand or body) in mm/s
T = stopping time of the machine (including reaction time of safety devices) in seconds
C = additional distance in mm based upon the body´s intrusion towards the hazardous area before the safety device has been actuated.

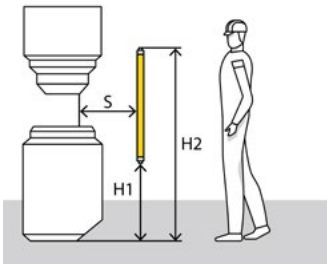


Resolution for finger (≤14 mm) gives C = 0

NB If it is possible to reach the hazard zone by reaching over the light beam, an adjustment is made to the formula. In table 1 in EN ISO 13855 an alternative safety distance addition (C_{ro}) is given to the formula S = (K x T) + C. The greatest value out of C and C_{ro} is to be used to prevent reaching the hazard zone by reaching over the light curtain/grid.

Minimum distances for light curtains installed vertically and horizontally according to EN ISO 13855

S = minimum distance in mm
H1 = the lower beam may not be situated higher than 300 mm above the ground
H2 = the upper beam may not be situated lower than 900 mm above the ground



For S ≤ 500 mm the minimum distance for vertical installation is calculated with the following formula:

$$S = (2000 \times T) + 8 \times (d-14)$$

where d is the light curtain´s resolution in mm.

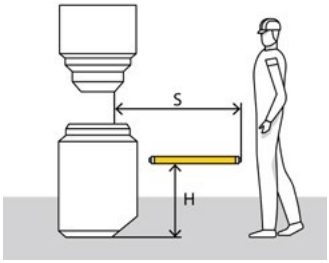
K = 2000 mm/s is used to represent the speed of the hand. The expression (8 x (d-14)) may never be less than 0. Minimum distance S may never be less than 100 mm.

If the minimum distance according to the formula above gets larger than 500 mm one can instead use:

$$S = (1600 \times T) + 8 \times (d-14)$$

K = 1600 mm/s is used to represent the speed of the body. Minimum distance according to this formula is 500 mm.

S = minimum distance in mm
H = the light curtain detection zone must be positioned between 0 and 1000 mm above the floor



The minimum distance for horizontal installation is calculated with the following formula:

$$S = (1600 \times T) + (1200 - 0.4 \times H)$$

where H is the height of the detection zone above the reference plane, e.g. the ground

(1200 – 0,4 x H) may not be less than 850 mm. Depending on the resolution, d, that the light curtain has, there is a minimum height where the detection zone may be placed. This is calculated with:
H = 15 x (d – 50).
H cannot be less than 0. With a resolution d =14 or 30 mm one can therefore install the light curtain from H = 0 and up. The higher it is situated, the shorter the minimum distance gets. The highest permissible height H of the detection zone is 1000 mm.

When you use a horizontal light curtain as perimeter protection, the depth of the light curtain shall be at least 750 mm to prevent people from inadvertently stepping over it. The estimated minimum distance is measured from the machine's hazardous section to the outermost beam of the horizontal light curtain (seen from the machine).

Safety distance according to EN ISO 13855

Minimum distance for light beams according to EN ISO

For light beams the minimum distance is calculated from the following:

$$S = (1600 \times T) + 850 \text{ mm}$$

NOTE! The additional distance will in most cases be more than 850 mm due to the possibility to reach over a light beam. (C_{ro})

The formula applies to light guards with 2, 3 or 4 beams. It is the risk assessment that decides the number of beams that are to be chosen. The following possibilities must be considered.

- to crawl under the lowest beam;
- to reach over the top beam;
- to reach in between two beams;
- that the body passes in between two beams.

To fulfill the requirements the beams shall be installed at the following heights:

Number of beams	Height over the reference plane, e.g. ground
4	300, 600, 900, 1200
3	300, 700, 1100
2	400, 900

Minimum distance for single beams according to EN ISO 13855

A single beam as only protection is normally not suitable to prevent whole body access. Single beams are mostly used in combination with other safety devices or fixed guards.

The risk assessment should determine if a single beam is a suitable protection for the hazard in question.

The safety distance is calculated using:

$$S = (1600 \times T) + 1200 \text{ mm}$$

A height of 750 mm from the reference plane has been found suitable to prevent inadvertent access to the danger zone.

Notes

Safety light curtain
Orion1 Base

Orion1 Base is an easy to use light curtain with compact dimensions and two resolutions for detection of fingers and hands.

Light curtains are usually used closed to the hazardous zone when repeated access to the machine is necessary, for example manually serviced machines.

Light curtains can also be used to limit work zones inside the hazardous area and be mounted horizontally for area protection.

Cost effective solution

No unnecessary functions

Orion1 Base comes with a minimum of advanced functionalities to save cost.

Minimized cabling
A local reset button can be connected directly to the light curtain. In this way there is no need for a cable between the reset button and the electrical cabinet or for an extra control module.

External device monitoring
Each light curtain can monitor the actuators without any extra control module (EDM function).

Continuous operation

Visible alignment level

Since the alignment level is displayed, the alignment can be improved before the occurrence of an unwanted stop.

Extensive error indication
Extensive error indication reduces troubleshooting time.

Protection against harsh environment
Protective tubes and lens shields protect the devices in harsh environments.

Easy to install

Easy to align

Alignment help and a wide angle within the limits of a Type 4 device facilitate alignment. Rotation brackets also simplify alignment.

Easy to connect
M12 connectors speed up cabling.

Applications and features

Orion1 Base

Applications

Vertical mounting

When using standard vertical mounting the light guard can be placed close to the hazard zone. This is suitable for applications where repeated access to the machine is necessary, e.g. manually serviced machines.

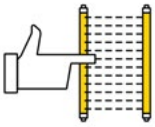
Horizontal mounting

Horizontal mounting is mainly used for area protection and limitation of work zones.

Features

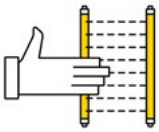
Finger detection

A 14 mm resolution is intended for finger detection when the light guard needs to be very close to the machine in order to give the operator a good view and easy accessibility to the machine. A 14 mm resolution enables a sensing range of 6 m.



Hand detection

A 30 mm resolution is intended for hand detection and area protection and is a good compromise between cost and accessibility to the machine. A 30 mm resolution enables a sensing range of 19 m.

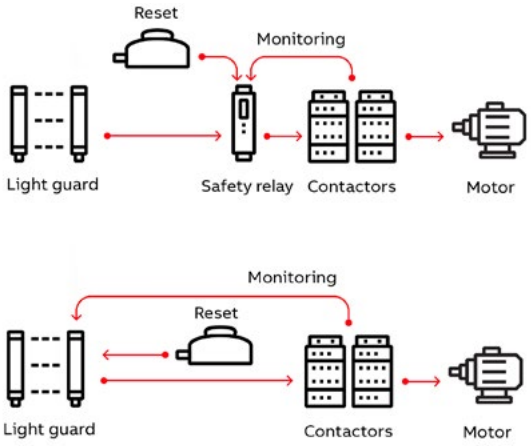


Local reset

A local reset button is connected directly to the light guard instead of to the safety control module in the electrical cabinet. This saves safety relays/PLC inputs and minimizes cabling to the electrical cabinet. Smart accessories simplify connectivity.

EDM

External Device Monitoring is a feature allowing the light guard to supervise the actuators in simpler applications, eliminating the need for a safety relay or programmable safety controller.



Safety light curtain

Orion1 Base

Ordering Details

Detection (Resolution mm)	Protected height mm	Type (Transmitter + receiver)	Order code
Finger (14)	150	Orion1-4-14-015-B	2TLA022300R0000
	300	Orion1-4-14-030-B	2TLA022300R0100
	450	Orion1-4-14-045-B	2TLA022300R0200
	600	Orion1-4-14-060-B	2TLA022300R0300
	750	Orion1-4-14-075-B	2TLA022300R0400
	900	Orion1-4-14-090-B	2TLA022300R0500
	1050	Orion1-4-14-105-B	2TLA022300R0600
	1200	Orion1-4-14-120-B	2TLA022300R0700
	1350	Orion1-4-14-135-B	2TLA022300R0800
	1500	Orion1-4-14-150-B	2TLA022300R0900
	1650	Orion1-4-14-165-B	2TLA022300R1000
	1800	Orion1-4-14-180-B	2TLA022300R1100
Hand (30)	150	Orion1-4-30-015-B	2TLA022302R0000
	300	Orion1-4-30-030-B	2TLA022302R0100
	450	Orion1-4-30-045-B	2TLA022302R0200
	600	Orion1-4-30-060-B	2TLA022302R0300
	750	Orion1-4-30-075-B	2TLA022302R0400
	900	Orion1-4-30-090-B	2TLA022302R0500
	1050	Orion1-4-30-105-B	2TLA022302R0600
	1200	Orion1-4-30-120-B	2TLA022302R0700
	1350	Orion1-4-30-135-B	2TLA022302R0800
	1500	Orion1-4-30-150-B	2TLA022302R0900
	1650	Orion1-4-30-165-B	2TLA022302R1000
	1800	Orion1-4-30-180-B	2TLA022302R1100

Accessories

Orion1 Base

Accessories

Mounting accessories		
Description	**Type**	**Order code**
Orion Test Piece 14 mm	Orion TP-14	2TLA022310R5200
Orion Test Piece 30 mm	Orion TP-30	2TLA022310R5300
Orion Laser pointer	Orion Laser	2TLA022310R5000
4 rotation brackets for Orion1 Base	JSM Orion03	2TLA022310R0100
Kit for mounting of Orion1 & Orion2 in Stand (4 pieces for lengths shorter than 1200 mm)	JSM Orion06	2TLA022310R0400
Kit for mounting of Orion1 & Orion2 in Stand (6 pieces for lengths of 1200 mm or more)	JSM Orion07	2TLA022310R0500
Kit for mounting of Orion1 Mirror in Stand	JSM Orion11	2TLA022310R0900
Orion Plate kit for adjustment of protective stand	Orion Stand Plate	2TLA022312R5000
Deviating mirror to be mounted in Orion Stand with one kit JSM Orion11	Orion1 Mirror*	
Protective stand	Orion Stand*	
Protective tube	Orion WET*	
Lens shield	Orion Shield*	
Connection accessories		
Smile reset button with NO contact	Smile 11 RA	2TLA030053R0000
Smile reset button with NO contact for Pluto	Smile 11 RB	2TLA030053R0100
Smile reset button with NO contact for Orion1 Base	Smile 11RO1	2TLA022316R3000
Y-connector for series connection of DYNlink devices with M12-5 connectors, e.g. Eden	M12-3A	2TLA020055R0000
Y-connector for connection of a Smile reset button to Orion	M12-3R	2TLA022316R0000
Y-connector for easy connection of a transmitter	M12-3D	2TLA020055R0300
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Adaptation of OSSD to DYNlink. Two M12-5 connectors.	Tina 10A v2	2TLA020054R1210
Adaptation of OSSD to DYNlink with possibility to connect a local reset button. Three M12-5 connectors.	Tina 10B v2	2TLA020054R1310
Adaptation of OSSD to DYNlink with possibility to power the transmitter. Three M12-5 connectors.	Tina 10C v2	2TLA020054R1610
Spare parts (included when ordering Orion)		
4 standard brackets for Orion1 & Orion2	JSM Orion01	2TLA022310R0000

*These accessories are available in different sizes.

For more information see:
Orion1 Mirror 2TLC172058L0201,
Orion Stand 2TLC172059L0201,
Orion WET 2TLC172061L0201,
Orion Shield 2TLC172071L0201

For more information about the connection accessories see:
Orion connection accessories 2TLC172101L0201

How to choose correct reset button

Local or global reset	Adaption to DYNlink*	Safety controle module	Type	Useful connection accessories
Local reset button connected to the light guard (Orion in manual reset mode)	Yes	Vital or Pluto	Smile 11RO1	Tina 10B: OSSD to DYNlink + local reset button M12-3A: Serial connection of DYNlink
	No	Any safety control module compatible with light guard	Smile 11RO1	M12-3R: Easy connection of a local reset button
Global reset button connected to the control module (Orion in automatic reset mode)	Yes	Vital	Smile 11 RA	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
		Pluto	Smile 11 RB	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
	No	Any safety control module compatible with light guard	Smile 11 RA**	

* The ABB Jokab Safety DYNlink solution offers the following advantages:
- Serial connection of safety devices while maintaining PLe/cat. 4, up to 25 Tina 10 per Vital and up to 5 Tina 10 per Pluto input.
- Only one safety input of the Pluto instead of two with the standard OSSD outputs.

** Smile 11 RA has one NO contact, which is the most common for reset buttons. Please check what is requested for the chosen safety control module.

Cables and connectors

Orion1 Base

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
	(b)	6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
	(a)	0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
	(c)	10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
	(d)	10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634	2TLA020056R6400
	(e)	1 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100
M12-8 male + female	Female + male	0.2		M12-CTO1BA[1]	2TLA022315R3000
M12-8 male + female	Female + male	0.2		M12-CTO1BM[2]	2TLA022315R3100

Letters (a, b, c, d, e, t1, t2, t3) refer to cables in connection examples, e.g: -2TLC010002T0001 Connection diagram Orion_cables_Tina10_M12-3A_M12-3D

1) M12-CTO1BA (t1) can be used for:
- connection of Orion1 Base to Tina 10A/C
- replacement of Focus II in automatic reset with Orion in automatic reset.
The EDM function should be deactivated in all cases.

2) M12-CTO1BM (t2) can be used for:
- connection of Orion1 Base to Tina 10B or M12-3R for use of a local reset button, for example Smile 11ROx
- replacement of Focus II in manual reset with Orion in manual reset.
The EDM function should be deactivated in all cases.

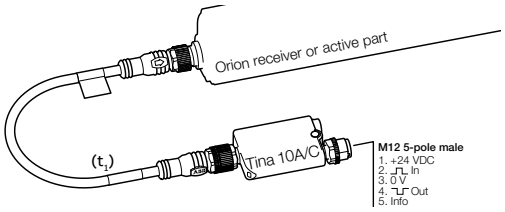
Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Connection examples

Orion1 Base

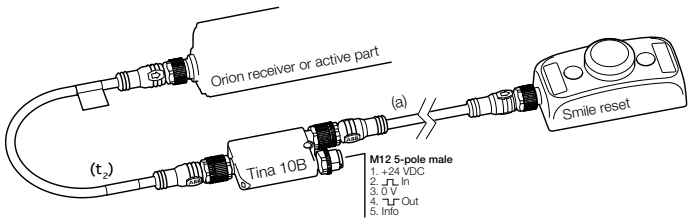
Orion with Tina 10A/C



Without local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10 A/C. To be used with Vital safety control module or Pluto programmable safety controller.

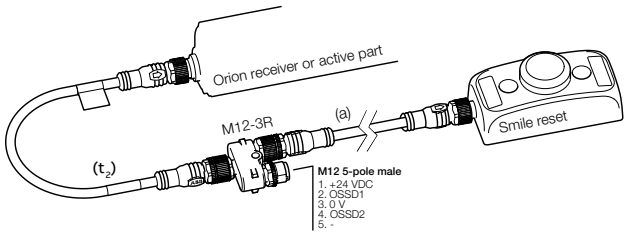
Reset to Orion with Tina 10B



With local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10B. To be used with Vital safety control module or Pluto programmable safety controller.

Reset to Orion with M12-3R



Connection of a local reset button via M12-3R.

Connection diagrams

For Orion1 Base connection diagrams please see https://library.abb.com/

Technical data

Orion1 Base

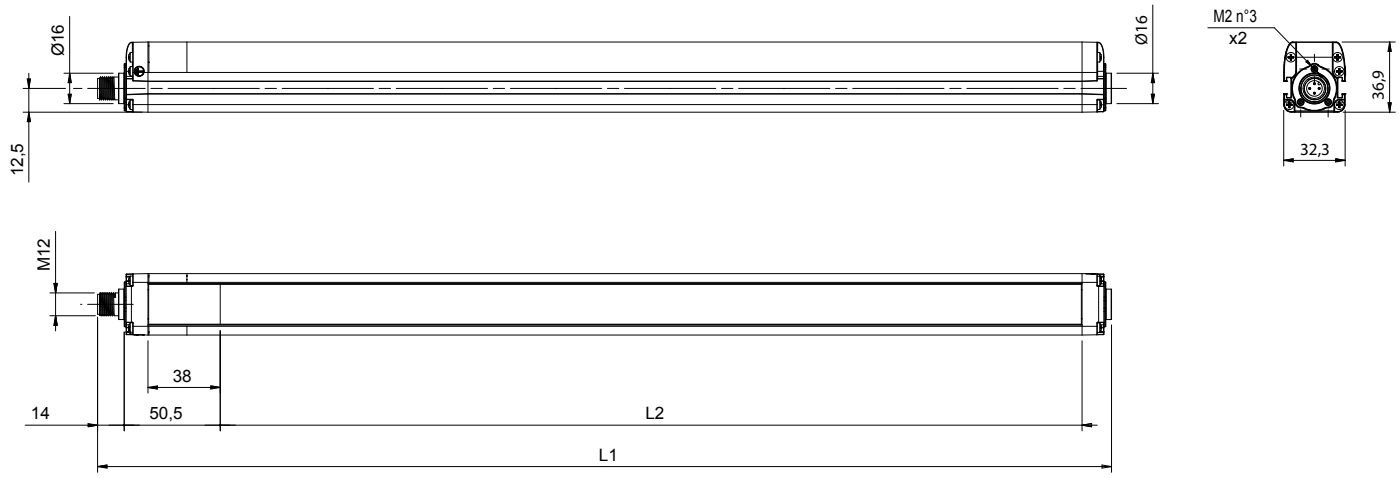
Technical data	
Approvals	
Conformity	CE 2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 13849-1:2008, EN 62061:2005/A1:2013, EN 61496-1:2013, EN 61496-2, EN 61508-1:2010, EN 61508-2:2010, EN 61508-3:2010, EN 61508-4:2010
Functional safety data	
EN 61508:2010	SIL3, PFHD = 2.64 x 10-9
EN 62061:2005+A1:2013	SILCL3, PFHD = 2.64 x 10-9
EN ISO 13849-1:2008	PL e, Cat. 4, PFHD = 2.64 x 10-9
Electrical data	
Power supply	+24 VDC ± 20%
Power consumtion, transmitter	1.5 W max
Power consumption, receiver	4 W max (without load)
Outputs	2 PNP
Short-circuit protection	1.4 A max
Output current	0.5 A max / output
Output voltage – ON	Vdd -1 V min
Output voltage – OFF	0.2 V max
Capacitive load	2.2 µF at +24 VDC max
Cable length (for power supply)	50 m max
Connectors	M12-4 pole male on transmitter (compatible with M12-5 pole female)
	M12-8 pole male on receiver
Optical data	
Light emission (λ)	Infrared, LED (950 nm)
Resolution	14 or 30 mm
Operating distance	0.2…19 m for 30 mm
	0.2…6 m for 14 mm
Ambient light rejection	According to IEC-61496-2:2013
Mechanical data	
Operating temperature	0…+ 55 °C
Storage temperature	- 25…+ 70 °C
Humidity range	15…95% (no condensation)
Protection class	IP65 (EN 60529:2000)
Weight	1.3 kg / meter for each single unit
Housing material	Painted aluminium (yellow RAL 1003)
Front glass material	PMMA
Cap material	PC MAKROLON

More information
For more information, e.g. the complete technical information, please see product manual for:
Orion1 Base 2TLC172287M0201
Connection diagrams
For Orion1 Base connection diagrams please see https://library.abb.com/

Dimension drawings

Orion1 Base

Orion1 Base



All dimensions in mm

Dimension

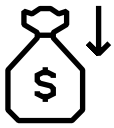
Protected height mm	L1 mm	L2 mm	Type
150	233.3	153.3	Orion1-4-xx-015-B
300	383.2	303.2	Orion1-4-xx-045-B
450	533.2	453.3	Orion1-4-xx-045-B
600	683.3	603.2	Orion1-4-xx-060-B
750	833.2	753.3	Orion1-4-xx-075-B
900	983.2	903.2	Orion1-4-xx-090-B
1050	1133.2	1053.2	Orion1-4-xx-105-B
1200	1283.2	1203.3	Orion1-4-xx-120-B
1350	1433.2	1353.2	Orion1-4-xx-135-B
1500	1583.3	1503.3	Orion1-4-xx-150-B
1650	1733.3	1653.3	Orion1-4-xx-165-B
1800	1883.3	1803.3	Orion1-4-xx-180-B

xx = Resolution

Safety light curtain
Orion1 Extended

Orion1 Extended is an easy to use light curtain with compact dimensions. It has two resolutions for detection of fingers and hands, and comes with advanced features like cascading, muting and blanking.

Light curtains are usually placed closed to the hazardous zone when repeated access to the machine is necessary, for example manually serviced machines.



Cost effective solution

Integrated muting function

Muting sensors are connected directly to the light grid, with no need for a remote muting module.

No dead zones
The light beams cover all of the profile length, without the usual dead zones at the ends requiring extra mechanical guards.

Easy serial connection
Cascading with the standard units: no separate slave or master units.

Easy to install

Easy to align

Alignment help and a wide angle within the limits of a Type 4 device facilitate installation.

Easy to connect
Our cables with M12 connectors speed up connectivity.

Continuous operation

Reduced downtime

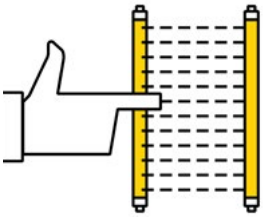
Extensive error indication reduces troubleshooting time.

Interference protection
Protection against mutual interference with coding.

Features
Orion1 Extended

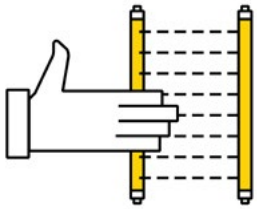
Finger detection

A 14 mm resolution is intended for finger detection when the light guard needs to be very close to the machine in order to give the operator a good view and easy accessibility to the machine. A 14 mm resolution enables a sensing range of 7 m.



Hand detection

A 30 mm resolution is intended for hand detection and area protection and is a good compromise between cost and accessibility to the machine. A 30 mm resolution enables a sensing range of 20 m.

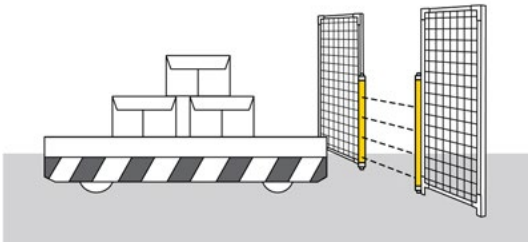


Blanking
The blanking function allows to define a number of beams that can be constantly interrupted without stopping the machine. In this way a fixed material or a cable is allowed in the protected field, but a hand interrupting an extra beam would stop the machine. With floating blanking, the object, for ex. the cable, can move within the protected field.

No dead zones
A special feature of Orion1 Extended is that the light beams cover all of the profile length, without any dead zones. This enables to place it inside openings, instead of having a larger light guard in front of an opening.

Cascading
All Orion1 Extended units can be connected in series (cascaded) to easily create a suitable light curtain setup with no special units needed.

Muting
By connecting muting sensors to the light guard, it can distinguish material from persons and allow the material to pass through an opening but not persons.



Local reset
A local reset button is connected directly to the light guard instead of to the safety control module in the electrical cabinet. This saves safety relays/programmable inputs and minimizes cabling to the electrical cabinet.

EDM
External Device Monitoring is a feature allowing the light guard to supervise the actuators in simpler applications, eliminating the need for a safety relay or programmable safety controller.

Ordering information

Orion1 Extended

Ordering Details

Resolution mm	Protected height mm	Type (Transmitter + receiver)	Order code
Finger (14)	300	Orion1-4-14-030-E	2TLA022301R0100
	450	Orion1-4-14-045-E	2TLA022301R0200
	600	Orion1-4-14-060-E	2TLA022301R0300
	750	Orion1-4-14-075-E	2TLA022301R0400
	900	Orion1-4-14-090-E	2TLA022301R0500
	1050	Orion1-4-14-105-E	2TLA022301R0600
	1200	Orion1-4-14-120-E	2TLA022301R0700
	1350	Orion1-4-14-135-E	2TLA022301R0800
	1500	Orion1-4-14-150-E	2TLA022301R0900
	1650	Orion1-4-14-165-E	2TLA022301R1000
	1800	Orion1-4-14-180-E	2TLA022301R1100
Hand (30)	300	Orion1-4-30-030-E	2TLA022303R0100
	450	Orion1-4-30-045-E	2TLA022303R0200
	600	Orion1-4-30-060-E	2TLA022303R0300
	750	Orion1-4-30-075-E	2TLA022303R0400
	900	Orion1-4-30-090-E	2TLA022303R0500
	1050	Orion1-4-30-105-E	2TLA022303R0600
	1200	Orion1-4-30-120-E	2TLA022303R0700
	1350	Orion1-4-30-135-E	2TLA022303R0800
	1500	Orion1-4-30-150-E	2TLA022303R0900
	1650	Orion1-4-30-165-E	2TLA022303R1000
	1800	Orion1-4-30-180-E	2TLA022303R1100

Accessories

Orion1 Extended

Accessories

Connection accessories		
Description	**Type**	**Order code**
Connection box for two or four muting sensors	OMC1	2TLA022316R2000
Retroreflex photoelectric sensor	Mute R2	2TLA022044R0500
Adjustable mounting bracket for M18 sensors (e.g. Mute R2).	JSM 64	2TLA040007R0200
Reflector diameter 63 mm	Reflect 1	2TLA022044R2000
Reflector diameter 82 mm	Reflect 2	2TLA022044R3000
Smile reset button with NO contact	Smile 11 RA	2TLA030053R0000
Smile reset button with NO contact for Pluto	Smile 11 RB	2TLA030053R0100
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Mounting accessories		
Orion Test Piece 14 mm	Orion TP-14	2TLA022310R5200
Orion Test Piece 30 mm	Orion TP-30	2TLA022310R5300
Orion Laser pointer	Orion Laser	2TLA022310R5000
Kit for mounting of Orion1 & Orion2 in Stand (4 pieces for lengths shorter than 1200 mm)	JSM Orion06	2TLA022310R0400
Kit for mounting of Orion1 & Orion2 in Stand (6 pieces for lengths of 1200 mm or more)	JSM Orion07	2TLA022310R0500
Kit for mounting of Orion1 Mirror in Stand	JSM Orion11	2TLA022310R0900
Orion Plate kit for adjustment of protective stand	Orion Stand Plate	2TLA022312R5000
Deviating mirror to be mounted in Orion Stand with one kit JSM Orion11	Orion1 Mirror*	
Protective stand	Orion Stand*	
Spare parts (included when ordering Orion)		
4 standard brackets for Orion1 & Orion2	JSM Orion01	2TLA022310R0000

*These accessories are available in different sizes.

For more information see:
Orion1 Mirror 2TLC172058L0201,
Orion Stand 2TLC172059L0201

For more information about the connection accessories see:
Orion connection accessories 2TLC172101L0201

Cables

Orion1 Extended

Cables with connectors

Muting to be used	Neccessary transmitter/ receiver cable	Suitable cable between transmitter/receiver cable and el-cabinet	Length	Special feature	Type	Order code
Yes	Transmitter M12-C02PT2T	M12-5 female single ended, to e.g. el-cabinet (b)	3 m		M12-C31	2TLA020056R0500
			6 m		M12-C61	2TLA020056R0000
			6 m	Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
			10 m		M12-C101HE	2TLA020056R8100
			10 m		M12-C101	2TLA020056R1000
			20 m		M12-C201	2TLA020056R1400
	Receiver M12-C02PT62RM	M12-5 male + female, to e.g. OMC1 (a)	0.06 m		M12-C00612	2TLA020056R6300
			0.3		M12-C0312	2TLA020056R5800
			1 m		M12-C112	2TLA020056R2000
			3 m		M12-C312	2TLA020056R2100
			6 m		M12-C612	2TLA020056R2200
			10 m		M12-C1012	2TLA020056R2300
			16 m		M12-C1612	2TLA020056R5400
			20 m		M12-C2012	2TLA020056R2400
		M12-12 female single ended, to e.g. el-cabinet	6 m		M12-C65	2TLA020056R7200
			10 m		M12-C105	2TLA020056R7300
			20 m		M12-C205	2TLA020056R7500
No	Transmitter M12-C02PT2T	M12-5 female single ended, to e.g. el-cabinet (b)	6 m		M12-C61	2TLA020056R0000
			6 m	Harsh environment, halogen free	M12-C61HE	2TLA020056R8100
			10 m		M12-C101HE	2TLA020056R5400
			10 m		M12-C101	2TLA020056R1000
			20 m		M12-C201	2TLA020056R1400
	Receiver M12-C02PT6RB	M12-12 female single ended, to e.g. el-cabinet	6 m		M12-C65	2TLA020056R7200
			10 m		M12-C105	2TLA020056R7300
			20 m		M12-C205	2TLA020056R7500

Cables
Orion1 Extended

Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050

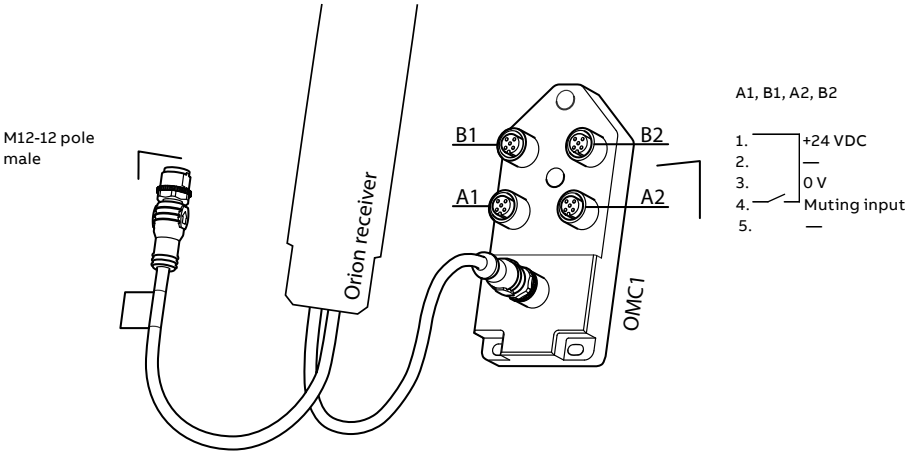
Special cables for Orion1 Extended

Description	Length	Type	Order code
Transmitter cable for Orion1 Extended. M12-5 male connector.	0.2 m	M12-C02PT2T	2TLA022315R0100
Receiver cable for Orion1 Extended when no muting. M12-12 male connector.	0.2 m	M12-C02PT6RB	2TLA022315R0200
Receiver cable for Orion1 Extended when muting. M12-5 male connector (for muting sensors) and M12-12 male connector.	0.2 m	M12-C02PT62RM	2TLA022315R0300
Cascade cable for Orion1 Extended	1 m	PT-C1PT	2TLA022315R1000
Cascade cable for Orion1 Extended	0.5 m	PT-C05PT	2TLA022315R1100
Cascade cable for Orion1 Extended	0.05 m	PT-C005PT	2TLA022315R1200

Connection example

Orion1 Extended

Connection of the muting sensors with M12-C02PT62RM and OMC1



NB: Cable with M12-5 male + female connectors shall be used between muting sensors and OMC1 inputs A1, B1, A2, B2.

Technical data

Orion1 Extended

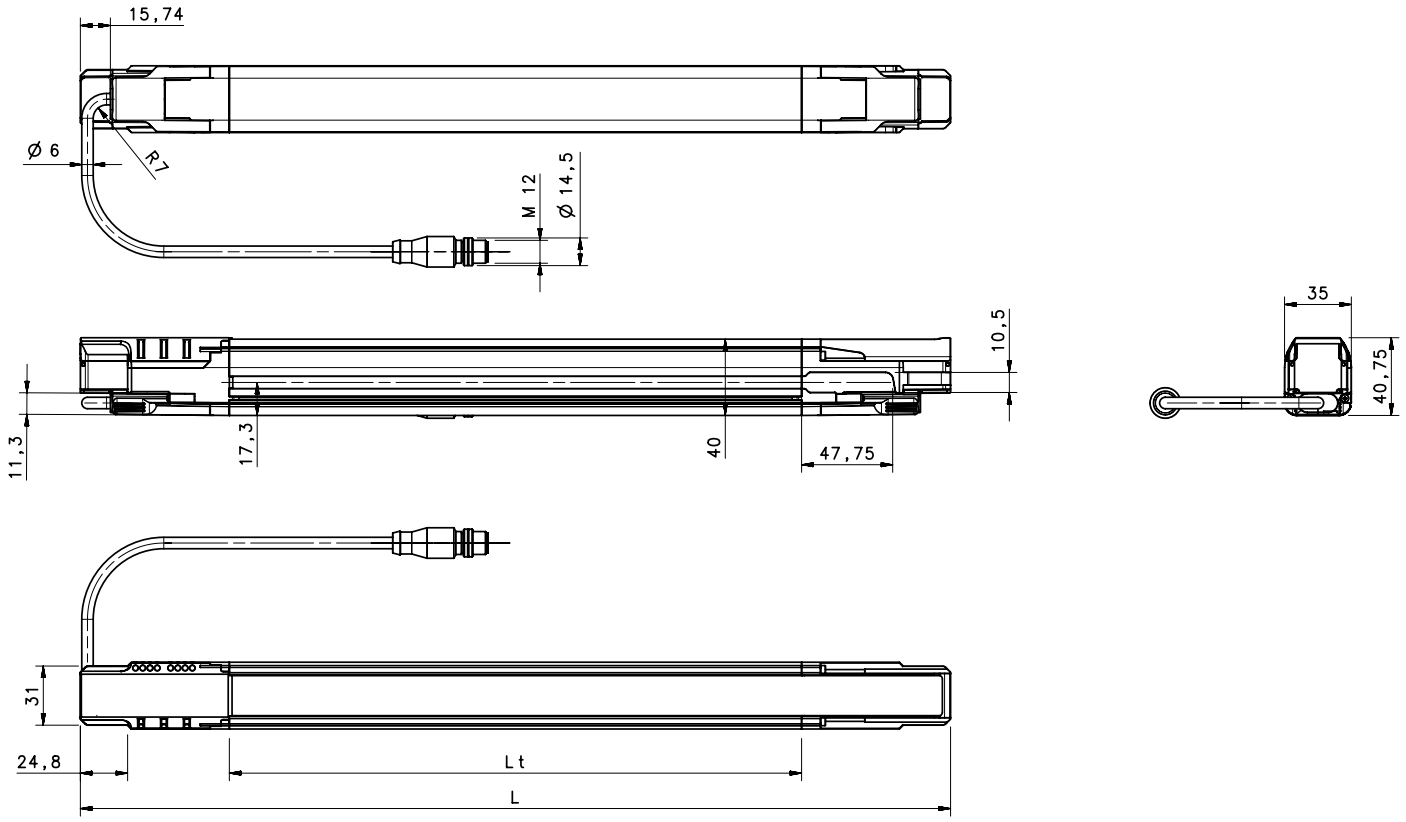
Technical data	
Approvals	
Conformity	CE 2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 13849-1:2008, EN 62061:2005/A1:2013, EN 61496-1:2013, EN 61496-2, EN 61508-1:2010, EN 61508-2:2010, EN 61508-3:2010, EN 61508-4:2010
Functional safety data	
EN 61508:2010	SIL3, PFHD = 2.64 x 10-9
EN 62061:2005+A1:2013	SILCL3, PFHD = 2.64 x1 0-9
EN ISO 13849-1:2008	PL e, Cat. 4, PFHD = 2.64 x 10-9
Electrical data	
Power supply	+24 VDC ± 20%
Power consumtion, Transmitter	3 W max
Power consumption, Receiver	5 W max (without load)
Outputs	2 PNP
Short-circuit protection	1.4 A max
Output current	0.5 A max / output
Output voltage – ON	Vdd -1 V min
Output voltage – OFF	0.2 V max
Capacitive load	2.2 µF at +24 VDC max
Current for external lamp	20 mA min; 200 mA max
Cable length (for power supply)	50 m max
Connectors	M12-4 pole male on transmitter (compatible with M12-5 pole female)
	M12-8 pole male on receiver
Optical data	
Light emission (λ)	Infrared, LED (950 nm)
Resolution	14 or 30 mm
Operating distance	0.2…20 m for 30 mm
	0.2…7 m for 14 mm
Ambient light rejection	According to IEC-61496-2:2013
Mechanical data	
Operating temperature	0…+ 50 °C
Storage temperature	- 25…+ 70 °C
Humidity range	15…95% (no condensation)
Protection class	IP65 (EN 60529:2000)
Weight	1.35 kg / meter for each single unit
Housing material	Painted aluminium (yellow RAL 1003)
Front glass material	PMMA
Cap material	PBT Valox 508

More information
For more information, e.g. the complete technical information, see product manual for:
Orion1 Extended 2TLC172290M0201

Dimension drawings

Orion1 Extended

Orion1 Extended



All dimensions in mm

Dimension

L1 mm	L2 mm	Type
300	306.3	Orion1-4-xx-030-E
450	456.3	Orion1-4-xx-045-E
600	606.3	Orion1-4-xx-060-E
750	756.3	Orion1-4-xx-075-E
900	906.3	Orion1-4-xx-090-E
1050	1056.3	Orion1-4-xx-105-E
1200	1206.3	Orion1-4-xx-120-E
1350	1356.3	Orion1-4-xx-135-E
1500	1506.3	Orion1-4-xx-150-E
1650	1656.3	Orion1-4-xx-165-E
1800	1806.3	Orion1-4-xx-180-E

xx = Resolution (14 or 30 mm)

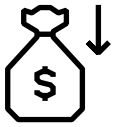
Notes

Safety light grid
Orion2 Base

Orion2 Base is a compact light grid for access protection.

The light grid has 2-4 beams and is intended for body detection.

With an operating distance of 50 m between transmitter and receiver the light grid is suitable for applications with deviating mirrors.



Cost effective solution

Minimized cabling

A local reset button can be connected directly to the light grid, eliminating the need for a cable between the reset button and the electrical cabinet or for an extra control module.

External device monitoring
Each light grid can monitor the actuators without any extra control module (EDM function).

Easy to install

Alignment help

Alignment help and a wide angle within the limits of a Type 4 device facilitate installation.

Easy adjustment
Rotation brackets make alignment easy.

Fast connection
M12 connectors speed up cabling.

Continuous operation

Protection in harsh environments

The housing is IP65 rated. Protective tubes and lens shields are available to provide further protection for the device in harsh environments.

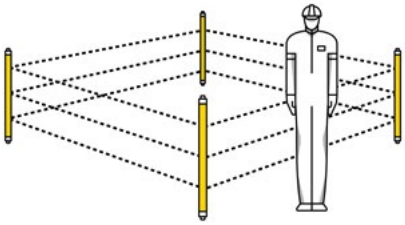
Applications and features

Orion2 Base

Applications

Body detection over long distances

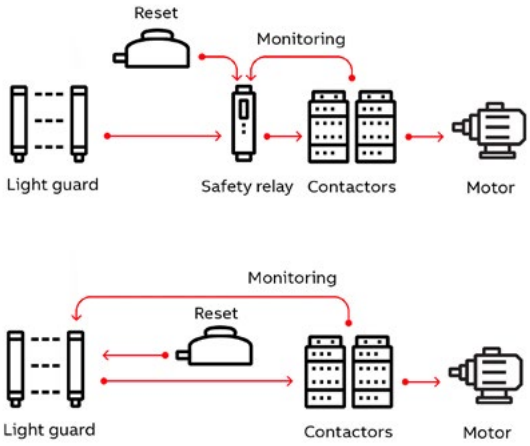
With 2-4 beams and a maximum sensing range of 50 m between transmitter and receiver, the light grid is intended for body detection and can be used with deviating mirrors to form a protective perimeter around a dangerous area.



Features

EDM

External Device Monitoring is a feature allowing the light guard to supervise the actuators in simpler applications, eliminating the need for a safety relay or programmable safety controller.



Local reset

A local reset button is connected directly to the light guard instead of to the safety control module in the electrical cabinet. This saves safety relays/programmable inputs and minimizes cabling to the electrical cabinet. Smart accessories simplify connectivity.

Ordering information

Orion2 Base

Ordering details

Detection	Protected height mm	Type (Transmitter + receiver)	Order code
Body	500 (2 beams)	Orion2-4-K2-050-B	2TLA022304R0000
	800 (3 beams)	Orion2-4-K3-080-B	2TLA022304R0100
	900 (4 beams)	Orion2-4-K4-090-B	2TLA022304R0200
	1200 (4 beams)	Orion2-4-K4-120-B	2TLA022304R0300

Accessories

Orion2 Base

Accessories

Mounting accessories		
Description	**Type**	**Order code**
Orion Test Piece 14 mm	Orion TP-14	2TLA022310R5200
Orion Test Piece 30 mm	Orion TP-30	2TLA022310R5300
Orion Laser pointer	Orion Laser	2TLA022310R5000
4 rotation brackets for Orion2	JSM Orion04	2TLA022310R0200
Kit for mounting of Orion1 & Orion2 in Stand (4 pieces for lengths shorter than 1200 mm)	JSM Orion06	2TLA022310R0400
Kit for mounting of Orion1 & Orion2 in Stand (6 pieces for lengths of 1200 mm or more)	JSM Orion07	2TLA022310R0500
Orion Plate kit for adjustment of protective stand	Orion Stand Plate	2TLA022312R5000
Deviating mirror in stand for Orion 2 and 3	Orion Mirror*	
Protective stand	Orion Stand*	
Protective tube	Orion WET*	
Lens shield	Orion Shield*	
Connection accessories		
Smile reset button with NO contact	Smile 11 RA	2TLA030053R0000
Smile reset button with NO contact for Pluto	Smile 11 RB	2TLA030053R0100
Smile reset button with NO contact for Orion1 Base	Smile 11RO1	2TLA022316R3000
Y-connector for series connection of DYNlink devices with M12-5 connectors, e.g. Eden	M12-3A	2TLA020055R0000
Y-connector for connection of a Smile reset button to Orion	M12-3R	2TLA022316R0000
Y-connector for easy connection of a transmitter	M12-3D	2TLA020055R0300
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Adaptation of OSSD to DYNlink. Two M12-5 connectors.	Tina 10A v2	2TLA020054R1210
Adaptation of OSSD to DYNlink with possibility to connect a local reset button. Three M12-5 connectors.	Tina 10B v2	2TLA020054R1310
Adaptation of OSSD to DYNlink with possibility to power the transmitter. Three M12-5 connectors.	Tina 10C v2	2TLA020054R1610
Spare parts (imcluded when ordering Orion)		
4 standard brackets for Orion1 & Orion2	JSM Orion01	2TLA022310R0000

*These accessories are available in different sizes.
For more information see:
Orion Mirror 2TLC172060L0201,
Orion Stand 2TLC172059L0201,
Orion WET 2TLC172061L0201,
Orion Shield 2TLC172071L0201
For more information about the connection accessories see:
Orion connection accessories 2TLC172101L0201

How to choose correct reset button

Local or global reset	Adaption to DYNlink*	Safety controle module	Type	Useful connection accessories
Local reset button connected to the light guard (Orion in manual reset mode)	Yes	Vital or Pluto	Smile 11RO2	Tina 10B: OSSD to DYNlink + local reset button M12-3A: Serial connection of the DYNlink
	No	Any safety control module compatible with light guard	Smile 11RO2	M12-3R: Easy connection of a local reset button
Global reset button connected to the control module (Orion in automatic reset mode)	Yes	Vital	Smile 11 RA	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
		Pluto	Smile 11 RB	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
	No	Any safety control module compatible with light guard	Smile 11 RA**	-

* The ABB Jokab Safety DYNlink solution offers the following advantages:
- Serial connection of safety devices while maintaining PLe/cat. 4, up to 25 Tina 10 per Vital and up to 5 Tina 10 per Pluto input.
- Only one safety input of the Pluto instead of two with the standard OSSD outputs.
** Smile 11RA has one NO contact, which is the most common for reset buttons. Please check what is requested for the chosen safety control module.

Cables

Orion2 Base

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
	(b)	6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
	(a)	0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
	(c)	10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
	(d)	10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634[1]	2TLA020056R6400
	(e)	1 m		M12-C134[1]	2TLA020056R5000
		3 m		M12-C334[1]	2TLA020056R5100

Letters (a, b, c, d, e, t3) refer to cables in connection examples, e.g: -2TLC010002T0001 Connection diagram Orion_cables_Tina10_M12-3A_M12-3D

1) Used for the connection to Tina 10, M12-3D and M12-3R. Tina 10 can be connected directly to the light guard without cable, but will form an angle (i.e. not be aligned) with the light guard, which might be a problem if the light guard is mounted close to a wall/aluminum profile.

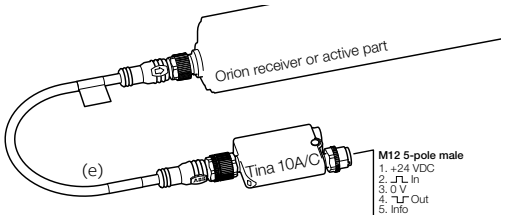
Separate Cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Connection examples

Orion2 Base

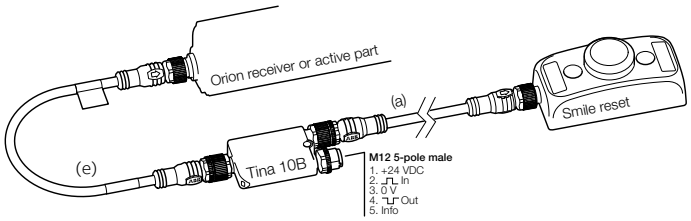
Orion with Tina 10A/C



Without local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10 A/C. To be used with Vital safety control module or Pluto programmable safety controller.

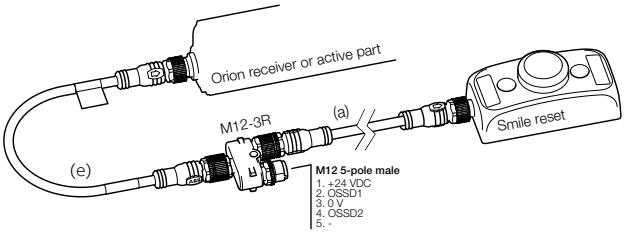
Reset to Orion with Tina 10B



With local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10B. To be used with Vital safety control module or Pluto programmable safety controller.

Reset to Orion with M12-3R



Connection of a local reset button via M12-3R.

Connection diagrams

For Orion2 Base connection diagrams please see https://library.abb.com/

Technical data

Orion2 Base

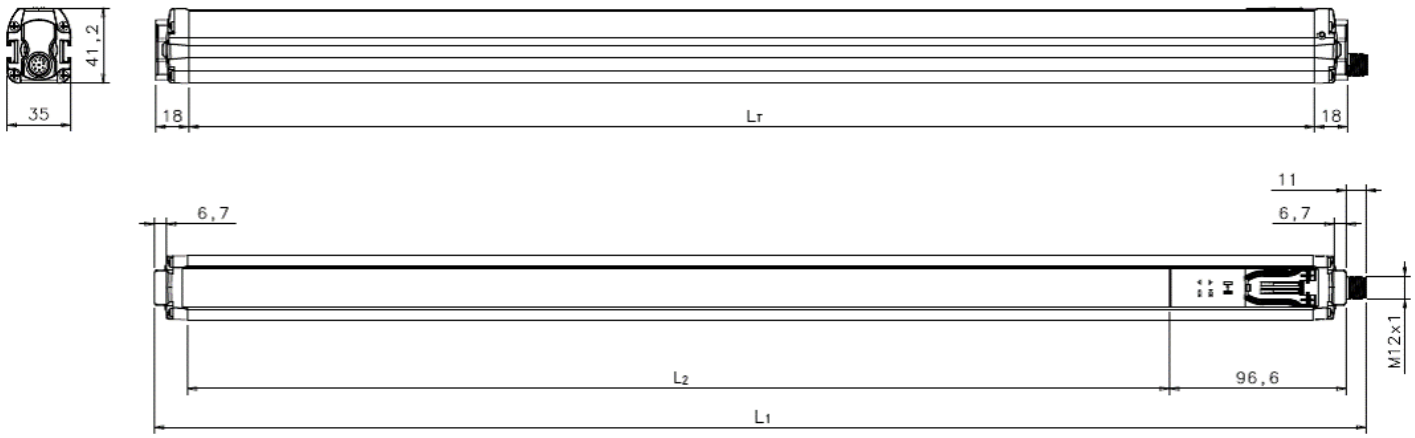
Technical data	
Approvals	
Conformity	CE 2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 13849-1:2008, EN 62061:2005/A1:2013, EN 61496-1:2013, EN 61496-2, EN 61508-1:2010, EN 61508-2:2010, EN 61508-3:2010, EN 61508-4:2010
Functional safety data	
EN 61508:2010	SIL3, PFHD = 2.64 x 10-9
EN 62061:2005+A1:2013	SILCL3, PFHD = 2.64 x 10-9
EN ISO 13849-1:2008	PL e, Cat. 4, PFHD = 2.64 x 10-9
Electrical data	
Power supply	+24 VDC ± 20% (SELV/PELV)
Power consumtion, Transmitter	30 mA max. / 0.9 W
Power consumption, Receiver	75 mA max. (without load) / 2.2 W
Cable length (for power supply)	50 m max with 50 nF capacitive load and +24 VDC
Internal capacitance	23 nF (Transmitter) / 120 nF (Receiver)
Outputs	2 PNP
Short-circuit protection	Max 1.4 A at 55 °C, min. 1.1 A at -10 °C
Output current	0.5 A max / output
Leakage current	< 1 mA
Capacitive load (pure)	65 nF max at 25 °C
Resitive load (pure)	56 Ω min at +24 VDC
Current for external lamp	20 mA min, 250 mA max
Connectors	M12-4 pole male on transmitter (compatible with M12-5 pole female)
	M12-8 pole male on receiver
Optical data	
Light emission (λ)	Infrared, LED (880 nm)
Resolution	315 - 515 mm
Operating distance	0.5...50 m
Ambient light rejection	According to IEC-61496-2:2013
Mechanical data	
Operating temperature	10...+ 55 °C
Storage temperature	- 25...+ 70 °C
Humidity range	15...95% (no condensation)
Protection class	IP65 (EN 60529:2000)
Weight	1.2 kg max / meter for each single unit
Housing material	Painted aluminium (yellow RAL 1003)
Front glass material	PMMA
Cap material	PC Lexan 943A

More information
For more information, e.g. the complete technical information, see product manual for:
Orion2 Base 2TLC172288M0201
Connection diagrams
For Orion2 Base connection diagrams please see https://library.abb.com/

Dimension drawings

Orion2 Base

Orion2 Base



All dimensions in mm

Dimension

Lr mm	L1 mm	L2 mm	Type
617	664	538.4	Orion2-4-K2-050-B
917	964	838.4	Orion2-4-K3-080-B
1017	1064	938.4	Orion2-4-K4-090-B
1317	1364	1238.4	Orion2-4-K4-120-B

xx = Resolution

Safety light grid
Orion2 Extended

Orion2 Extended is a compact light grid for access protection in muting applications.

The light grid has 2-4 beams and is intended for body detection.

Cost effective solution

Integrated muting function

Muting sensors are connected directly to the light grid, with no need for a remote muting module.

Minimized cabling
A local reset button can be connected directly to the light grid, eliminating the need for a cable between the reset button and the electrical cabinet.

External device monitoring (EDM)
Each light grid can monitor the actuators without any extra control module.

Easy to install

Alignment help

Alignment help and a wide angle within the limits of a Type 4 device facilitate installation.

Easy adjustment
Rotation brackets make alignment easy.

Fast connection
M12 connectors speed up cabling.

Continuous operation

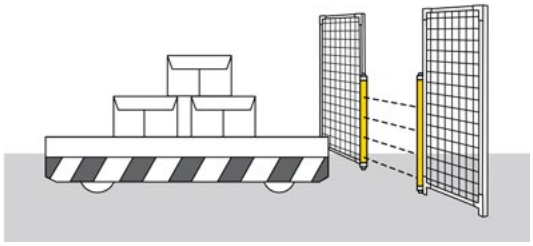
Protection in harsh environments

The housing is IP65 rated. Protective tubes and lens shields are available to provide further protection for the device in harsh environments.

Features
Orion2 Extended

Muting

Orion2 Extended is intended for muting applications. By connecting muting sensors to the light guard, it can distinguish material from persons and allow the material to pass through an opening but not persons. Muting sensors and a connection box for muting are available to simplify the muting application.

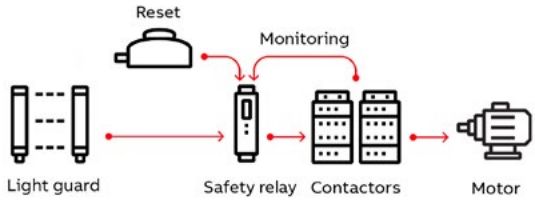


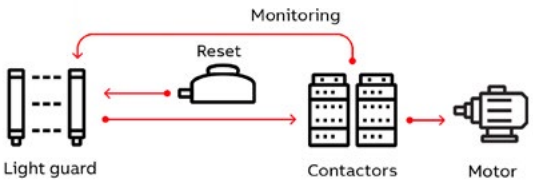
Local reset

A local reset button is connected directly to the light guard instead of to the safety control module in the electrical cabinet. This saves safety relays/PLC inputs and minimizes cabling to the electrical cabinet. Smart accessories simplify connectivity.

EDM

External Device Monitoring is a feature allowing the light guard to supervise the actuators in simpler applications, eliminating the need for a safety relay or programmable safety controller.





Ordering information

Orion2 Extended

Ordering details

Resolution (Detection) mm	Protected height mm	Type (Transmitter + receiver)	Order code
Body	500 (2 beams)	Orion2-4-K2-050-E	2TLA022305R0000
	800 (3 beams)	Orion2-4-K3-080-E	2TLA022305R0100
	900 (4 beams)	Orion2-4-K4-090-E	2TLA022305R0200
	1200 (4 beams)	Orion2-4-K4-120-E	2TLA022305R0300

Accessories

Orion2 Extended

Connection Accessories

Description	Type	Order code
Connection box for two or four muting sensors	OMC1	2TLA022316R2000
Retroreflex photoelectric sensor	Mute R2	2TLA022044R0500
Adjustable mounting bracket for M18 sensors (e.g. Mute R2).	JSM 64	2TLA040007R0200
Reflector diameter 63 mm	Reflect 1	2TLA022044R2000
Reflector diameter 82 mm	Reflect 2	2TLA022044R3000
Smile reset button with NO contact	Smile 11 RA	2TLA030053R0000
Smile reset button with NO contact for Pluto	Smile 11 RB	2TLA030053R0100
Smile reset button with NC contact for Orion2 Base/Extended and Orion3 Extended	Smile 11RO2	2TLA022316R3100
Y-connector for series connection of DYNlink devices with M12-5 connectors, e.g. Eden	M12-RA	2TLA020055R0000
Y-connector for connection of a Smile reset button to Orion	M12-3R	2TLA022316R0000
Y-connector for easy connection of a transmitter	M12-3D	2TLA020055R0300
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Adaptation of OSSD to DYNlink. Two M12-5 connectors.	Tina 10A v2	2TLA020054R1210
Adaptation of OSSD to DYNlink with possibility to connect a local reset button. Three M12-5 connectors.	Tina 10B v2	2TLA020054R1310
Adaptation of OSSD to DYNlink with possibility to power the transmitter. Three M12-5 connectors.	Tina 10C v2	2TLA020054R1610
Mounting accessories		
Orion Test Piece 14 mm	Orion TP-14	2TLA022310R5200
Orion Test Piece 30 mm	Orion TP-30	2TLA022310R5300
Orion Laser pointer	Orion Laser	2TLA022310R5000
4 standard brackets for Orion1 & Orion2	JSM Orion01	2TLA022310R0000
4 rotation brackets for Orion2	JSM Orion04	2TLA022310R0200
Kit for mounting of Orion1 & Orion2 in Stand (4 pieces for lengths shorter than 1200 mm)	JSM Orion06	2TLA022310R0400
Kit for mounting of Orion1 & Orion2 in Stand (6 pieces for lengths of 1200 mm or more)	JSM Orion07	2TLA022310R0500
Orion Plate kit for adjustment of protective stand	Orion Stand Plate	2TLA022312R5000
Deviating mirror in stand for Orion 2 and 3	Orion Mirror*	
Protective stand	Orion Stand*	
Protective tube	Orion WET*	
Lens shield	Orion Shield*	
Spare parts (included when ordering Orion)		
4 standard brackets for Orion1 & Orion2	JSM Orion01	2TLA022310R0000

*These accessories are available in different sizes.

For more information see:

Orion Mirror 2TLC172060L0201, Orion Stand 2TLC172059L0201, Orion WET 2TLC172061L0201, Orion Shield 2TLC172071L0201

For more information about the connection accessories see:

Orion connection accessories 2TLC172101L0201

How to choose correct reset button

Local or global reset	Adaption to DYNlink*	Safety controle module	Type	Useful connection accessories
Local reset button connected to the light guard	Yes	Vital or Pluto	Smile 11RO2	Tina 10B: OSSD to DYNlink + local reset button M12-3A: Serial connection of DYNlink
(Orion in manual reset mode)	No	Any safety control module compatible with light guard	Smile 11RO2	M12-3R: Easy connection of a local reset button
Global reset button connected to the control module	Yes	Vital	Smile 11 RA	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
(Orion in automatic reset mode)		Pluto	Smile 11 RB	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
	No	Any safety control module compatible with light guard	Smile 11 RA**	

* The ABB Jokab Safety DYNlink solution offers the following advantages:
- Serial connection of safety devices while maintaining PLe/cat. 4, up to 25 Tina 10 per Vital and up to 5 Tina 10 per Pluto input.
- Only one safety input of the Pluto instead of two with the standard OSSD outputs.

** Smile 11 RA has one NO contact, which is the most common for reset buttons. Please check what is requested for the chosen safety control module.

Cables

Orion2 Extended

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
	(b)	6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
	(a)	0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
	(c)	10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
	(d)	10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634[1]	2TLA020056R6400
	(e)	1 m		M12-C134[1]	2TLA020056R5000
		3 m		M12-C334[1]	2TLA020056R5100
M12-8 female - M12-5 male	Female + male	1		M12-CYMUTE[2]	2TLA022316R0100

Letters (a, b, c, d, e, t3) refer to cables in connection examples, e.g:
2TLC010002T0001 Connection diagram Orion_cables_Tina10_M12-3A_M12-3D

1) Used for the connection to Tina 10, M12 3D and M12-3R. Tina 10 can be connected directly to the light guard without cable, but will form an angle (i.e. not be aligned) with the light guard, which might be a problem if the light guard is mounted close to a wall/aluminum profile.
2) M12-CYMUTE is used to simplify the connection of 2 or 4 muting sensors with the help of the OMC1 connection box.

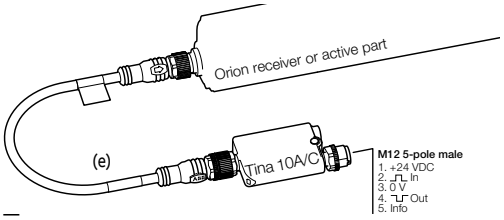
Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Connection examples

Orion2 Extended

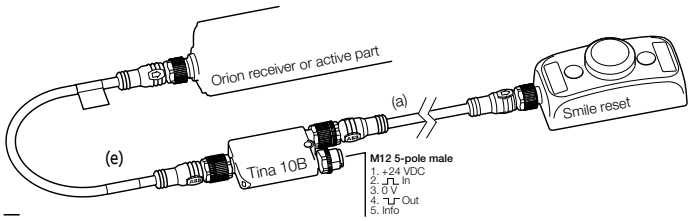
Orion with Tina 10A/C



Without local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10 A/C. To be used with Vital safety control module or Pluto programmable safety controller.

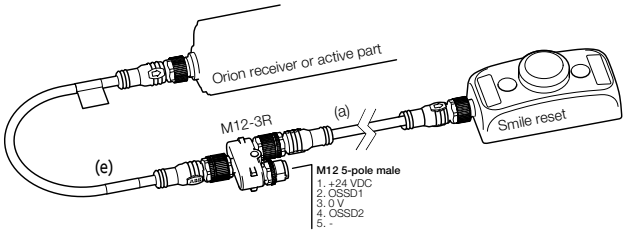
Reset to Orion with Tina 10B



With local reset button

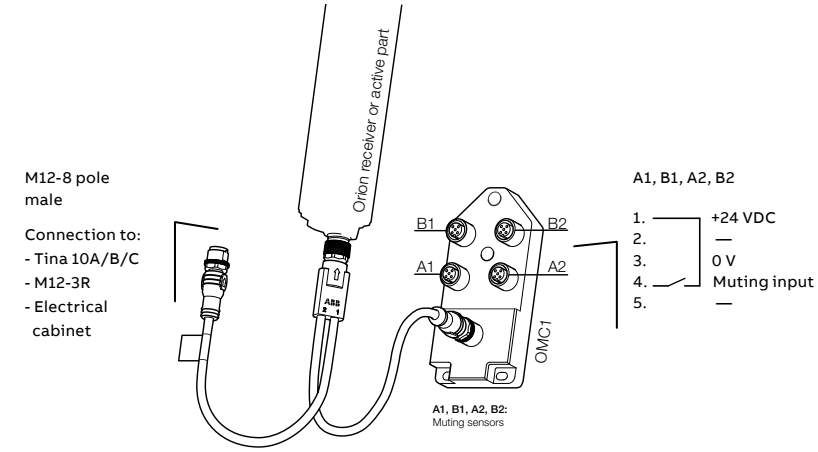
Connection to the ABB Jokab Safety DYNlink signal via Tina 10B. To be used with Vital safety control module or Pluto programmable safety controller.

Reset to Orion with M12-3R



Connection of a local reset button via M12-3R.

Connection of muting sensors with M12-CYMUTE and OMC1



NB: Cable with M12-5 male + female connectors shall be used between muting sensors and OMC1 inputs A1, B1, A2, B2.

Connection diagrams

For Orion2 Extended connection diagrams please see https://library.abb.com/

Technical data

Orion2 Extended

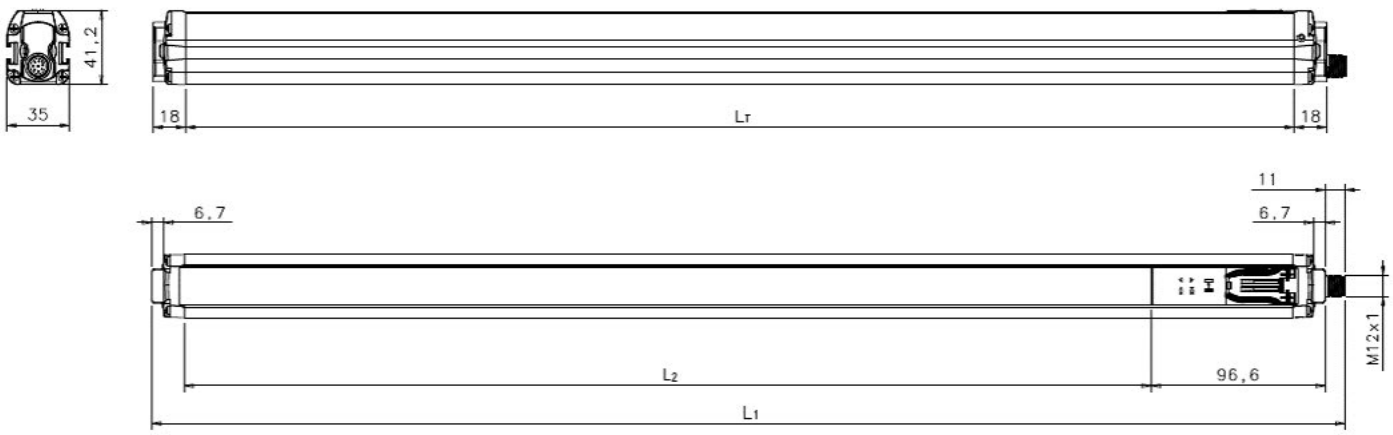
Technical data	
Approvals	
Conformity	CE 2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 13849-1:2008, EN 62061:2005/A1:2013, EN 61496-1:2013, EN 61496-2, EN 61508-1:2010, EN 61508-2:2010, EN 61508-3:2010, EN 61508-4:2010
Functional safety data	
EN 61508:2010	SIL3, PFHD = 2.64 x 10-9
EN 62061:2005+A1:2013	SILCL3, PFHD = 2.64 x 10-9
EN ISO 13849-1:2008	PL e, Cat. 4, PFHD = 2.64 x 10-9
Electrical data	
Internal capacitance	23 nF (Transmitter) / 120 nF (Receiver)
Power supply	+24 VDC ± 20% (SELV/PELV)
Power consumtion, Transmitter	0.5 W during normal operation
Power consumption, Receiver	2 W during normal operation
Outputs	2 PNP
Short-circuit protection	Max 1.4 A at 55 °C, min 1.1 A at -10 °C
Output current	0.5 A max / output
Leakage current	< 1 mA
Capacitive load (pure)	65 nF max at 25 °C
Resistive load (pure)	56 Ω min at +24 VDC
Current for external lamp	20 mA min, 250 mA max
Response time	2 and 3 beams: 14 ms; 4 beams: 16 ms
Connectors	M12-4 pole male on transmitter (compatible with M12-5 pole female)
	M12-8 pole male on receiver
Optical data	
Light emission (λ)	Infrared (880 nm)
Resolution	315 - 515 mm
Operating distance	0.5…50 m
Ambient light rejection	According to IEC-61496-2:2013
Mechanical data	
Operating temperature	- 10…+ 55 °C
Storage temperature	- 25…+ 70 °C
Humidity range	15…95% (no condensation)
Protection class	IP65 (EN 60529:2000)
Weight	1.2 kg max / meter for each single unit
Housing material	PC Lexan 943A
Lens material	PMMA
Cap material	PC MAKROLON

More information
For more information, e.g. the complete technical information, see manual for:
Orion2 Extended 2TLC172291M0201
Connection diagrams
For Orion2 Extended connection diagrams please see https://library.abb.com/

Dimension drawings

Orion2 Extended

Orion2 Extended



All dimensions in mm

Dimension

Lr mm	L1 mm	L2 mm	Type
617	664	538.4	Orion2-4-K2-050-E
917	964	838.4	Orion2-4-K3-080-E
1017	1064	938.4	Orion2-4-K4-090-E
1317	1364	1238.4	Orion2-4-K4-120-E

Safety light grid
Orion3 Base

Orion3 Base is a light grid with a sturdy profile for access protection.

Only one of the parts needs power supplied, since both transmitter and receiver are in the same active part. The other part is passive with mirrors to reflect the beams.

With 2-4 beams and an operating range of up to 8 m, it is intended for body detection.

Easy to install

Alignment help

Alignment help and a wide angle within the limits of a Type 4 device facilitate installation.

Easy adjustment
Rotation brackets make alignment easy.

Fast connection
M12 connectors speed up cabling.

Less cabling
Only the active part needs connecting.

Cost effective solution

Minimized cabling

A local reset button can be connected directly to the light grid, eliminating the need for a cable between the reset button and the electrical cabinet or for an extra control module.

External device monitoring
Each light grid can monitor the actuators without any extra control module (EDM function).

Continuous operation

Minimized cabling

A local reset button can be connected directly to the light grid, eliminating the need for cable between the reset button and the electrical cabinet or for an extra control module.

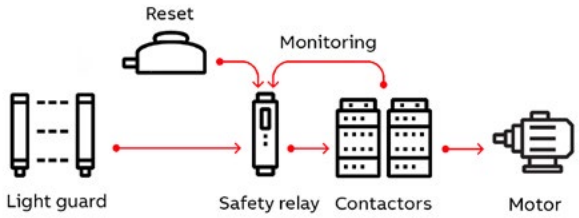
External device monitoring
Each light grid can monitor the actuators without any extra control module (EDM function).

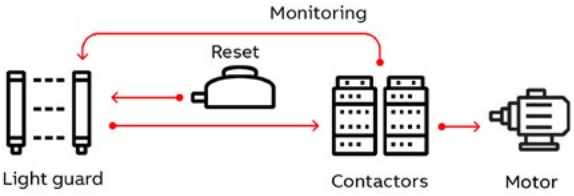
Features
Orion3 Base

Sturdy profile for demanding applications

With its thicker and sturdier profile Orion3 is suitable for applications with tougher requirements.

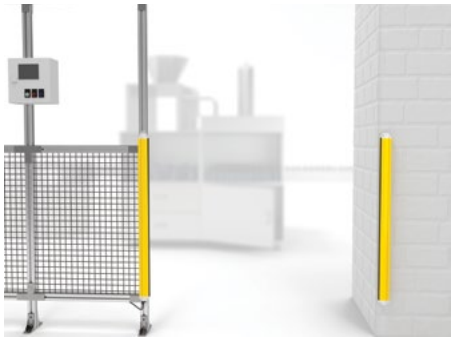
EDM
External Device Monitoring is a feature allowing the light guard to supervise the actuators in simpler applications, eliminating the need for a safety relay or programmable safety controller.





Power on one side

Both transmitter and receiver are in one active part, and the other part is passive containing mirrors. This simplifies installation and saves cables, making it easier to place in applications where cables needs to be avoided.



Local reset
A local reset button is connected directly to the light guard instead of to the safety control module in the electrical cabinet. This saves safety relays/PLC inputs and minimizes cabling to the electrical cabinet. Smart accessories simplify connectivity.

Ordering information

Orion3 Base

Ordering details

Detection	Protected height mm	Active or passive part	Type	Order code
Body	500 (2 beams)	Active part	Orion3-4-K1C-050-B	2TLA022306R0000
		Passive part	Orion3-4-M1C-050	2TLA022306R1000
	800 (3 beams)	Active part	Orion3-4-K2C-080-B	2TLA022306R0100
		Passive part	Orion3-4-M2C-080	2TLA022306R1100
	900 (4 beams)	Active part	Orion3-4-K2C-090-B	2TLA022306R0200
		Passive part	Orion3-4-M2C-090	2TLA022306R1300
	1200 (4 beams)	Active part	Orion3-4-K2C-120-B	2TLA022306R0300
		Passive part	Orion3-4-M2C-120	2TLA022306R1400

Accessories

Orion3 Base

Accessories

Mounting accessories		
Description	**Type**	**Order code**
Orion Laser pointer	Orion Laser	2TLA022310R5000
4 standard brackets for Orion3	JSM Orion05	2TLA022310R0300
Kit for mounting of Orion3 in Stand (4 pieces for lengths shorter than 1200 mm)	JSM Orion08	2TLA022310R0600
Kit for mounting of Orion3 in Stand (6 pieces for lengths of 1200 mm or more)	JSM Orion09	2TLA022310R0700
Orion Plate kit for adjustment of protective stand	Orion Stand Plate	2TLA022312R5000
Deviating mirror in stand for Orion 2 and 3	Orion Mirror*	
Protective stand	Orion Stand*	
Connection accessories		
Smile reset button with NO contact	Smile 11 RA	2TLA030053R0000
Smile reset button with NO contact for Pluto	Smile 11 RB	2TLA030053R0100
Smile reset button with NC contact for Orion3 Base	Smile 11 RO3	2TLA022316R3200
Y-connector for series connection of DYNlink devices with M12-5 connectors, e.g. Eden	M12-3A	2TLA020055R0000
Y-connector for connection of a Smile reset button to Orion	M12-3R	2TLA022316R0000
Y-connector for easy connection of a transmitter	M12-3D	2TLA020055R0300
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Adaptation of OSSD to DYNlink. Two M12-5 connectors.	Tina 10A v2	2TLA020054R1210
Adaptation of OSSD to DYNlink with possibility to connect a local reset button. Three M12-5 connectors.	Tina 10B v2	2TLA020054R1310
Adaptation of OSSD to DYNlink with possibility to power the transmitter. Three M12-5 connectors.	Tina 10C v2	2TLA020054R1610
Spare parts (included when ordering Orion)		
4 standard brackets for Orion3	JSM Orion02	2TLA022310R1000

*These accessories are available in different sizes.
For more information see:
Orion Mirror 2TLC172060L0201,
Orion Stand 2TLC172059L0201
For more information about the connection accessories see:
Orion connection accessories 2TLC172101L0201

How to choose correct reset button

Local or global reset	Adaption to DYNlink*	Safety controle module	Type	Useful connection accessories
Local reset button connected to the light guard (Orion in manual reset mode)	Yes	Vital or Pluto	Smile 11 RO3	Tina 10B: OSSD to DYNlink solution + local reset button M12-3A: Serial connection of the DYNlink solution
	No	Any safety control module compatible with light guard	Smile 11 RO3	M12-3R: Easy connection of a local reset button
Global reset button connected to the control module (Orion in automatic reset mode)	Yes	Vital	Smile 11 RA	Tina 10A: OSSD to DYNlink solution Tina 10C: OSSD to DYNlink solution + supply to transmitter/active part
		Pluto	Smile 11 RB	Tina 10A: OSSD to DYNlink solution Tina 10C: OSSD to DYNlink solution + supply to transmitter/active part
	No	Any safety control module compatible with light guard	Smile 11 RA**	-

* The ABB Jokab Safety DYNlink solution offers the following advantages:
- Serial connection of safety devices while maintaining PLe/cat. 4, up to 25 Tina 10 per Vital and up to 5 Tina 10 per Pluto input.
- Only one safety input of the Pluto instead of two with the standard OSSD outputs.
** Smile 11 RA has one NO contact, which is the most common for reset buttons. Please check what is requested for the chosen safety control module.

Cables

Orion3 Base

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
	(b)	6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
	(a)	0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
	(c)	10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
	(d)	10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634	2TLA020056R6400
		1 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100
		0,2 m		M12-CTO3B[1]	2TLA022315R3200

Letters (a, b, c, d, t2, t3) refer to cables in connection examples, e.g:
2TLC010002T0002 Connection diagram Cables Orion3 to Tina10

1) M12-CTO3B (t2) can be used for:- connection of Orion3 Base to Tina 10A/B/C.
- connection of Orion 3 Base to M12-3R.
The EDM function is deactivated in all cases

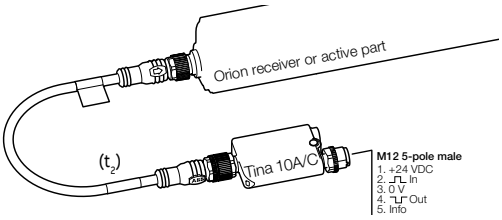
Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Connection examples

Orion3 Base

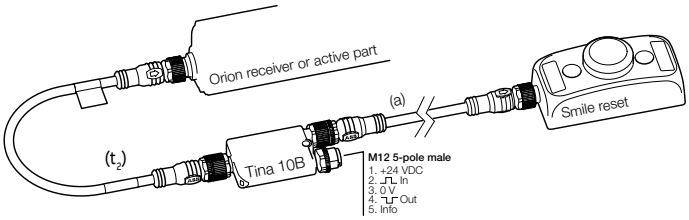
Orion with Tina 10A/C



Without local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10 A/C. To be used with Vital safety control module or Pluto programmable safety controller.

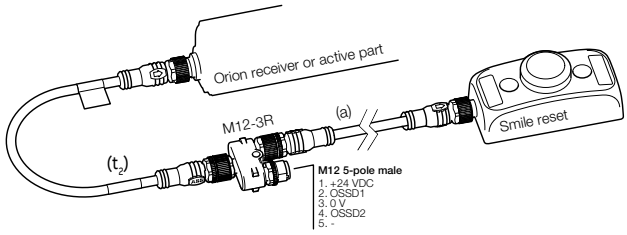
Reset to Orion with Tina 10B



With local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10B. To be used with Vital safety control module or Pluto programmable safety controller.

Reset to Orion with M12-3R



Connection of a local reset button via M12-3R.

Connection diagrams

For Orion3 Base connection diagrams please see https://library.abb.com/

Technical data
Orion3 Base

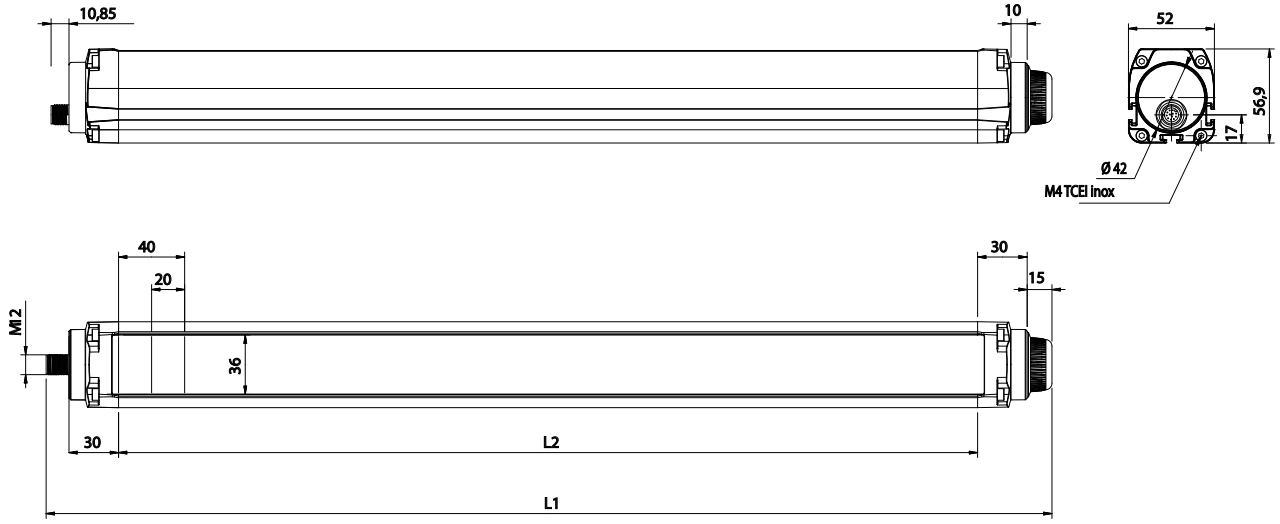
Technical data	
Approvals	
Conformity	CE 2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 13849-1:2008, EN 62061:2005/A1:2013, EN 61496-1:2013, EN 61496-2, EN 61508-1:2010, EN 61508-2:2010, EN 61508-3:2010, EN 61508-4:2010
Functional safety data	
EN 61508:2010	SIL3, PFHD = 9.28 x 10-9
EN 62061:2005+A1:2013	SILCL3, PFHD = 9.28 x 10-9
EN ISO 13849-1:2008	PL e, Cat. 4, PFHD = 9.28 x 10-9
Electrical data	
Power supply	+24 VDC ±20 %
Power consumption, Active unit	6.5 W max (without load)
Cable length (for power supply)	70 m max
Outputs	2 PNP
Short-circuit protection	1.4 A max
Output current	0.5 A max / output
Output voltage – ON	Power supply value less 1 V (min)
Output voltage – OFF	0.2 V max
Capacitive load	2.2 µF at +24 VDC max
Cable length (for power supply)	70 m max
Connectors	M12-8 pole male on receiver
Optical data	
Light emission (λ)	Infrared, LED (950 nm)
Resolution	319.75 - 519.75 mm
Operating distance	0.5...8 m except K2C-090: 0.5...6.5 m
Ambient light rejection	According to IEC-61496-2:2013
Mechanical data	
Operating temperature	0...+ 55 °C
Storage temperature	- 25...+ 70 °C
Humidity range	15...95% (no condensation)
Protection class	IP65 (EN 60529:2000)
Weight	
Orion3-4-K1C-050-B	1.3 kg
Orion3-4-K2C-080-B	1.8 kg
Orion3-4-K2C-090-B	2.1 kg
Orion3-4-K2C-120-B	2.6 kg
Orion3-4-M1C-050 (passive)	1.2 kg
Orion3-4-M2C-080 (passive)	1.7 kg
Orion3-4-M2C-090 (passive)	1.9 kg
Orion3-4-M2C-120 (passive)	2.5 kg
Housing material	Painted aluminium (yellow RAL 1003)
Cap material	PBT Valox 508
Lens material	PMMA

More Information
For more information about the connection accessories, see manual for:
Orion3 Base 2TLC172289M0201
Connection diagrams
For Orion3 Base connection diagrams please see https://library.abb.com/

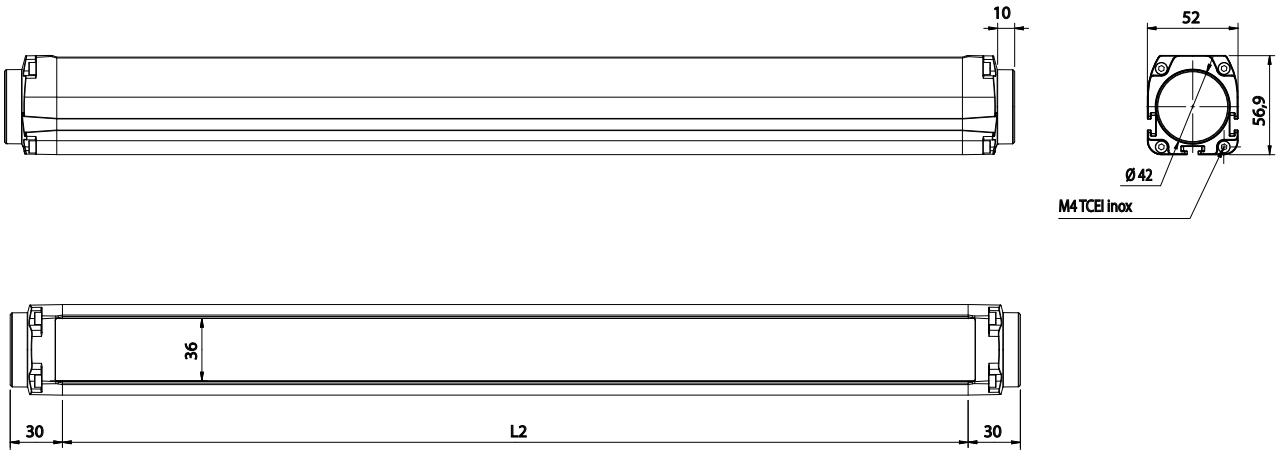
Dimension drawings

Orion3 Base

Orion3 Base



Active part – All dimensions in mm



Passive part – All dimensions in mm

Dimensions

L1 mm	L2 mm	Type
606.4	520.5	Orion3-4-K1C-050-B (active part)
906.4	820.5	Orion3-4-K2C-080-B (active part)
1006.4	920.5	Orion3-4-K2C-090-B (active part)
1306.4	1220.5	Orion3-4-K2C-120-B (active part)
580.5	520.5	Orion3-4-M1C-050 (passive part)
880.5	820.5	Orion3-4-M2C-080 (passive part)
980.5	920.5	Orion3-4-M2C-090 (passive part)
1280.5	1220.5	Orion3-4-M2C-090 (passive part))

xx = Resolution

Safety light grid
Orion3 Extended

Orion3 Extended is a sturdy light grid for access protection in muting applications.

Only one of the parts needs power supplied, since both transmitter and receiver are in the same active part. The other part is passive and contains mirrors to reflect the beams.

With 2-4 beams and an operating range of up to 8 m, it is intended for body detection.

Cost effective solution

Integrated muting function

Muting sensors are connected directly to the light grid, with no need for a remote muting module.

Minimized cabling
A local reset button can be connected directly to the light grid, eliminating the need for a cable between the reset button and the electrical cabinet.

External device monitoring (EDM)
Each light grid can monitor the actuators without any extra control module.

Easy to install

Alignment help

Alignment help and a wide angle within the limits of a Type 4 device facilitate installation.

Easy adjustment
Rotation brackets make alignment easy.

Fast connection
M12 connectors speed up cabling.

Less cabling
Only the active part needs connecting.

Continuous operation

Visible alignment level

Since the alignment level is displayed, the alignment can be improved before the occurrence of an unwanted stop.

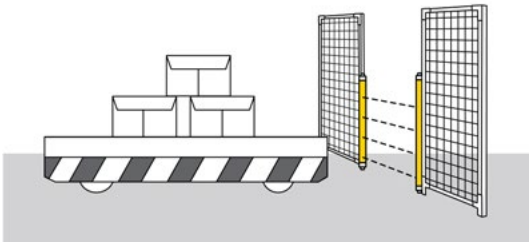
Extensive error indication
Extensive error indication reduces troubleshooting time.

Applications and features
Orion3 Extended

Application

Muting

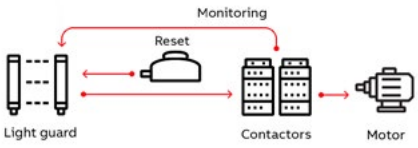
Orion2 Extended is intended for muting applications. By connecting muting sensors to the light guard, it can distinguish material from persons and allow the material to pass through an opening but not persons. Muting sensors and a connection box for muting are available to simplify the muting application.



Features

Power on one side
Both transmitter and receiver are in one active part, and the other part is passive and contains mirrors. This simplifies installation and saves cables, making it easier to place in applications where cables need to be avoided.

EDM
External Device Monitoring is a feature allowing the light guard to supervise the actuators in simpler applications, eliminating the need for a safety relay or programmable safety controller.



Sturdy profile for demanding applications
With its thicker and sturdier profile Orion3 is suitable for applications with tougher requirements.

Local reset
A local reset button is connected directly to the light guard instead of to the safety control module in the electrical cabinet. This saves safety relays/PLC inputs and minimizes cabling to the electrical cabinet. Smart accessories simplify connectivity.

Ordering information

Orion3 Extended

Ordering details

Detection	Protected height mm	Active or passive part	Type	Order code
Body	500 (2 beams)	Active part	Orion3-4-K1C-050-E	2TLA022307R0000
		Passive part	Orion3-4-M1C-050	2TLA022306R1000
	800 (3 beams)	Active part	Orion3-4-K2C-080-E	2TLA022307R0100
		Passive part	Orion3-4-M2C-080	2TLA022306R1100
	900 (4 beams)	Active part	Orion3-4-K2C-090-E	2TLA022307R0200
		Passive part	Orion3-4-M2C-090	2TLA022306R1300
	1200 (4 beams)	Active part	Orion3-4-K2C-120-E	2TLA022307R0300
		Passive part	Orion3-4-M2C-120	2TLA022306R1400

Please note that active and passive parts are ordered separately and both are necessary for Orion3 Extended to function.

Accessories

Orion3 Extended

Accessories

Connection accessories		
Description	**Type**	**Order code**
Connection box for two or four muting sensors	OMC1	2TLA022316R2000
Retroreflex photoelectric sensor	Mute R2	2TLA022044R0500
Adjustable mounting bracket for M18 sensors (e.g. Mute R2).	JSM 64	2TLA040007R0200
Reflector diameter 63 mm	Reflect 1	2TLA022044R2000
Reflector diameter 82 mm	Reflect 2	2TLA022044R3000
Smile reset button with NO contact	Smile 11 RA	2TLA030053R0000
Smile reset button with NO contact for Pluto	Smile 11 RB	2TLA030053R0100
Smile reset button with NC contact for Orion2 Base/Extended and Orion3 Extended	Smile 11R02	2TLA022316R3100
Y-connector for series connection of DYNlink devices with M12-5 connectors, e.g. Eden	M12-3A	2TLA020055R0000
Y-connector for connection of a Smile reset button to Orion	M12-3R	2TLA022316R0000
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Adaptation of OSSD to DYNlink. Two M12-5 connectors.	Tina 10A v2	2TLA020054R1210
Adaptation of OSSD to DYNlink with possibility to connect a local reset button. Three M12-5 connectors.	Tina 10B v2	2TLA020054R1310
Mounting accessories		
Orion Laser pointer	Orion Laser	2TLA022310R5000
4 rotation brackets for Orion3	JSM Orion05	2TLA022310R0300
Kit for mounting of Orion3 in Stand (4 pieces) - For a pair Orion3 - 050 / 080 / 090 (active + passive units)	JSM Orion08	2TLA022310R0600
For a pair Orion3 - 120 (Orion3-4-K2C-120 + Orion3-4-M2C-120)	JSM Orion09	2TLA022310R0700
Orion Plate kit for adjustment of protective stand	Orion Stand Plate	2TLA022312R5000
Deviating mirror in stand for Orion 2 and 3	Orion Mirror*	
Protective stand	Orion Stand*	
Lens shield	Orion Shield*	
Spare parts (included when ordering Orion		
4 standard brackets for Orion3	JSM Orion02	2TLA022310R1000

*These accessories are available in different sizes.
For more information see:
Orion Mirror 2TLC172060L0201, Orion Stand 2TLC172059L0201, Orion Shield 2TLC172071L0201
For more information about the connection accessories see:
Orion connection accessories 2TLC172101L0201

How to choose correct reset button

Local or global reset	Adaption to the DYNlink solution*	Safety controle module	Type	Suitable connection accessories
Local reset button connected to the light guard	Yes	Vital or Pluto	Smile 11RO2	Tina 10B: OSSD to DYNlink + local reset button M12-3A: serial connection of DYNlink
(Orion in manual reset mode)	No	Any safety control module compatible with light guard	Smile 11RO2	M12-3R: Easy connection of a local reset button
Global reset button connected to the control module	Yes	Vital	Smile 11 RA	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
(Orion in automatic reset mode)		Pluto	Smile 11 RB	Tina 10A: OSSD to DYNlink Tina 10C: OSSD to DYNlink + supply to transmitter
	No	Any safety control module compatible with light guard	Smile 11 RA**	-

* The ABB Jokab safety DYNlink solution offers the following advantages:
- Serial connection of safety devices while maintaining PLe/cat. 4, up to 25 Tina 10 per Vital and up to 5 Tina 10 per Pluto input.
- Only one safety input of the Pluto instead of two with the standard OSSD outputs.
** Smile 11RA has one NO contact, which is the most common for reset buttons. Please check what is requested for the chosen safety control module.

Cables
Orion3 Extended

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
	(b)	6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
	(a)	0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
	(c)	10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
	(d)	10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634[1]	2TLA020056R6400
		1 m		M12-C134[1]	2TLA020056R5000
		3 m		M12-C334[1]	2TLA020056R5100
M12-8 female + M12-5 male	Female + male	1		M12-CYMUTE[2]	2TLA022316R0100

Letters (a, b, c, d, t2, t3) refer to cables in connection examples, e.g:
2TLC010002T0002 Connection diagram Cables Orion3 to Tina10

1) These cables (t2) are used for the connection to Tina 10, M12 3D and M12-3R. Tina 10 can be connected directly to the light guard without cable, but will form an angle (i.e. not be aligned) with the light guard, which might be a problem if the light guard is mounted close to a wall/aluminum profile.
2) M12-CYMUTE is used to simplify the connection of 2 or 4 muting sensors with the help of the OMC1 connection box.

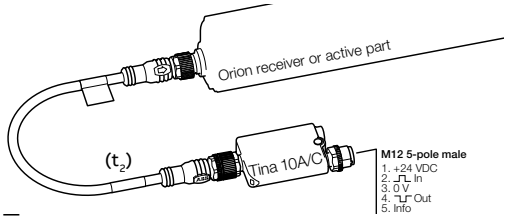
Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Connection examples

Orion3 Extended

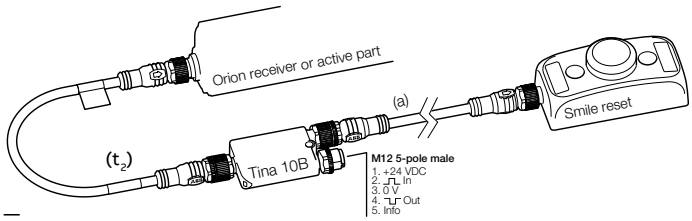
Orion with Tina 10A/C



Without local reset button

Connection to the ABB Jokab Safety DYNlink signal via Tina 10 A/C. To be used with Vital safety control module or Pluto programmable safety controller.

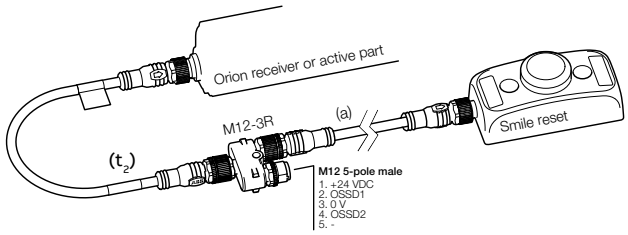
Reset to Orion with Tina 10B



With local reset button

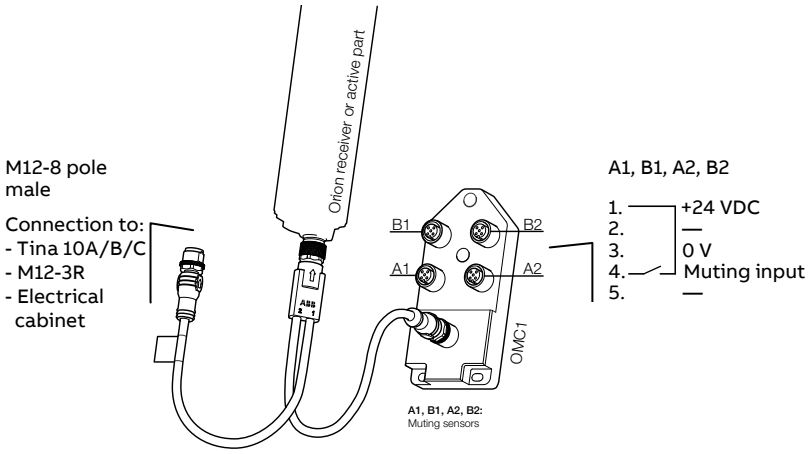
Connection to the ABB Jokab Safety DYNlink signal via Tina 10B. To be used with Vital safety control module or Pluto programmable safety controller.

Reset to Orion with M12-3R



Connection of a local reset button via M12-3R.

Connection of muting sensors with M12-CYMUTE and OMC1



NB: Cable with M12-5 male + female connectors shall be used between muting sensors and OMC1 inputs A1, B1, A2, B2.

Connection diagrams

For Orion3 Extended connection diagrams please see https://library.abb.com/

Technical data
Orion3 Extended

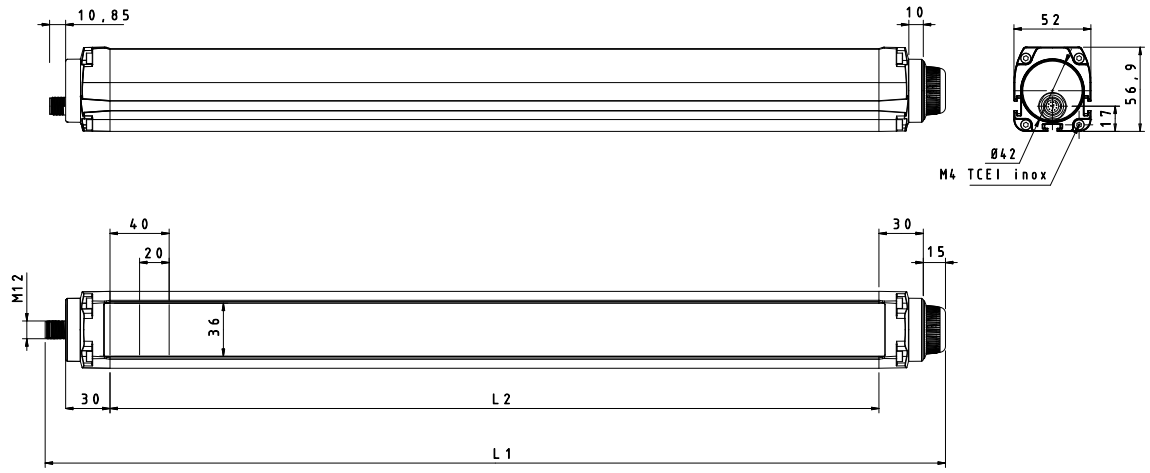
Technical data	
Approvals	
ConformityW	CE 2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 13849-1:2008, EN 62061:2005/A1:2013, EN 61496-1:2013, EN 61496-2, EN 61508-1:2010, EN 61508-2:2010, EN 61508-3:2010, EN 61508-4:2010
Functional safety data	
EN 61508:2010	SIL3, PFHD = 8.57 x 10-9
EN 62061:2005+A1:2013	SILCL3, PFHD = 8.57 x 10-9
EN ISO 13849-1:2008	PL e, Cat. 4, PFHD = 8.57 x 10-9
Electrical data	
Power supply	+24 VDC ± 20%
Power consumtion, Active unit	2.5 W max (without load)
Cable length (for power supply)	70 m max
Outputs	2 PNP
Short-circuit protection	1.4 A at 55 °C
Output current	0.5 A max / output
Output voltage – ON	Power supply value less 1 V (min)
Output voltage – OFF	0.2 V max
Capacitive load	2.2 µF at +24 VDC max
Current for external lamp	20 mA min, 250 mA max
Response time	K1C-050: 11 ms, others: 12 ms
Connectors	M12-4 pole male on transmitter (compatible with M12-5 pole female)
Optical data	
Light emission (λ)	Infrared (860 nm)
Resolution	319.75 - 519.75 mm
Operating distance	0.5...8 m except K2C-090: 0.5...6.5 m
Ambient light rejection	According to IEC-61496-2:2013
Mechanical data	
Operating temperature	0...+ 55 °C
Storage temperature	- 25...+ 70 °C
Humidity range	15...95% (no condensation)
Protection class	IP65 (EN 60529:2000)
Housing material	Painted aluminium
Lens material	PMMA
Cap material	PBT Valox 508
Weight	
Orion3-4-K1C-050-E	1.3 kg
Orion3-4-K2C-080-E	1.8 kg
Orion3-4-K2C-090-E	2.1 kg
Orion3-4-K2C-120-E	2.6 kg
Orion3-4-M1C-050 (passive)	1.2 kg
Orion3-4-M2C-080 (passive)	1.7 kg
Orion3-4-M2C-090 (passive)	1.9 kg
Orion3-4-M2C-120 (passive)	2.5 kg

More information
For more information about the connection accessories, see manual for:
Orion3 Extended 2TLC172292M0201
Connection diagrams
For Orion3 Extended connection diagrams please see https://library.abb.com/

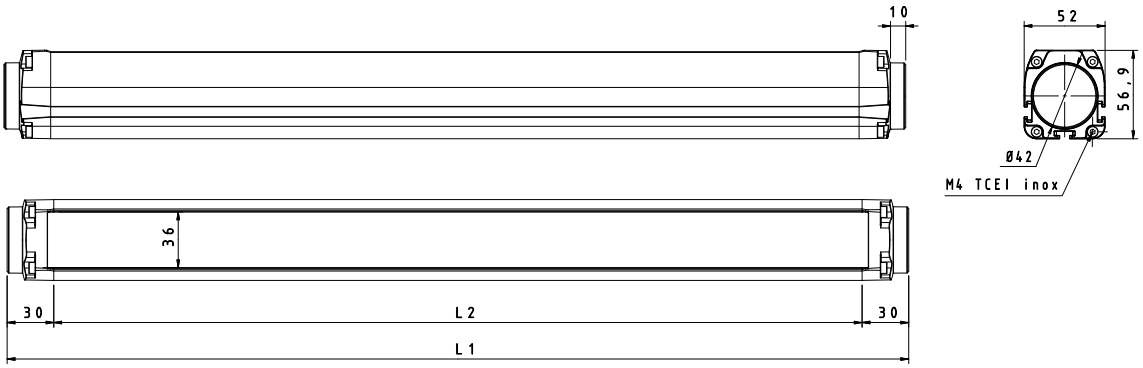
Dimension drawings

Orion3 Extended

Orion3 Extended



Active part - All dimensions in mm



Passive part – All dimensions in mm

Dimensions

L1 mm	L2 mm	Type
606.4	520.5	Orion3-4-K1C-050-E (active part)
906.4	820.5	Orion3-4-K2C-080-E (active part)
1006.4	920.5	Orion3-4-K2C-090-E (active part)
1306.4	1220.5	Orion3-4-K2C-120-E (active part)
580.5	520.5	Orion3-4-M1C-050 (passive part)
880.5	820.5	Orion3-4-M2C-080 (passive part)
980.5	920.5	Orion3-4-M2C-090 (passive part)
1280.5	1220.5	Orion3-4-M2C-090 (passive part)

4

Sensors and locks

Sensors and locks

Introduction and overview	112
Non-contact safety sensor - Eden	116
Sensor connection block - OCB	125
Safety magnetic switch - Sense	129
Safety interlock switch - MKey	133
Electromagnetic process lock - Magne	141
Safety lock - GKey	147

Introduction and overview
Selection guide

ABB has a full range of switches for monitoring doors and hatches, both with and without locking function.

	Eden	OCB	Sense
Function	Interlock	Connection Block	Interlock
Type	Non-contact switch	OCB Sensor connection block	Magnetic non-contact switch
Description	The original non-contact sensor with unique fault-detection capabilities.	Connection block for OSSD and voltage free safety sensor signals.	Coded and non-coded magnetic switch available in plastic as well as stainless steel for harsh environments.
Applications	Monitoring doors and hatches. Ideal for use in harsh environments such as food and beverage. Also for monitoring of end positions of e.g. an overhead crane.	It is used to simplify the connection of multiple sensors by only having one cable out from the control cabinet to the sensors. Sensors are either treated as in series or with individual safety signals.	Monitoring doors and hatches.
Advantage	• Flexible mounting • M12 connectors • IP69K for harsh environments • One switch to reach Cat. 4 • Unique coding to prevent defeat • Local reset minimizes cabling • Non-contact eliminates wear	• Reduced total cable length with appr. 30m • Reduced number of cables to the cabinet • Reduced number of cable glands in the cabinet • Reduced number of terminal blocks in the cabinet • M12 connectors • OCB housing has an IP67 rating	• Stainless steel • IP69K for harsh environments • Extreme temperature range • Coded sensor • Non-contact eliminates wear

	MKey	Magne	GKey
Function	Interlock and process/safety lock	Interlock and process lock	Interlock and safety lock
Type	Mechanical switch	Electromagnetic lock	Mechanical safety lock
Description	A classic and well-tried solution.	A robust magnetic lock with strong holding force.	A robust safety lock with die cast housing.
Applications	Monitoring doors and hatches. Also available with safe locking.	Locking doors and hatches to prevent interruption of machines with short stopping time e.g. robotics applications.	Safe locking of hinged and sliding doors for machines with a long stopping time.
Advantage	• Holds the door closed • Possible to lock	• Robust design for harsh environments • M12 connectors.	• Safe locking • Robust design • Room to integrate 22 mm pilot devices • Rear escape release • High level coding • Lockout function • Manual unlocking (auxiliary release)

Introduction and overview
Selection orientation

The difference between locking and interlocking functions

Interlocking function
An interlocking function indicates if a door is open or closed. When the door is open the interlocking function also prevents dangerous machine functions, but it does not prevent the door from being opened.

Interlocking function e.g. Eden

Locking function
A locking function prevents the door from being opened until an unlocking signal has been sent.

Locking function e.g. Magne

When to use interlocking and locking functions
An interlocking function is required if the dangerous machine functions needs to be stopped when someone enters the dangerous area.

A locking function is required if a user can open a door/hatch and reach the dangerous machine parts before the dangerous machine functions have ceased. It is also required if the process needs to be protected from unwanted stops that would occur if a person could open a door in the middle of a critical stage of the process..

The difference between a process lock and a safety lock

All locks of the ABB Jokab Safety range can be used as process locks but only GKey and the models of MKey that uses power to unlock can be used as safety locks. Here is why:

A **process lock** protects the process. One example of an application is a lock on a door giving access to a machine with short stopping time, e.g. a welding machine. The door should not be unlocked before the end of the welding cycle. Should the door be unlocked before the end of the cycle (as a consequence of a fault in the installation like a loss of power or a short-circuit) the door could be opened, which would result in a process stop. It might take a long time to restart the process, but no person would have had time to come close to the danger or get injured. Since the lock only protects the process there is no need for a safe locking signal.

Process lock e.g. Magne

A **safety lock** protects people. One example of an application is a lock on a door giving access to a dangerous machine with a long stopping time, e.g. a circular saw. The door should never be unlocked before the dangerous movement has stopped, not even as a consequence of a fault in the installation like a loss of power or a short-circuit. Should the door be unlocked before the machine has stopped, a person could open the door and have time to get close to the dangerous movement and get injured. Since the lock is protecting the person, the unlocking signal should be safe. Since a loss of power should not unlock a safety lock, only locks that require power to unlock (e.g. +24 VDC) can be used as safety locks.

Safety lock e.g. GKey

Notes

Non-contact safety sensor
Eden

Eden is a non-contact safety sensor used an interlocking device for e.g. doors and safe position monitoring.

Eden consists of two parts: Adam and Eva. Adam senses the presence of Eva without mechanical contact and therefore without any wear.
The compact size of Eden and its 360° mounting possibility make it easy to use in most applications.

Different models of Eden are available for different types of control modules. All Eden models make it very easy to reach PL e, often using fewer components than other solutions.

All Eden models have an IP67/IP69K sealing.

Continuous operation

Easier troubleshooting
Extensive LED indication and status information reduce downtime.

Suitable in harsh environments
IP67/IP69K and a temperature range of -40 to +70°C offer an excellent resistance in demanding environments.

No wear, no mechanical breakage
Non-contact sensing means no mechanical wear and the large sensing tolerance gives a better tolerance to vibrations, resulting in fewer unwanted process stops.

Affordable range

Local reset function
The integrated reset function reduces the number of cables and PLC inputs.

PL e with fewer components
Series connection with PL e, local reset and DYNlink signal allow to considerably reduce the number of components needed to reach PL e.

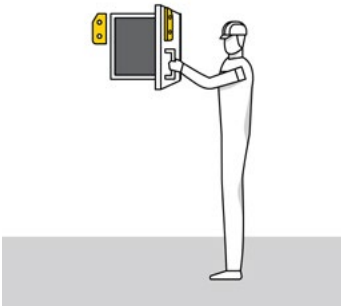
Easy to install

Large mounting tolerance
A 360° mounting possibility with generous tolerances facilitates mounting.

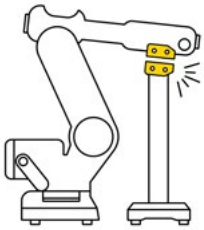
Fast connection
M12 connectors, local reset and accessories speed up installation.

Applications
Eden

Doors and hatches
Eden monitors whether the hatch is open or closed. The dangerous movement is stopped as soon as the hatch is opened.



Position control
Eden can be used to monitor the position of a machine when someone is in the work area. This can be useful when removing power to the machine causes problems like a long restart time. As long as the machine remains in the safe position monitored by Eden, a person can be allowed to enter the hazardous area even though the machine is still powered. If the machine leaves the safe position while the person is still in the hazardous area, power is removed from the machine.

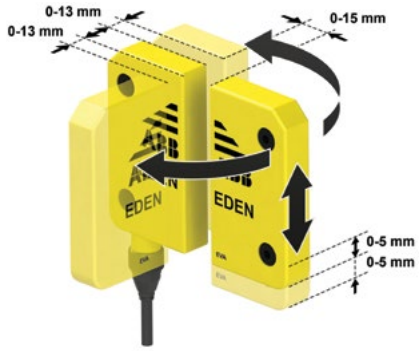


Features
Eden

Easy PL e with Eden safety sensor
Eden sensors can be connected in series while maintaining Cat. 4. Only one Eden per guard is necessary to reach PL e (instead of two key switches). Eden reaches PL e without any need for periodic checks (see ISO/TR 24119).

Low or high level coded sensor
Eva is available with General code or Unique code. If a new Adam is paired with an Eva general code at start up, Adam will accept all Eva with general code as a valid actuator. Eden will then classify as a low level coded sensor. If a new Adam is paired with an Eva Unique code at startup, Adam will only accept this specific Eva as a valid actuator. In this case Eden is classified as a high level coded sensor. A high level coded sensor should be used when the motivation to defeat a sensor cannot be eliminated (see EN ISO 14119:2013).

360° mounting possibility
Eden offers 360° mounting possibility with generous tolerances.



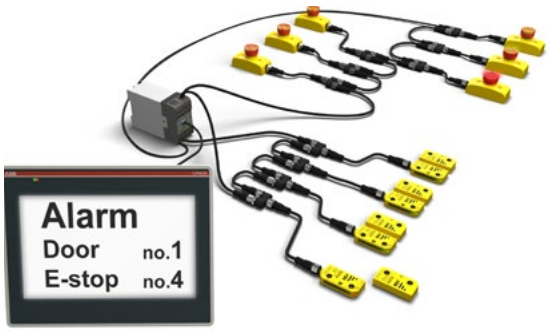
Local reset button
A local reset button with integrated LED can be connected directly to Adam Reset instead of to the safety control module. In this way, each Eden can easily have its own reset button, which saves cable length and safety relay/PLC inputs. Adam Reset monitors the reset function and manages the LED in the reset button in the following way:

- on - Adam and Eva are not in contact
- flashing - Adam and Eva in contact, waiting for reset
- off - Adam and Eva in contact and reset

Info signal and extensive indication facilitate troubleshooting
All Eden models offer extensive LED indication to help troubleshooting and localizing which doors/hatches are opened. The LED on Adam lights in green or red depending on status:

- green - valid Eva within range
- red - valid Eva out of range
- flashing red/green - valid Eva within range, but no valid safety signal received (loop broken “upstream”)

Simple status information with StatusBus
StatusBus is a simple and cost effective way to collect the status information of safety sensors. The StatusBus functionality is available with some DYNlink devices and allows to collect the status of each individual safety device, even when connected in series. A single input on Pluto safety PLC can collect the status of up to 30 safety devices. The devices are connected using standard cable and M12-5 connectors. No specific bus cable or extra communication module is necessary.



Models

Eden

Eden DYN

Eden DYN consists of an Adam DYN and an Eva (general or unique code). Adam DYN uses the ABB Jokab Safety DYNlink signal that allows you to connect several safety products in series while maintaining PL e using only one channel. DYNlink signals must be used with Vital safety controller or Pluto safety PLC. Up to 30 Adam DYN can be connected in series to Vital and up to 10 Adam DYN can be connected in series to one input of Pluto. All products using the DYNlink signal can easily be connected in series and mixed in the same loop with a maintained PL e. Tina adapters allow the use of other products in a DYNlink loop, and a wide range of connection accessories simplifies the cabling.

Eden OSSD

Eden OSSD consists of an Adam OSSD and an Eva (general or unique code). Adam OSSD can be used with all safety relays and safety PLCs compatible with OSSD signals (commonly used for light guards). Up to 30 Adam OSSD can be connected in series, and since OSSD devices monitor their own outputs for short circuits, a Cat. 4/PL e can still be reached.

Ordering information

Eden

Adam

Type of safety controller	StatusBus	Info signal	Local reset	Series connection	Connector male	Type	Order code
Pluto	x	x 1)		x	M12-5	Adam DYN-Status M12-5	2TLA020051R5200
Pluto or Vital		x		x	M12-5	Adam DYN-Info M12-5	2TLA020051R5100
			x	x	M12-5	Adam DYN-Reset M12-5	2TLA020051R5300
OSSD compatible (incl. Pluto and Sentry)		x			M12-5	Adam OSSD-Info M12-5	2TLA020051R5400
		x		x	M12-8	Adam OSSD-Info M12-8	2TLA020051R5700
			x		M12-5	Adam OSSD-Reset M12-5	2TLA020051R5600
		x	x	x	M12-8	Adam OSSD-Reset M12-8	2TLA020051R5900

1) Pin 5 can be used as a standard info signal or StatusBus.

Eva

Compatible Adam	Code description	Code level	Type	Order code
Adam DYN and OSSD	General code. (Eva is interchangeable)	Low level	Eva General code	2TLA020046R0800
	Unique code. (Prevents defeat/fraud)	High level	Eva Unique code	2TLA020046R0900

Accessories

Description	Type	Order code
Sliding lock for Eden on conventional doors. (Eden is not included.)	JSM D20	2TLA020302R1000
Mounting converting plate from Eden E to Eden OSSD or Eden DYN	DA 3A	2TLA020053R0600
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Wrench for tightening of M12 connectors according to specified torque: 0.6 Nm.	M12 Torque wrench	2TLA020053R0900
Handheld terminal for addressing, configuration and testing of StatusBus devices, DYNlink devices and conventional PNP devices.	FIXA	2TLA020072R2000
Spare parts (included with main product on delivery)		
Distance plate in yellow PBT (4 pcs).	DA 1B	2TLA020053R0700
Black distance rings to be mounted in Adam and Eva mounting holes (4 pcs).	DA 2B	2TLA020053R0300

Reset buttons for local reset

Description	Type	Order code
Reset button for Adam with 5 pins	Smile 12RF	2TLA030053R2600
Reset button for Adam with 8 pins	Smile 12RG	2TLA030053R2700

Cables and connectors

Eden

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
		0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
			Angled female connector	M12-C1012V2	2TLA020056R6700
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
		10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
		10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634	2TLA020056R6400
		1 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100

Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Connection Accessories
Eden

Connection accessories

Description	Type	Order code
Y-connector for series connection of DYNlink devices with M12-5 connectors, e.g. Eden.	M12-3A	2TLA020055R0000
Y-connector for parallel connection of 2 DYNlink devices.	M12-3B	2TLA020055R0100
Y-connector for the connection of 2 DYNlink devices or one DYNlink and one light button to Pluto safety PLC with only one cable.	M12-3E	2TLA020055R0200
Y-connector for series connection of DYNlink devices with the StatusBus function.	M12-3S	2TLA020055R0600
Y-connector for series connection of Adam OSSD M12-8 with M12-8 cables	M12-3G	2TLA020055R0700
Y-connector for series connection of Adam OSSD M12-8 with M12-5 cables	M12-3H	2TLA020055R0800
Termination plug M12-5. For Adam OSSD with M12-3H. Connects pin 1 with pin 2 and 4.	JSOP-1 Terminator	2TLA020053R7000
Termination plug M12-8. For Adam OSSD with M12-3G. Connects pin 2 with pin 3 and 4.	JSOP-2 Terminator	2TLA020053R7100

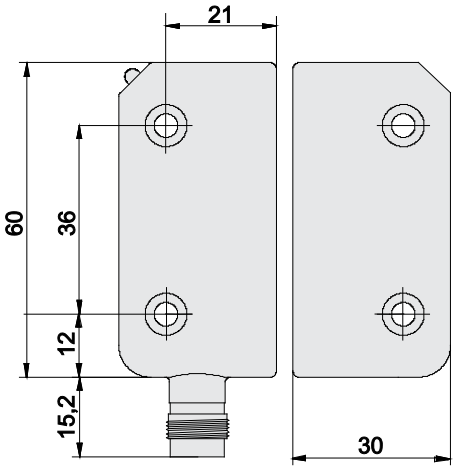
Technical data
Eden

Technical data	
	Eden DYN, Eden OSSD
Approvals	
Conformity	CE 2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS
	EN ISO 12100:2010, EN ISO 13849-1:2015, EN 62061:2005/A2:2015, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 60947-5-3:2013, EN ISO 14119:2013, EN 61508:2010
Functional safety data	
EN/IEC 61508:2010	SIL3, $PFH_D = 4.5 \times 10^{-9}$
EN/IEC 62061:2005+A1:2013	SILCL3, $PFH_D = 4.5 \times 10^{-9}$
EN ISO 13849-1:2008	PL e, Cat. 4, $PFH_D = 4.5 \times 10^{-9}$
Electrical data	+24 VDC Tolerance: +14.4...+27.6 VDC
Mechanical data	
Operating temperature	-40 °C...+70 °C (storage/operation)
Protection class	IP67 and IP69K
Humidity range	35 to 85% (no icing, no condensation)
Material	
Housing	Polybutylene terephthalate (PBT)
Moulding	Epoxy
Weight	Eva: 70 g, Adam: 80 g
Assured release distance (Sar)	25 mm
Assured operating distance (Sao)	10 mm
Rated operating distance (Sn)	15 ± 2mm
Recommended distance between Adam and Eva	7 mm
Min distance between two Eden	100 mm

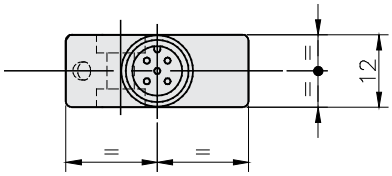
More information
For more information, e.g. the complete technical information, see product manual for:
Eden DYN 2TLC172271M0201,
Eden OSSD 2TLC172272M0201
Connection diagrams
For Eden connection diagrams please see https://library.abb.com/

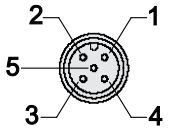
Dimension drawings

Eden



All dimensions in mm





Adam M12-5 male connector.
(Note that some models have 4 or 8 pins instead.)

SAFETY PRODUCTS

OCB

Sensor connection block

OCB is a connection block for OSSD and voltage free safety sensor signals. It is used to simplify the connection of multiple sensors by only having one cable out from the control cabinet to the sensors.

Up to 4 sensors can be connected to each OCB.

Sensors can be either OSSD or voltage free.

Sensors are either treated as in series or with individual safety signals.

Speed up your projects

Easy connection
The M12 connectors are fast and easy to use, while minimizing the risk of poor connection.

No programming required
Just connect the sensors to the OCB and the wires to the safety controller – and you're good to go.

Reduced wiring
Only one cable required for each OCB, reducing the number of wires to the cabinet to 25 % or less.

Continuous operation

Simple replacement
If you need to replace any of the sensors, you just disconnect it and connect the new one.
No configuration required.

Simple trouble shooting
OCB always provides individual status information for each sensor, in order to simplify trouble shooting.

Resistant to demanding environments
The OCB housing has an IP67 rating and can be used in applications with temperatures from -25 to +80 °C.

Safety and protection

Easy to reach highest safety level
OSSD connection always reaches Cat 4/PL e.

Voltage free sensors with individual safety signals results in Cat 4/ PL e.

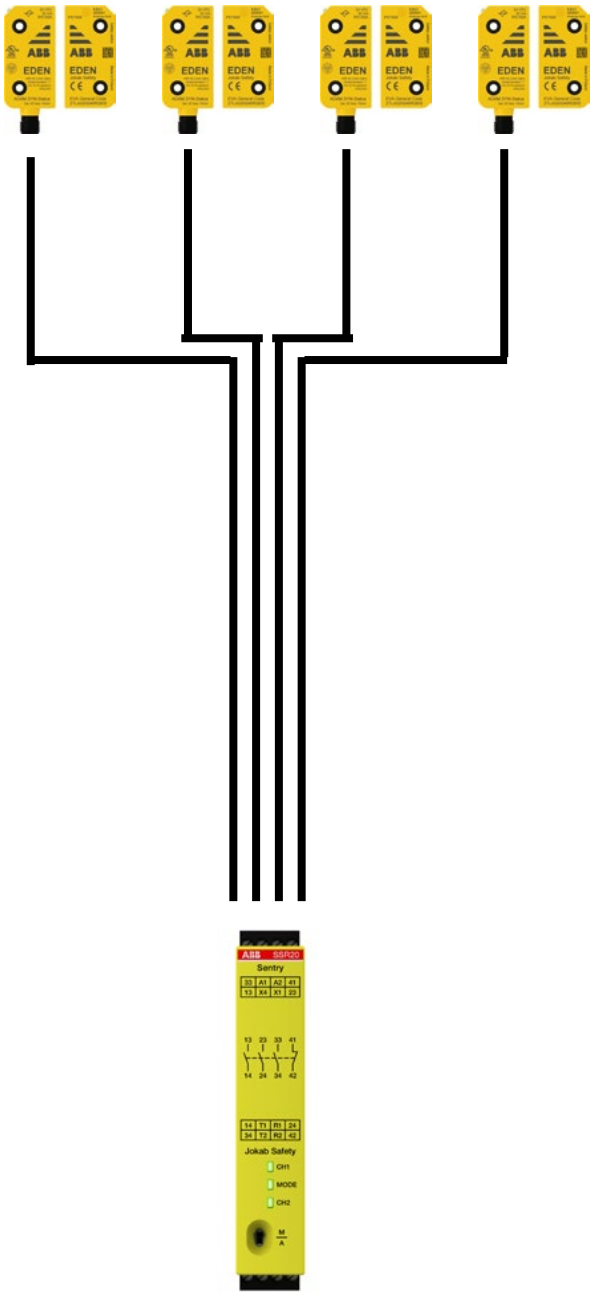
Voltage free sensors connected in series depends on the configuration, but are often Cat 3/PL d.

Connection example

OCB vs traditional connection

Traditional connection

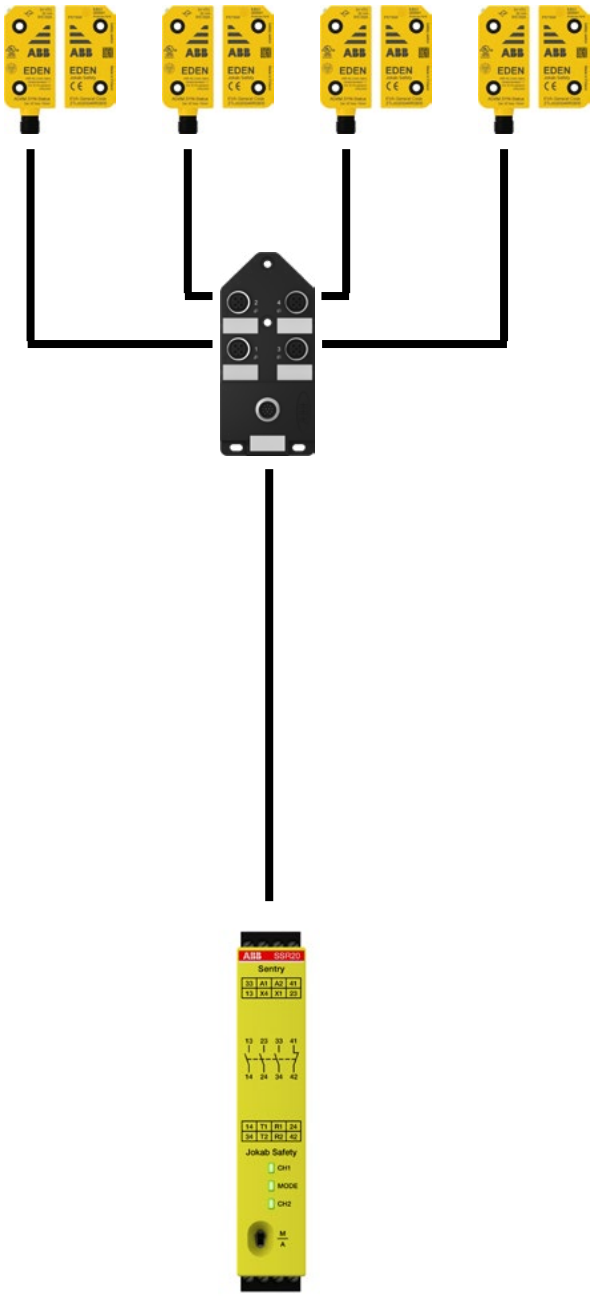
A traditional connection with 4 sensors connected in series for gates and hatches on a machine, with individual status information for each sensor. The control cabinet is 10 m away from the machine.



OCB connection

Using OCB for the same machine would result in a number of advantages for the cabling:

- Reduced total cable length with appr. 30 m
- Reduced number of cables to the cabinet
- Reduced number of cable glands in the cabinet
- Reduced number of terminal blocks in the cabinet



Models

OCB

Model descriptions

OCB-1A - serial OSSD

OCB-1A is used for serial connection of the safety signals of up to 4 Eden OSSD sensors. It has four M12-8 pin female connectors for the connection of the safety sensors and one M12-8 pin male connector for connection to the electrical cabinet. The blanking plug JSOP-8 must be connected to any unused M12 sensor connectors.
Individual information output is available from each sensor.

Compatible sensors: Adam OSSD-Info M12-8, and other OSSD sensors with compatible pin configuration.

OCB-1A

OCB-2A - serial voltage free

OCB-2A is used for serial connection of the safety signals of up to 4 sensors with voltage free contacts. It has four M12-5 pin female connectors for the connection of the safety sensors and one M12-8 pin male connector for connection to the electrical cabinet. Blanking plug JST2 must be connected to any unused M12 sensor connectors.
Individual information output is available from each sensor.

Compatible sensors: Smile, LineStrong, MKey, EStrong, and other sensors with compatible pin configuration.

OCB-2A

OCB-3A - individual OSSD

OCB-3A is used for individual connection of the safety signals of up to 4 Eden OSSD sensors. It has four M12-5 pin female connectors for the connection of the safety sensors and one M12-12 pin male connector for connection to the electrical cabinet.

Compatible sensors: Adam OSSD-Info M12-5, Orion, and other OSSD sensors with compatible pin configuration.

OCB-3A

OCB-4A - individual voltage free

OCB-4A is used for individual connection of the safety signals of up to 4 sensors with voltage free contacts. It has four M12-5 pin female connectors for the connection of the safety sensors and one M12-12 pin male connector for connection to the electrical cabinet.

Compatible sensors: Smile, LineStrong, MKey, EStrong, and other sensors with compatible pin configuration.

OCB-4A

OCB sensor connection box

OCB-1A

Connection	Communication type	Connectors for sensors	Connector for cabinet	Type	Order code
Serial	OSSD	M12-8 female	M12-8 male	OCB-1A	2TLA020055R3000
	Voltage free	M12-5 female	M12-8 male	OCB-2A	2TLA020055R3100
Individual	OSSD	M12-5 female	M12-12 male	OCB-3A	2TLA020055R3200
	Voltage free	M12-5 female	M12-12 male	OCB-4A	2TLA020055R3300

OCB accessories

JSOP-8

JST2

Function	Usage	Connector	Type	Order code
OSSD termination plug	Required for unused connectors on OCB-1A	M12-8 male	JSOP-8	2TLA020055R2400
Voltage free termination plug	Required for unused connectors on OCB-2A	M12-5 male	JST2	2TLA030051R1300

Selection table for OCB cable types

Connection block	OCB-1A	OCB-2A	OCB-3A	OCB-4A
Sensor cable	B	A	A	A
Cabinet cable	C	C	D	D

Cables for OCB

M12-C334

Cable type	Connector	Female/male	Length	Type	Order code
A	M12-5	Female + male	1 m	M12-C112	2TLA020056R2000
			3 m	M12-C312	2TLA020056R2100
			6 m	M12-C612	2TLA020056R2200
			10 m	M12-C1012	2TLA020056R2300
			16 m	M12-C1612	2TLA020056R5400
			20 m	M12-C2012	2TLA020056R2400
B	M12-8	Female + male	1 m	M12-C134	2TLA020056R5000
			3 m	M12-C334	2TLA020056R5100
C	M12-8	Female	3 m	M12-C33	2TLA020056R2900
			6 m	M12-C63	2TLA020056R3000
			10 m	M12-C103	2TLA020056R4000
			20 m	M12-C203	2TLA020056R4100
D	M12-12	Female	6 m	M12-C65	2TLA020056R7200
			10 m	M12-C105	2TLA020056R7300
			20 m	M12-C205	2TLA020056R7500

Safety magnetic switch
Sense

Sense is a non-contact switch for interlocking gates and hatches that is available in coded and non-coded versions

Sense is available in plastic and stainless steel housing. The stainless steel versions are designed for harsh environments and extreme temperatures.

Sense offers an interlocking function reaching PL e/SIL3 with low level coding.

Safety and protection

High safety level
Sense has two closing and one opening solid state contacts. Two of these need to be monitored to achieve PL e/SIL3.

LED indication
An integrated LED shows the status of the sensor.

Easy to install

Compact size
Sense is compact in size to make it easy to position and hide on gates and hatches.

Large sensing distance
With a large sensing distance and a high tolerance for misalignment Sense7 is easy to install.

Reliable in extreme conditions

Stainless steel models
With a stainless steel 316 body and a IP67/IP69K rating, Sense is resistant to harsh environments with both dirt and water. The stainless steel has a mirror polished finish (Ra4) suitable for CIP cleaning - food splash zones according to EHEDG guidelines.

High temperatures
Sense stainless steel models can be used at temperatures from -25 °C up to 105 °C.

Ordering information

Sense

Ordering details

Sense is always delivered with both switch and actuator.

Description	Connector	Cable length (m)	Contacts	Type	Order code
Non-coded magnetic switch-Stainless steel		10	2NC+1NO	Sense 4 10M	2TLA050072R6120
Non-coded magnetic switch-Stainless steel	M12-8 male	0,25	2NC+1NO	Sense 4 QC	2TLA050072R2120
Coded magnetic switch-Stainless steel		5	2NC+1NO	Sense 5Z 5M	2TLA050054R5120
Coded magnetic switch-Stainless steel		10	2NC+1NO	Sense 5Z 10M	2TLA050054R6120
Non-coded magnetic switch-Stainless steel	M12-8 male	0,25	2NC+1NO	Sense 6 QC	2TLA050074R2120
Coded magnetic switch		2	2NC+1NO	Sense 7 2M	2TLA050056R4100
Coded magnetic switch		5	2NC+1NO	Sense 7 5M	2TLA050056R5100
Coded magnetic switch		10	2NC+1NO	Sense 7 10M	2TLA050056R6100
Coded magnetic switch	M12-8 male	0,25	2NC+1NO	Sense 7 QC	2TLA050056R2100
Safety magnetic switch	-	5	2NC+1NO	Sense7Z 5M	2TLA050056R5120
Safety magnetic switch	-	10	2NC+1NO	Sense7Z 10M	2TLA050056R6120
Coded magnetic switch-Stainless steel	M12-8 male	0,25	2NC+1NO	Sense 7Z QC	2TLA050056R2120
Non-coded magnetic switch		2	2NC+1NO	Sense 8 2M	2TLA050076R4100
Non-coded magnetic switch		5	2NC+1NO	Sense 8 5M	2TLA050076R5100
Coded magnetic switch		5	2NC+1NO	Sense 11 5M	2TLA050060R5100
Non-coded magnetic switch-Stainless steel		10	2NC+1NO	Sense 12 10M	2TLA050080R6120
Spare parts					
Actuator to safety magnetic switch Sense7				Sense 7 Key	2TLA050040R0211
Actuator to safety magnetic switch Sense7Z, stainless steel.				Sense7Z Key SS	2TLA050040R0212

Technical data

Sense

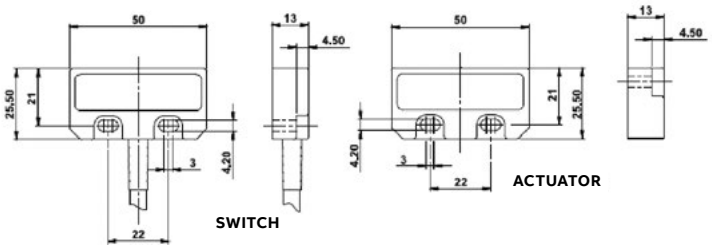
Technical data	
Approvals	
Conformity	2006/42/EC 2014/30/EU 2011/65/EU EN ISO 12100:2010, EN ISO 14119:2013, EN ISO 13849-1:2008+AC:2009, EN 60947-5-3:1999+A1:2005, EN 60947-5-2:1998+A1:1999+A2:2004
Functional safety data	
EN/IEC 61508:2010	Up to SIL3 (depending on system architecture) PFHD = 2.52 x 10-8
EN/IEC 62061:2005+A1:2013	Up to SILCL3 (depending on system architecture) PFHD = 2.52 x 10-8 Proof test interval T1 = 47 a MTTFd = 470 a (8 cycles per hour/24 hours per day/365 days) B10d = 3 300 000 operations at 100 mA load
EN ISO 13849-1:2008	Up to PL e, Cat 4 (depending on system architecture) PFHD = 2.52 x 10-8
If the product usage differs from these assumptions (different load, operating frequency, etc.) the values must be adjusted accordingly.	
Electrical data	
Operating voltage	+24 VDC ± 10%
Minimum switched current	10 VDC 1 mA
Safety channel output (NC/NO)	24 VDC 0.2 A max. rating
Mechanical data	
Material	Stainless steel 316
Protection class	IP67 and IP69K
Operating temperature	-25 °C ... + 105 °C
Cable type	PVC 8 core 6 mm
Mounting bolts (tightening torque)	2 x M4 (1.0 Nm)
Assured release distance (Sar)	10 mm
Assured operating distance (Sor)	20 mm
Recommended distance	5 mm

More information
For more information, e.g. the complete technical information,see product manual:
Sense 2TLC172249M0201

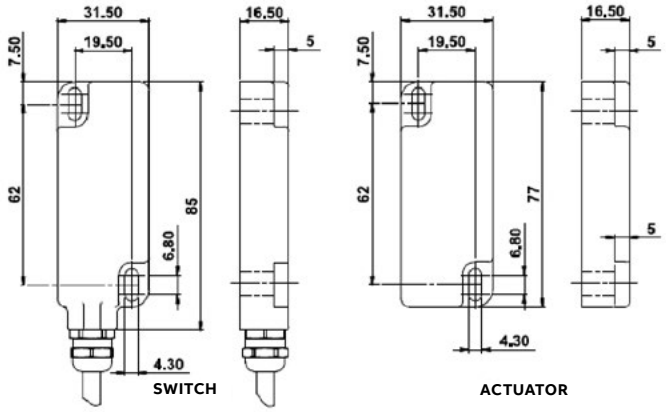
Dimension drawings

Sense - common models

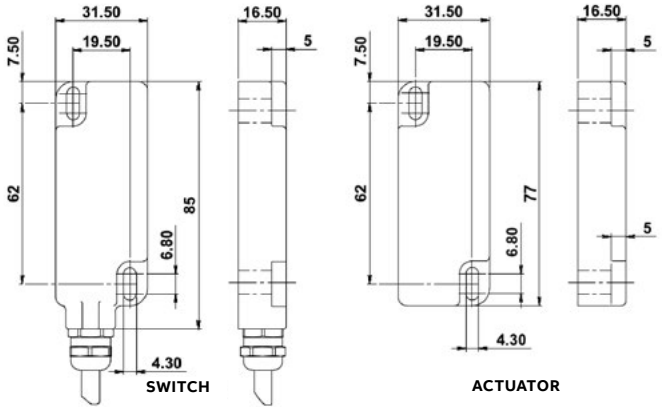
Sense4Z and Sense3Z



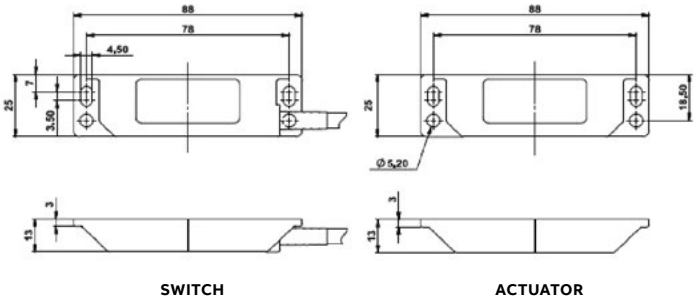
Sense5Z



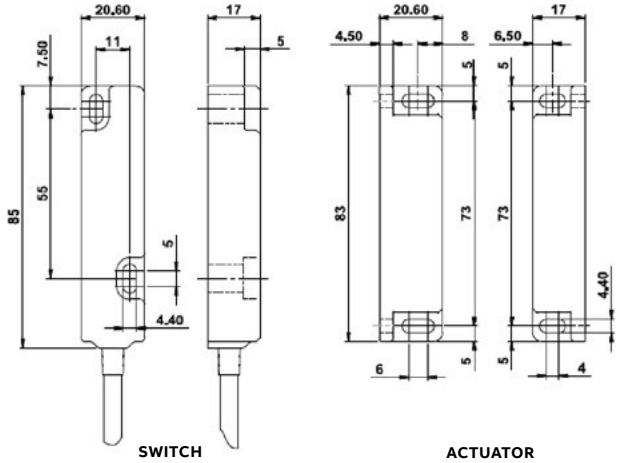
Sense7 and Sense7Z



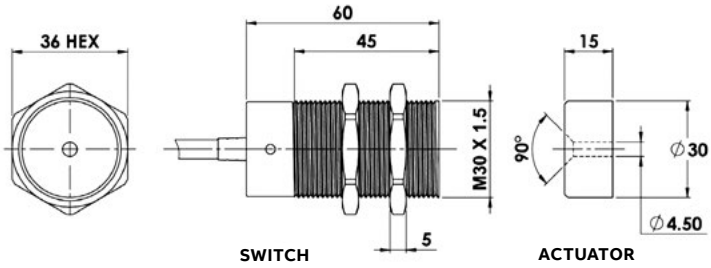
Sense8



Sense10Z



Sense11 & 12 and Sense11Z & 12Z



All dimensions in mm

Safety interlock switch
MKey

MKey are mechanical safety switches used for monitoring doors and hatches. The switch is mounted on the frame and the actuator key on the moving part of the guard.

All MKey models have a safe interlocking function. Some MKey models can be locked and depending on the locking signal they can be used either as process locks or safety locks (with a safe unlocking function).

MKey switches are available in different materials and sizes in order to meet the requirements of different applications.

Safety and protection

Highest level of safety
PL e/SIL3 can be reached when using two switches on a door.

Safety lock
Models that use power to unlock can be used as safety locks.

Emergency escape button
When using MKey8ER with an integrated emergency escape button, it is always possible to open the door from inside the dangerous zone.

Continous operation

Strong holding force
A holding force of up to 2000 N prevents unwanted process stops.

Robust design
Models are available in full stainless steel housing with IP69K, suitable for most applications in food processing and chemical industries.

Status information
Auxiliary contacts give status information.

Easy to install

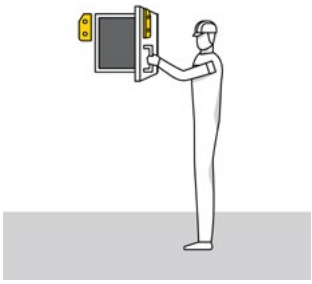
Easy mounting with rotating head
The head of the switch can be mounted in up to 8 actuating positions to allow different mounting positions.

Flexible keys
Flexible keys are available to minimize mechanical wear and allow a smaller movement radius and use in reduced spaces.

Applications
MKey

Doors and hatches
MKey is used to monitor the position of doors and hatches. The models with locking function are usually used for:
- Processes which should not be interrupted, such as welding.
- Machinery with a long stopping procedure, such as paper machinery that requires a long braking operation.
- Prevention of unauthorized access to a particular area.

Please note that all safety key switches (including MKey) normally need two switches per door/hatch in order to reach PL e/SIL3. (See EN ISO 13849 and EN ISO 14119.)



Locking and interlocking
An interlocking function indicates if a door is open or closed and prevents movement when the door is open, but it does not prevent the door from being opened. A locking function makes sure the door is kept closed.

Process lock with safe interlocking
All MKey models offer a safe interlocking function that will stop the process if the door/hatch is opened. All lockable models of MKey can also be used as a process lock to prevent the process from being interrupted.

An example of an application where a process lock could be used is a welding robot where the stopping time is short, but the welding should not be interrupted once it has started.

Safety lock with safe interlocking and safe unlocking
The MKey models that use power to unlock can be used as safety locks. They have a safe unlocking function, which means that the loss of power for these locks will not result in the release of the locking element, and the door will remain locked even during a power failure.

An example of an application where a safety lock should be used is a circular saw that would have a long stopping time after a power failure.

Features
MKey

Different models
MKey 1 through 6 are simple mechanical interlocks while MKey8 and MKey9 also have locking functions.
- MKey 1 through 6: plastic body with plastic or stainless steel head, or full stainless steel body and head.Holding force 12 N or 40 N.
- MKey8: robust design in die cast metal or stainless steel body and head. Holding force of 2000 N.
- MKey9: plastic body with stainless steel head. Holding force of 1800 N.

Different materials and protection classes
The housing and head of the key switches are available in different material in order to meet the requirements of different applications. Metal heads are more resistant to mechanical wear. The choice between plastic, die cast or stainless steel depends on the environment and the chemicals used. Models ending with -Z are completely made of stainless steel 316 and offers an IP69K protection class. They can be high pressure hosed with detergent at high temperature and can be used in harsh applications, e.g. the food processing and chemical industries. All other models offer IP67.

Emergency escape button
MKey8ER has a manual release button at the rear of the housing. It is used for emergency exit by a person locked inside the dangerous zone by mistake. It is a non-latching manual escape, and can be used when the risk assessment requires it. The switch must be mounted so that the release button is reachable from inside the dangerous zone, but not reachable from outside. Pressing and holding the button will release the locking mechanism allowing to open the door/ guard.

Power to lock or power to unlock
Two different types of locking function are available:
- Spring lock (power to unlock) models are automatically locked when closing the door. An active signal (+24 VDC) must be supplied to unlock the switch, which makes these models suitable as safe locks.
- Electro-magnetic lock (power to lock) models are locked when an active signal (+24 VDC) is supplied, which makes these models suitable only as process locks.

Rotatable head
Depending on model, the head of MKey can be set in two or four directions with two entrance holes each, thus providing four or eight different mounting positions. The leading edges of the actuator key are reinforced and beveled in order to guide it properly into the hole.

Constructed for safety
All MKey switches have double positively operated forced-guided contacts controlled by the actuator key. This means that the contacts that are closed when the actuator key is in the switch will be forced to open, and the ones that are opened will be forced to close, when the actuator key is removed. It also means that it is not possible to have, e.g. NO and NC contacts opened at the same time due to a fault like one welded contact.

The actuator key is designed to prevent tampering with the safety switch using a tool, a magnet or any similar object. The lockable models also have forced-guided contacts controlled by the locking mechanism. MKey8 and MKey9 have auxiliary contacts giving status information.

Ordering information

MKey

MKey ordering information

Locking function	Material housing	Material head	Holding force (N)	Special feature	Type	Order code
—	Plastic	Plastic	12		Mkey1	2TLA050021R1100
	Plastic	Plastic	12		Mkey1	2TLA050021R1300
	Plastic	Plastic	12		Mkey4	2TLA050001R1100
	Plastic	Plastic	40		Mkey4+	2TLA050001R1101
	Plastic	Plastic	12		MKey5	2TLA050003R1100
	Plastic	Plastic	40		MKey5+	2TLA050003R1101
	Die cast	Die cast	12		Mkey6	2TLA050005R1130
	Die cast	Die cast	40		Mkey6+	2TLA050005R1431
Process lock (power to lock)	Die cast	Die cast	2000		MKey8M 24VDC	2TLA050013R1132
Safety lock (power to unlock)	Die cast	Die cast	2000		MKey8 24VDC	2TLA050011R1132
	Die cast	Die cast	2000	With escape release button	MKey8ER 24VDC	2TLA050015R1132
	Stainless steel	Stainless steel	2000	With escape release button, IP69K	MKey8ERZ 24VDC	2TLA050015R0122
	Die cast	Die cast	2000	Quick connect	MKey8 24VDC	2TLA050011R2132
	Die cast	Die cast	2000		MKey8 110VAC	2TLA050011R1133
	Stainless steel	Stainless steel	2000	IP69K	MKey8Z 24VDC	2TLA050011R1122
	Plastic	Stainless steel	1800		MKey9 24VDC	2TLA050007R1112

Accessories

MKey

Actuator keys

Choose standard key or flat key depending on suitable mounting direction, e.g. standard door or sliding door.
Flexible keys are suitable for doors/hatches with a smaller opening radius (i.e. 100-175 mm).

Type of key	Compatible MKey models	Key housing	Description	Type	Order code
Angled key	MKey1		Angled key for MKey1 safety switches. Stainless steel	Mkey Key Key7	2TLA050040R0200
Standard key	MKey5 MKey5+	None	Standard key for MKey safety switches with plastic head. Stainless steel key.	MKey Key 1	2TLA050040R0201
	MKey5 SSH MKey5+ SSH MKey5Z MKey5+Z All MKey8 All MKey9	None	Standard key for MKey safety switches with metal head. Stainless steel key.	MKey Key 2	2TLA050040R0202
Flat key	All	Plastic shroud	Flat key for MKey safety switches. Stainless steel key with plastic shroud.	MKey Key 3	2TLA050040R0220
Flexible key	All	Die cast	Flexible key for MKey safety switches. Stainless steel key with black die cast metal housing.	MKey Key 5	2TLA050040R0203
	All	Stainless steel	Flexible key for MKey safety switches. Stainless steel key with stainless steel housing.	MKey Key 6	2TLA050040R0204

Other accessories

Description	Type	Order code
Bit for manual unlocking of MKey8Z. Stainless steel.	MKey8Z Manual release	2TLA050040R0400
Slide Lock for MKey8 and MKey9, left.	MKey slide lock left	2TLA050040R0500
Slide Lock for MKey8 and MKey9, right.	MKey slide lock right	2TLA050040R0501

Technical data

MKey

Technical data			
Approvals			
Conformity	CE 2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS EN ISO 12100:2010, EN ISO 14119:2013, EN 60204-1:2006:+A1:2009, EN 60947-1:2007:+A1:2011, EN 60947-5-1:2004:+A1:2009		
Functional safety data			
B10d	2,500,000 operations at 100 mA load		
EN/IEC 62061	Up to SILCL3 (depending on system architecture) [1]		
EN ISO 13849-1	Up to PL e (depending on system architecture) [1]		
Electrical data	**MKey 1 through 6**	**MKey8**	**MKey9**
Contact block configuration with guard open and unlocked			
For actuator key	2 NO + 1 NC	MKey8, Mkey8Z, MKey8ER: 2 NO + 1 NC MKey8M: 1 NO + 1 NC	MKey9: 2 NO + 1 NC [2] 1 NO + 1 NC
For solenoid/locking	-	MKey8, Mkey8Z, MKey8ER: 2NO + 1NC MKey8M: 2 NO	MKey9: 2 NO + 1 NC [2] MKey9M: 2 NO
Solenoid voltage	-	+24 VDC ± 10%	+24 VDC ± 10%
DC-13	+24 VDC / 3 A		
AC-15	230 VAC / 3 A		
Mechanical data			
Travel for positive opening	6 mm	10 mm	10 mm
Material	Body: Polyester or stainless steel 316 Head: Polyester or stainless steel 316	MKey8, MKey8M, MKey8ER: Die cast painted red MKey8Z: Stainless steel 316	Body: Glass filled polyester Head: Stainless steel 316
Conduit entries	3 x M20 x 1.5	3 x M20 x 1.5	1 x M20 x 1.5
Operating temperature	-25...+80 °C	-25...+40 °C	-25...+40 °C
Protection class	MKey5, MKey5+, MKey5 SSH, MKey5+ SSH: IP67 MKey5Z, MKey5+Z: IP67, IP69K	MKey8, MKey8M, MKey8ER: IP67 MKey8Z: IP67, IP69K	IP67

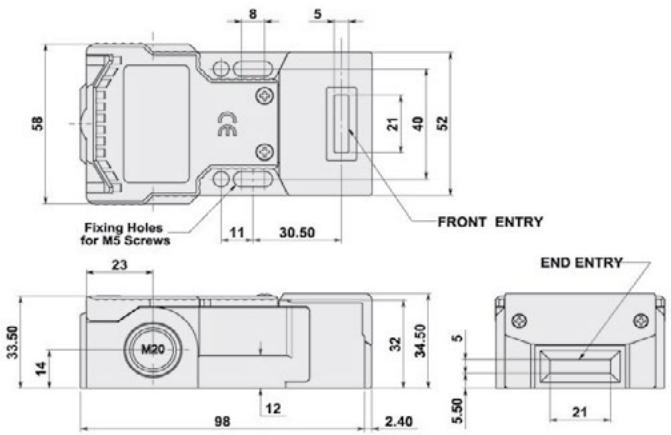
1) Please see EN/IEC 62061, EN ISO 13849, EN ISO 14119 and ISO/TR 24119 to see how fault exclusions and serial connection impacts the reliability of the safety related parts of control systems.
2) For MKey9, the pair of contacts for the actuator key and the pair of contacts for the locking cannot be used independently of each other. See the manual for more information.

More information
For more information, e.g. the complete technical information, see product manual:
MKey5 2TLC172244M0201,
MKey8 2TLC172245M0201,
MKey9 2TLC172246M0201
Connection diagrams
For MKey connection diagrams please see https://library.abb.com/

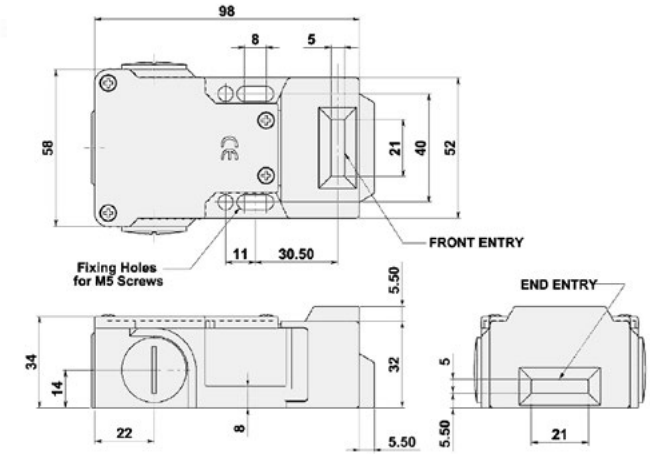
Dimension drawings

MKey - common models

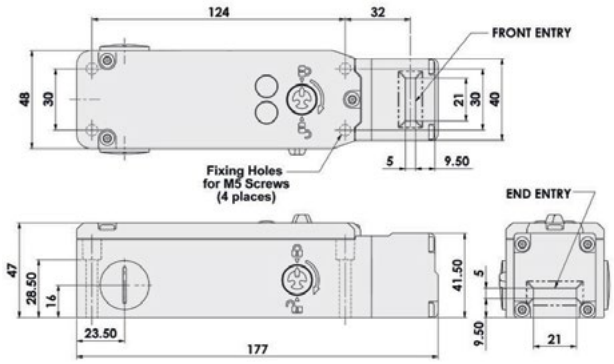
MKey5



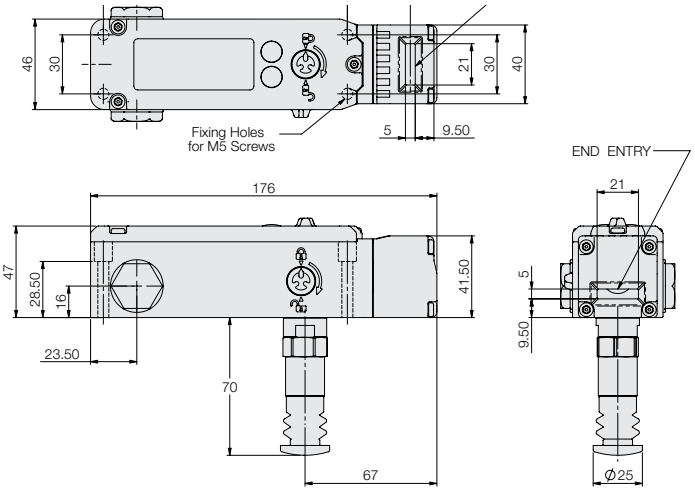
MKey5Z



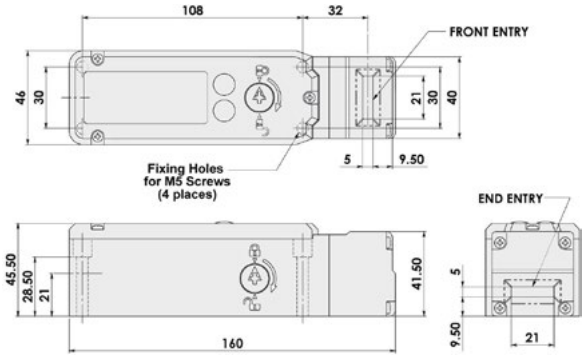
MKey8 and MKey8M



MKey8ER



MKey9 and MKey9M



All dimensions in mm

Notes

Electromagnetic process lock
Magne

Magne is an electromagnetic process lock intended for locking doors and hatches.

Magne is usually used to prevent unwanted process interruptions, e.g. during a welding operation.

Magne models with integrated Adam safety sensor make it easy to achieve the highest safety level for the interlocking function.

Reliable in extreme conditions

Sealed aluminium housing
IP67 sealing makes Magne suitable for harsh environments.

Robust design
The electromagnetic lock without mechanical moving parts is a robust design with fewer parts that are subject to wear.

Hygienic design
Flat surfaces without cavities or screws sticking out minimize the risk of accumulating dirt on the surface.

Easy to install

M12 connectors
Quick and easy cabling with M12 connectors.

Magnets simplify installation
Electromagnets offer larger mounting tolerances than mechanical locks.

Continuous operation

LED diagnostics
Integrated LED diagnostics reduce down time when troubleshooting.

Strong holding force
A holding force of up to 1500 N prevents unwanted process stops.

Applications and features
Magne

Applications

Protect the process
Magne 4 is a process lock, with a safe interlocking function. This means that the interlocking function reaches PL e/SIL3 but the unlocking signal is not a safe signal. A typical application is to prevent unintentional/unnecessary interruptions of a sensitive process when the dangerous movement has a very short stop time.

Magne 3 is a simple lock without any interlocking function/ safety function.

Harsh environments
With a hygienic enclosure in anodized aluminum and IP67 protection class, Magne is well suited for harsh environments.

Features

PL e in a simple and cost effective way
Magne 4 has an integrated Adam sensor. Models are available with either Adam DYN or Adam OSSD. Eva General code or Eva Unique code is ordered separately. The use of the Eden safety sensor makes it easy to reach PL e/SIL3 for the interlocking function, and enables serial connection of several Magne 4 locks to the Pluto safety PLC using only one input for Eden DYN and two for Eden OSSD. Tina 12A can be used for the serial connection of two Magne 4 locks in order to simplify connection, reduce cabling and risk of connection errors.

Optional permanent magnet
Anchor plates for Magne are ordered separately and are available with or without a permanent magnet. A permanent magnet holds the door closed when Magne is unlocked, or if there is a power loss. Without the permanent magnet, Magne has no magnetic field when unlocked, which avoids the accumulation of metallic particles on the magnet.

M12 connectors
Since the Adam sensor is integrated in Magne 4, the amount of cabling is reduced so that only one cable is necessary for both the locking of Magne and the interlocking with Eden.
The M12 connectors speed up connection and reduce the risk of connection errors.

Status indication
Most models offer an info signal indicating whether the Magne is locked or not, which simplifies troubleshooting and improves user friendliness.

Locking and interlocking
An interlocking function indicates if a door is open or closed and prevents movement when the door is open but it does not prevent the door from being opened. A locking function makes sure the door is kept closed.

Ordering information
Magne

Ordering details

For a complete Magne lock both door part and frame parts are necessary.
Magne 4 also requires a separate Eva sensor.

Safe interlocking with integrated Adam	Safety signal	Extra function	Connector	Type	Order code
No	-	-	M12-5 male	Magne 3X M12-5	2TLA042022R2700
Yes	DYNlink	-	M12-5 male	Magne 4X DYN M12-5	2TLA042022R3000
		"Locked" and "Closed" information outputs	M12-8 male	Magne 4 DYN-Info	2TLA042022R3400
		Two separate “locked” and “closed” information outputs	M12-8 male	Magne 4 DYN-2Info	2TLA042022R3410
	OSSD	"Locked" and "Closed" information outputs	M12-8 male	Magne 4 OSSD-Info	2TLA042022R4600

Accessories

Description	Type	Order code
Aluminium profile for door handle that completely covers a Magne unit when the door is closed. For conventional door (5–15 mm door gap)	JSM D28	2TLA042023R0100
Mounting kit for Magne. For conventional door (5 -15 mm door gap) *	JSM D21B	2TLA042023R0500
JSM D21C Mounting accessory	JSM D21C	2TLA042023R0510
Mounting kit for Magne. For sliding door *	JSM D23	2TLA042023R0200
Mounting kit for Eva. For conventional door*	JSM D24	2TLA042023R0300
Door handle for JSM D21B	JSM D27	2TLA042023R1000
Connection block for serial connection of two Magne (M12-8)	Tina 12A	2TLA020054R1800
Cellular rubber, 10 mm thick. Spare part for anchor plate.	Cellular rubber	2TLA042023R3600
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Door part		
Anchor plate with permanent magnet. Delivered with Magne rubber.	Magne Anchor 32E	2TLA042023R0420
Anchor plate without permanent magnet. Delivered with Magne rubber.	Magne Anchor 32D	2TLA042023R0410
Anchor plate with permanent magnet. Delivered with cellular rubber.	Magne Anchor 32B	2TLA042023R0400
Anchor plate without permanent magnet. Delivered with cellular rubber.	Magne Anchor 32A	2TLA042023R1300

* All mounting kits include the bolts and nuts necessary to mount Magne on ABB Quick-Guard® fencing system

Eva sensor for Magne 4 models

Compatible Adam	Code description	Code level	Type	Order code
Adam DYN and OSSD	General code. (Eva is interchangeable)	Low level	Eva General code	2TLA020046R0800
	Unique code. (Prevents defeat/fraud)	High level	Eva Unique code	2TLA020046R0900

Cables and connectors

Magne

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
		0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
			Angled female connector	M12-C1012V2	2TLA020056R6700
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
		10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
		10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634	2TLA020056R6400
		1 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100

Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Technical data
Magne

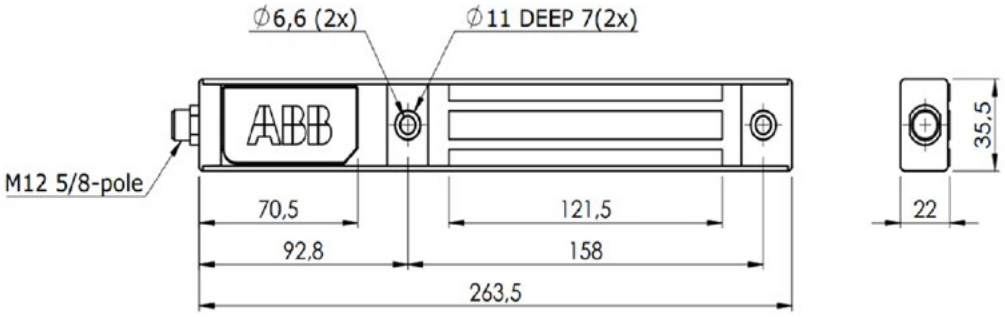
Technical data		
	Magne 3	**Magne 4**
Approvals		
Conformity	CE 2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS 2015/863 - RoHS3 EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 60947-5-2:2007+A1:2012, EN 60947-5-3:2013	CE 2006/42/EC - Machinery 2014/30/EU - EMC 2011/65/EU - RoHS 2015/863 - RoHS3 EN ISO 12100:2010, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN 62061:2005+A1:2012+A2:2015, EN 61508:2010, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 60947-5-2:2007+A1:2012, EN 60947-5-3:2013
Functional safety data		
EN 61508:2010		Interlocking function: SIL3, PFH_D = 4.50 x 10^{-9}
EN 62061:2005		Interlocking function: SILCL3, PFH_D = 4.50 x 10^{-9}
EN ISO 13849-1:2015		Interlocking function: PL e, Cat. 4, PFH_D= 4.50 x 10^{-9}
Electrical data		
Operating voltage	+24 VDC ± 15%	
Holding force		
+24 VDC	Up to 1500 N	
0 V, Anchor plate 32D	0 N	
0 V, Anchor plate 32E	30 N	
Assured release distance (S_{ar})		25 mm
Assured operating distance (S_{ao})		10 mm
Mechanical data		
Operating temperature	-20...+50 °C	
Humidity range	35 to 85% (with no icing or condensation)	
Protection class	IP67	
Weight		
	700 g	700 g
Anchor plate 32D/E	290 g	
Material		
Anchor plate	Iron with nickel coating	
Electromagnet	Iron with zinc coating	
Housing	Anodized aluminum with parts in polycarbonate	
Potting	PUR, epoxy	

More information
For more information, e.g. the complete technical information, see product manual for:
Magne 2TLC172315M0201

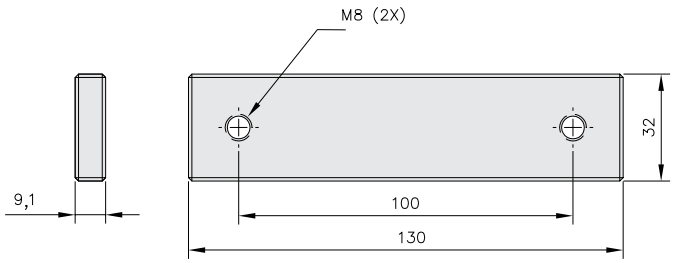
Dimension drawings

Magne

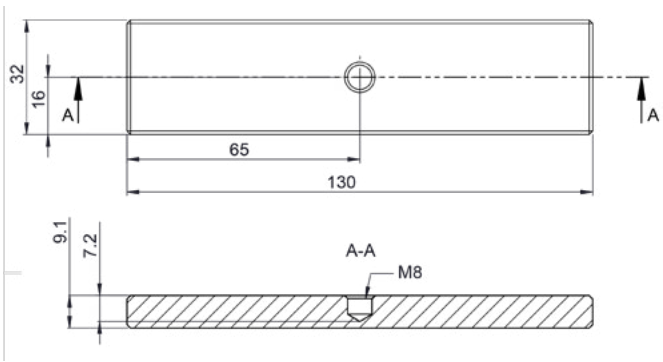
Magne



Anchor plate 32A



Anchor plate 32D



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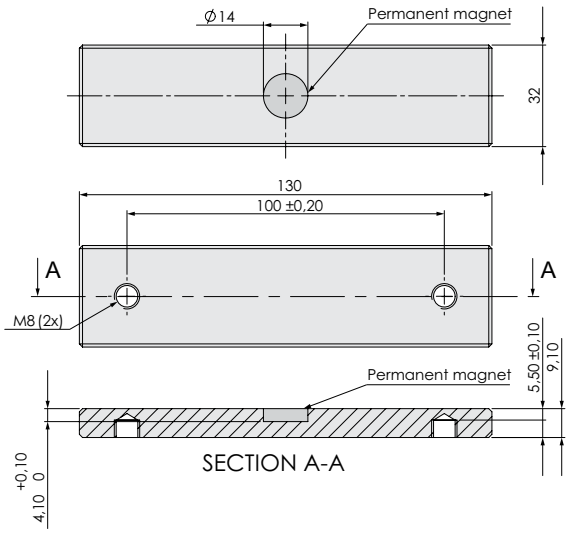
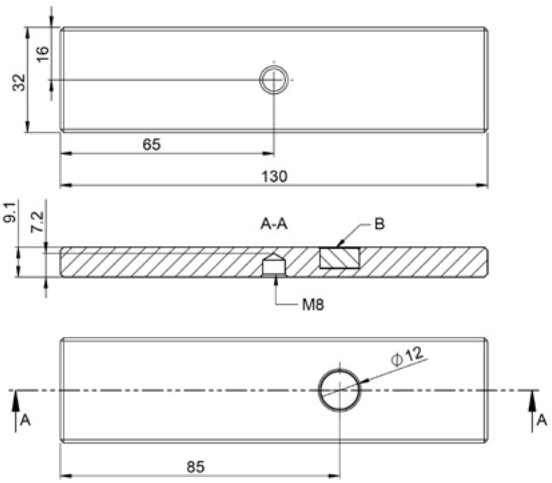


Anchor plate 32E



All dimensions in mm

Safety lock
GKey

GKey is a robust safety lock with a die cast housing for hinged and sliding doors.

GKey offers an interlocking function reaching PL e/SIL 3 with high level coding. Power is needed to unlock GKey which makes GKey a safety lock.

GKey is fitted with a rear escape release button and manual unlocking (auxiliary release).

GKey offers four positions for 22 mm pilot devices.

Safety and protection

Escape release
The door can always be opened from inside the danger zone using the escape release button.

High level coding
A standard mechanical interlock combined with RFID coding offers high level coding.

Lockout function
GKey can be padlocked off for safe working.

Easy to install

Integrated buttons
There are four positions in the key housing that can be used for integrating push buttons, switches or pilot lights.

Reliable in extreme conditions

Robust design
Made of die cast aluminum alloy with a robust construction, GKey is ideal for use in mechanically demanding environments.

Ordering details

GKey

For a complete safety lock, a switch and a mounting plate with front handle must be ordered separately.
Rear handle, spring catch, pilot devices and blanking plugs for the unused positions are available and also ordered separately.

Switches

All models are fitted with an escape release button and delivered with a high level coded RFID actuator.

Material (body)	Positions for pilot devices	Manual unlock	Type	Order code
Die cast	4	Yes	GKey4 RU	2TLA050304R0002

Mounting plate with front handle

The handle can be mounted on hinged doors and sliding doors, on the left or on the right.
Note that door and frame must be aligned when the door is closed.
Each order code includes a mounting plate for the switch and a front handle.

Type of handle	Material (mounting plates and sliding bolt)	Type	Order code
Sliding	Die cast	FHS GKey4	2TLA050310R0032

Accessories - Rear handle and spring loaded catch

The spring loaded catch prevents from closing the door by mistake.
When the sliding handle is in open position, the catch must be pulled in order to be able to push back the handle to closed position.

Type of handle	Material	Description	Type	Order code
Sliding	Die cast	Rear handle	RHS GKey MKey	2TLA050040R0510
		Spring catch	SCS GKey MKey	2TLA050040R0511

Accessories - Pilot devices

Pilot devices and blanking plugs must be ordered separately. Make sure that the total amount is 4, so that all holes in GKey4 are covered.

Description	Contacts	Illuminated	Voltage	Type	Order code
Emergency stop button	2NC	No	24 V AC/DC	CE3P-10R-02	1SFA619501R1051
Selector switch	2NO	No	24 V AC/DC	C2SS1-10B-20	1SFA619200R1026
Push button Green	1NO	Yes	24 V AC/DC	CP1-11G-10	1SFA619100R1112
Push button Yellow	1NO	Yes	24 V AC/DC	CP1-11Y-10	1SFA619100R1113
Push button Blue	1NO	Yes	24 V AC/DC	CP1-11L-10	1SFA619100R1114
Push button White/Clear	1NO	Yes	24 V AC/DC	CP1-11C-10	1SFA619100R1118
Push button Black	1NO	No	24 V AC/DC	CP2-10B-10	1SFA619101R1016
Blanking plug Black				MA1-8130	1SFA611920R8130
Legend plate holder (without insert)				KA1-8120	1SFA616920R8120

More information
For more optional pilot devices, pre-printed legend plate inserts and other accessories, please see the Compact range of ABB pilot devices:
http://new.abb.com/low-voltage/products/pilot-devices

5

Control devices

Control devices

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Three-position device JSHD5	171

Introduction and overview
Selection guide

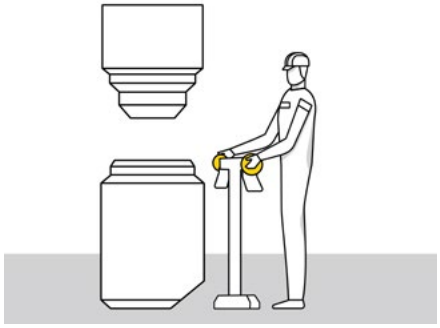
ABB offers ergonomic control devices that allow operators to safely control dangerous machinery.

	Safeball	**JSHD4**	**HD5**
Image			
Type	One or two-hand control device	Tree-position device	Tree-position device
Description	Ergonomic and unique machine control	Ergonomic hold-to-run device with extra control buttons	Ergonomic hold-to-run device for food and beverage applications
Application	Mainly used in pairs as a two-hand control in applications where it must be ensured that the operator has his hands outside the hazardous area, e.g. for starting a press cycle.	Used during e.g. troubleshooting, test running and programming, in order to allow the operator to be inside the hazardous area without stopping the machine, while ensuring limited movement and stop in case of danger.	
Advantages	- Ergonomic design - Several grip possibilities - Flexible mounting - Two opposing buttons minimize the possibility to defeat	- Ergonomic shape and operation - Hand recognition prevents defeat - Easy connection with M12 connectors - Several models to suit multiple applications - Extra buttons for e.g. machine control	- Adapted and approved for use in food and beverage applications - Ergonomic shape and operation - Flashlight for inspection - Integrated emergency stop - Extra buttons for e.g. machine control

Introduction and overview
Selection orientation and standards

Different types of control devices

When to use a two-hand or one-hand control device
A two-hand control device is often used for machines with manual loading or unloading. The operator uses the two-hand control device to safely start a machine cycle. A two-hand control must be used with a safety control device that supervises that both buttons are pressed simultaneously, i.e. both hands are on the control and therefore outside the dangerous zone, in order to start the dangerous movement. A one-hand control device can be used in applications when the operator cannot reach the hazardous area with his/her free hand, or on less dangerous machines.



When to use a three-position device
A three-position device (or hold-to-run device) is used to allow limited movement of the machine when the operator needs to be in the dangerous area without stopping the dangerous machine, for example during troubleshooting, test running or programming.

The operator pushes the larger black button to a middle position in order to allow a movement. In case of danger, the operator will either release the button or squeeze it to its bottom position and the machine will stop.

Standards
The safety distance of two-hand control devices should be calculated using EN ISO 13855.

When constructing a two-hand station for a machine, the standard EN 574 about functional aspects and principles for design needs to be followed.

One-and two-hand devices
Safeball™

Safeball™ is an ergonomic control device used for safe start and stop of machine cycles. Usually two Safeball™ are used together to form a two-hand control.

Safeball™ consists of a spherical ball containing two embedded push button switches, one on each side of the ball. Both buttons must be pressed in order to start and operate the machine. The risk of unintentional activation is thereby minimized and the device is simple and ergonomic to use.

When two Safeball™ are used in a two-hand device application, the operator must press all four push buttons simultaneously in order to operate the machine. If one or more of the buttons are released, a stop signal is given to the machine.

Optimum interface

Ergonomic design
The design of Safeball™ allows for comfort of use for all hand sizes and has a variety of gripping positions. There is no need for shrouding top covers to prevent defeat, as there is for two-hand devices with standard push buttons.

Flexible mounting
With the JSM C5 mounting bracket, Safeball™ can be orientated in the most ergonomic position for the operator.

Safety and protection

Unique design
The unique design of SafeballTM combines the highest level of safety with the best ergonomics.

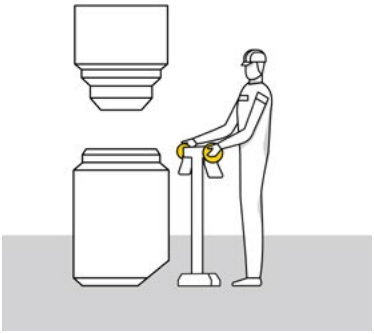
Highest safety level
SafeballTM provides the operator with a dual switching function and short-circuit supervision in each hand.

Applications and features
Safeball™

Applications

One-hand control device
One Safeball™ can be used as an ergonomic “hold to run” button, i.e. the movement is allowed as long as both push buttons on Safeball™ are pressed, usually when the operator cannot reach the hazardous area with his/her free hand, or on less dangerous machines. Safeball™ is a very practical one-hand control device since it is very easy to locate and activate.

Two-hand control device
A two-hand control device is often used for machines with manual loading or unloading. The operator uses the two-hand control device to safely start a machine cycle. A two-hand control must be used with a safety control device that makes sure that both buttons are pressed simultaneously, i.e. both hands are on the control and therefore outside the dangerous zone, in order to start the dangerous movement. Using two Safeball™, it is easy to realize a custom two-hand device.



Features

Mounting methods
Safeball™ can be mounted in many different ways. It can be mounted on a table, on the machine, on a support or wherever suitable for ergonomic reasons. Safeball™ can be mounted in a fixed position or on a tilting and/or rotating support when used with a JSM C5. This flexibility in mounting enhances ergonomics and minimizes work-related musculoskeletal disorders.

When two Safeball™ are used as a two-hand device, no shrouding top cover is necessary to prevent defeat, as it is for two-hand devices with push buttons, since it is very difficult to push all 4 push buttons of the two Safeball™ with e.g. a hand and an elbow.

Highest level of safety
When used as a two-hand control device, a safety controller for two-hand devices must be used, like an appropriate Sentry safety relay or a Pluto programmable safety controller. The safety controller monitors that all four push buttons (i.e. on each side of both Safeball™) are pressed within 0.5 second, in order to detect e.g. a short circuit or fraud, like a rubber band around one device. Safeball™ is certified to comply with type III C according to EN 574+A1:2008.

JSTD25
The JSTD25 control stations are pre-built two-hand devices utilizing the ergonomics of the Safeball™. They can be used as fixed devices that are easy to install, or as mobile devices. All models are equipped with shields to protect the buttons from accidental operation, and also protect from damage if the device is dropped on the floor when used as a mobile device. All versions meet EN 574 and EN ISO 13849-1.

Ordering information

Safeball™

Safeball™ JSTD1

Types of switches	Cable length	Type	Order code
1 NO + 1 NC	2 m	JSTD1-A	2TLA020007R3000
	0.2 m	JSTD1-B	2TLA020007R3100
	10 m	JSTD1-C	2TLA020007R3200
2 NO	0.2 m	JSTD1-E	2TLA020007R3400

Two-hand control devices JSTD25

Extra feature	Connector male	Type	Order code
None	M12-5	JSTD25F	2TLA020007R6000
	M12-8	JSTD25H	2TLA020007R6300
Pre-mounted Smile 10 EA emergency stop button	M12-8	JSTD25K	2TLA020007R6900

Accessories

Description	Type	Order code
Mounting bracket for JSTD1 with orientation possibility (ball joint)	JSM C5	2TLA020007R0900
Suspension shelf for JSTD25F/H/K	JSM C7	2TLA020007R1200
Protection coat for Safeball	Safeball coat	2TLA020007R1900
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800

Cables and connectors

Safeball™

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
		0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
			Angled female connector	M12-C1012V2	2TLA020056R6700
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
		10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
		10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634	2TLA020056R6400
		1 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100

Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Technical data

Safeball™

Technical data	
Approvals	Inspecta
Conformity	CE 2006/42/EC - Machinery EN ISO 12100:2010, EN 574+A1:2008
Functional safety data	
EN/IEC 61508:2010	Up to SIL3, depending on system architecture
EN/IEC 62061:2005+A1:2013	Up to SILCL3, depending on system architecture
EN ISO 13849-1:2008	Up to Cat. 4, PL e, depending on system
Mechanical data	
Operating force	Approx. 2N
Life, mechanical	> 1 x 10^6 operations at max 1 Hz
Connection cable	
JSTD1-A	PVC-cable, 4 x 0.75 mm^2, L = 2 m
JSTD1-B, JSTD1-E	Wires, 4 x 0.75 mm^2, L = approx. 0.2 m
JSTD1-C	PVC-cable, 4 x 0.75 mm^2, L = 10 m
Protection class	IP67. Not intended for use under water
Ambient temperature	-25 °C to +50 °C (operating)
Material JSTD1	Polypropylene
Weight JSTD1	
With 2 m cable	0.2 kg
With 10 m cable	0.7 kg
With 4 x 0.2 m wires	0.1 kg

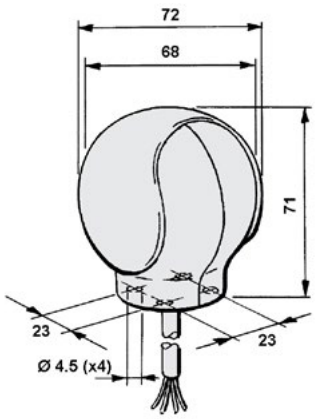
***More information**
Fore more information, e.g. the complete technical information, see product manual for:
Safeball - 2TLC172182M0201

Connection diagrams
For Safeball connection diagrams please see https://library.abb.com/

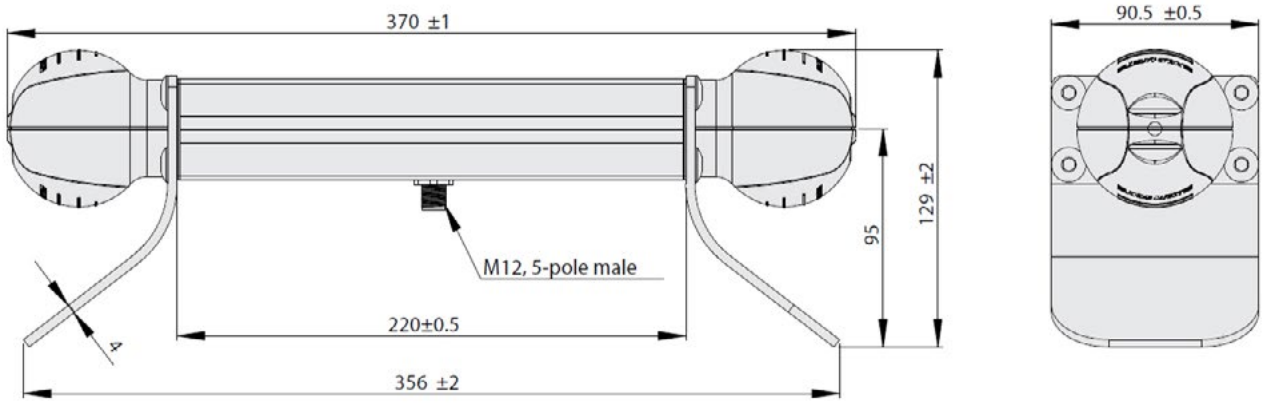
Dimension drawings

Safeball™

Safeball™



JSTD25F



All dimensions in mm

Three-position device
JSHD4

JSHD4 is a three-position device used to allow a limited movement of the machine when the operator is in the dangerous area, for example during troubleshooting, test running and programming.

The operator pushes the larger black button to a middle position in order to allow a movement. In case of danger, the operator will either release the button or squeeze it to its bottom position and the machine will stop.

JSHD4 is available with different types of connectors for an optimal adaptation to the application. Some models offer additional top and front button to control a non-safe signal, for ex. move forward and/or backward.

Safety and protection

Cheat-safe hand recognition
All JSHD4 models comply with PL e/Cat 4. Some models offer an “anti-tamper” function: an extra signal that indicates if the JSHD4 is held in the middle position by a human hand. A machine movement will be authorized only in presence of this signal and not if the device is held in run position by any other (fraudulent) mean.

Optimum interface

Ergonomic shape and operation
JSHD4 is ergonomic, both in respect of its shape, fitting to the hand, and the way the buttons are operated. JSHD4 is easy to operate using just the fingers (even with gloves), and the middle position provides a safe resting position.

Continuous operation

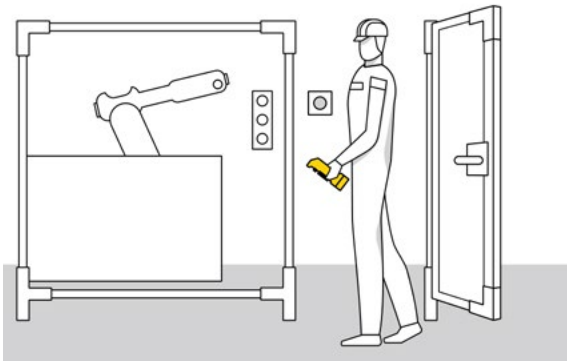
Safely inspect a running machine
JSHD4 allows the operators to safely inspect the manufacturing process without completely stopping the machine.

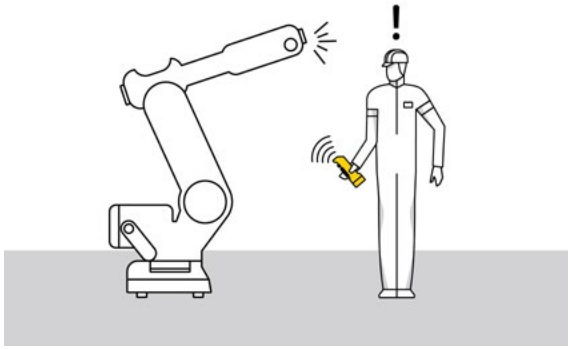
Applications and features
JSHD4

Applications

Safe troubleshooting, programming and testing
If the operator has to enter a risk area for troubleshooting or test running, it is extremely important that he/she is able to stop the machinery without having to rely on someone else pushing a stop button. In addition, no-one else should be able to start the machinery after it has been stopped by the operator. An operator who is under pressure must also be able to give a stop signal, whether in panic he/she pushes harder on the button or just releases it.

JSHD4 three-position control device can be used for troubleshooting, programming and test running in situations where no other protection is available or feasible. JSHD4 allows the operator to safely inspect the process without completely stopping the machine. The big black button has 3 distinct positions: released, pressed gently and pressed hard. The middle position allows the machine to run with limited speed or range, but when released or pressed hard the machine stops.





Features

Hand recognition for protection against tampering
An optional “anti-tamper” function sends an extra signal to indicate if the JSHD4 is held by a human hand or not. By using this, the safety level is increased, and the risk of manipulation or bypass of the safety function is reduced. It is no longer possible to expose the operator to danger by trying to lock the three-position control device in run mode.

Ergonomic design
JSHD4 is ergonomic, both in respect of its shape, fitting to the hand and the way the buttons are operated. It is easy to operate the device by using just the fingers (even with gloves), and the middle position provides a secure resting position.

Additional top and front buttons for non-safe signals
The two additional buttons can be used for e.g. start/stop, up/down or forward/ back. Internally the device is duplicated. The three-position function itself is built up of two completely independent three-position buttons which feels like one button for the user.

Ordering information

JSHD4

Choose top part, bottom part and anti-tamper

Top part	Bottom part			Anti-		
Buttons and LEDs	**Feature**	**ID**	**Connection**	**tamper**	**Type**	**Order code**
JSHD4-1 No LEDs No buttons	Use your own cable	AA	Cable gland and 5 screw connections		JSHD4-1-AA	2TLA020006R2100 & 2TLA020005R1000 or 2TLA019995R0100
	Cost effective and quick connection	AC	M12-5 male		JSHD4-1-AC	2TLA020006R2100 & 2TLA020005R1200 or 2TLA019995R0100
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections		JSHD4-1-AL	2TLA020006R2100 & 2TLA020005R2000
JSHD4-2 LEDs Front button Top button	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-2-AB	2TLA020006R2200 & 2TLA020005R1100 or 2TLA019995R0200
				•	JSHD4-2-AB-A	2TLA020006R2200 & 2TLA020005R1100 & 2TLA020005R0900
	Cost effective and quick connection	AD	M12-8 male		JSHD4-2-AD	2TLA020006R2200 & 2TLA020005R1300 or 2TLA019995R0400
				•	JSHD4-2-AD-A	2TLA020006R2200 & 2TLA020005R1300 & 2TLA020005R0900
	Use your own cable, simplified connection	AH	Cable gland and 10 screw connections		JSHD4-2-AH	2TLA020006R2200 & 2TLA020005R1700
				•	JSHD4-2-AH-A	2TLA020006R2200 & 2TLA020005R1700 & 2TLA020005R0900
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections		JSHD4-2-AJ	2TLA020006R2200 & 2TLA020005R1800
				•	JSHD4-2-AJ-A	2TLA020006R2200 & 2TLA020005R1800 & 2TLA020005R0900
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections		JSHD4-2-AL	2TLA020006R2200 & 2TLA020005R2000
				•	JSHD4-2-AL-A	2TLA020006R2200 & 2TLA020005R2000 & 2TLA020005R0900
JSHD4-3 LEDs No buttons	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-3-AB	2TLA020006R2300 & 2TLA020005R1100
				•	JSHD4-3-AB-A	2TLA020006R2300 & 2TLA020005R1100 & 2TLA020005R0900
	Cost effective and quick connection	AD	M12-8 male		JSHD4-3-AD	2TLA020006R2300 & 2TLA020005R1300
				•	JSHD4-3-AD-A	2TLA020006R2300 & 2TLA020005R1300 & 2TLA020005R0900
	E-stop	AE	M12-8 male		JSHD4-3-AE	2TLA020006R2300 & 2TLA020005R1400
	Use your own cable, simplified connection	AH	Cable gland and 10 screw connections		JSHD4-3-AH	2TLA020006R2300 & 2TLA020005R1700
				•	JSHD4-3-AH-A	2TLA020006R2300 & 2TLA020005R1700 & 2TLA020005R0900
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections		JSHD4-3-AJ	2TLA020006R2300 & 2TLA020005R1800
				•	JSHD4-3-AJ-A	2TLA020006R2300 & 2TLA020005R1800 & 2TLA020005R0900
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections		JSHD4-3-AL	2TLA020006R2300 & 2TLA020005R2000
				•	JSHD4-3-AL-A	2TLA020006R2300 & 2TLA020005R2000 & 2TLA020005R0900

Ordering information

JSHD4

Choose top part, bottom part and anti-tamper (continued)

Top part	Bottom part			Anti-		
Buttons and LEDs	Feature	ID	Connection	tamper	Type	Order code
JSHD4-4 LEDs Front button	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-4-AB	2TLA020006R2400 & 2TLA020005R1100
				•	JSHD4-4-AB-A	2TLA020006R2400 & 2TLA020005R1100 & 2TLA020005R0900
	Cost effective and quick connection	AD	M12-8 male		JSHD4-4-AD	2TLA020006R2400 & 2TLA020005R1300
				•	JSHD4-4-AD-A	2TLA020006R2400 & 2TLA020005R1300 & 2TLA020005R0900
	Use your own cable, simplified connection	AH	Cable gland and 10 screw connections		JSHD4-4-AH	2TLA020006R2400 & 2TLA020005R1700
				•	JSHD4-4-AH-A	2TLA020006R2400 & 2TLA020005R1700 & 2TLA020005R0900
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections		JSHD4-4-AJ	2TLA020006R2400 & 2TLA020005R1800
				•	JSHD4-4-AJ-A	2TLA020006R2400 & 2TLA020005R1800 & 2TLA020005R0900
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections		JSHD4-4-AL	2TLA020006R2400 & 2TLA020005R2000
				•	JSHD4-4-AL-A	2TLA020006R2400 & 2TLA020005R2000 & 2TLA020005R0900
JSHD4-5 LEDs Top button	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-5-AB	2TLA020006R2500 & 2TLA020005R1100
				•	JSHD4-5-AB-A	2TLA020006R2500 & 2TLA020005R1100 & 2TLA020005R0900
	Cost effective and quick connection	AD	M12-8 male		JSHD4-5-AD	2TLA020006R2500 & 2TLA020005R1300
				•	JSHD4-5-AD-A	2TLA020006R2500 & 2TLA020005R1300 & 2TLA020005R0900
	Use your own cable, simplified connection	AH	Cable gland and 10 screw connections		JSHD4-5-AH	2TLA020006R2500 & 2TLA020005R1700
				•	JSHD4-5-AH-A	2TLA020006R2500 & 2TLA020005R1700 & 2TLA020005R0900
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections		JSHD4-5-AJ	2TLA020006R2500 & 2TLA020005R1800
				•	JSHD4-5-AJ-A	2TLA020006R2500 & 2TLA020005R1800 & 2TLA020005R0900
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections		JSHD4-5-AL	2TLA020006R2500 & 2TLA020005R2000
				•	JSHD4-5-AL-A	2TLA020006R2500 & 2TLA020005R2000 & 2TLA020005R0900

Cables and connectors

JSHD4

Cable with connectors

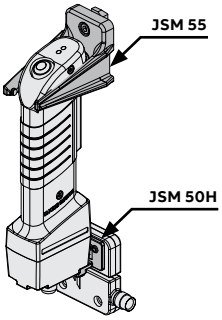
Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
		0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
		10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
		10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634	2TLA020056R6400
		1 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100
Cannon	Female	5 m		HK5	2TLA020003R4700
		10 m		HK10	2TLA020003R4800
		20 m		HK20	2TLA020003R4900
		2 m	Spiral cable	HK20S4	2TLA020003R5100
		3.2 m	Spiral cable	HK32S4	2TLA020003R5200
		4 m	Spiral cable	HK40S4	2TLA020003R3500
		6 m	Spiral cable	HK60S4	2TLA020003R3600
		8 m	Spiral cable	HK80S4	2TLA020003R5300

Separate cables and connectors

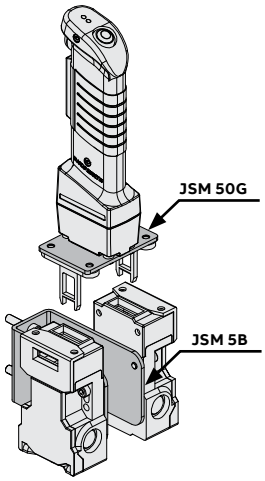
Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
12-pole female cannon connector for JSHD4	JSHK0	2TLA020003R0300
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Accessories

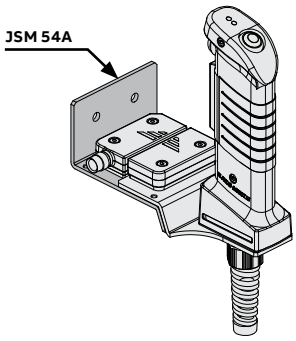
JSHD4



JSM 55 wall bracket and JSM 50H bracket for Eden



JSM 50G bracket for key switches and JSM 5B wall bracket for 2 pcs MKey5



JSM 54A wall bracket for Adam (and AL bottom part that has a holder for Eva)

Accessories

Description	Type	Order code
Brackets and bottom plates		
JSM 55 Wall bracket for three position device	JSM 55	2TLA040005R0500
JSM 5B Wall bracket for 2 pcs MKey5 interlock switches	JSM 5B	2TLA040005R0700
JSM 54A Wall bracket for Adam. Used with AL bottom part that has a holder for Eva	JSM 54A	2TLA020205R2800
JSM 50G Bracket for key switches	JSM 50G	2TLA020205R6300
JSM 50H Bracket for Eden sensor	JSM 50H	2TLA020205R6400
Others		
JSHD4 protection coat	JSHD4 Coat	2TLA020200R4600
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800

JSHD4H2

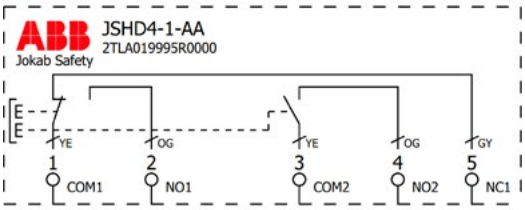
The three-position button of JSHD4 is available as a separate part for either external mounting or panel mounting. JSHD4H2A/B are intended for mounting on the back side of a handheld teaching pendant or similar. JSHD4H2 can be mounted in a panel hole.

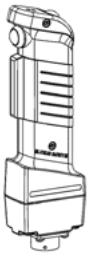
Mounting	Leads	Hand	Type	Order code
External mounting	6 x 150 mm	Left	JSHD4H2A	2TLA020002R0200
		Right	JSHD4H2B	2TLA020002R0210
Internal panel mounting	6 x 150 mm	-	JSHD4H2 0.15 m	2TLA020002R3100
	6 x 1200 mm	-	JSHD4H2 1.2 m	2TLA020002R4500

Electrical wiring diagrams

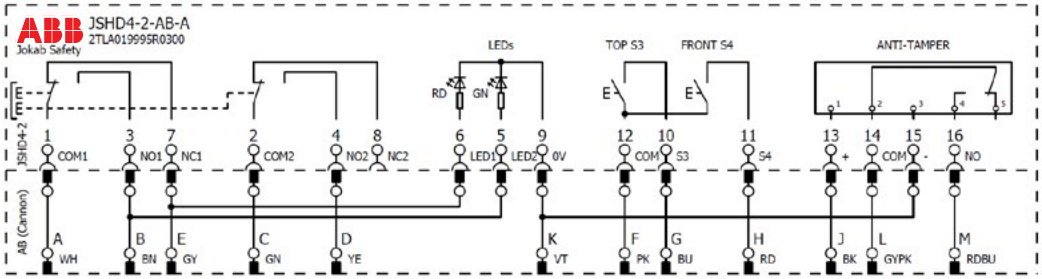
Examples with JSHD4-1 and JSHD4-2 models

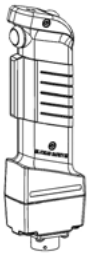
JSHD4-1-AA, cable gland and 5 screw connections on JSHD4-1



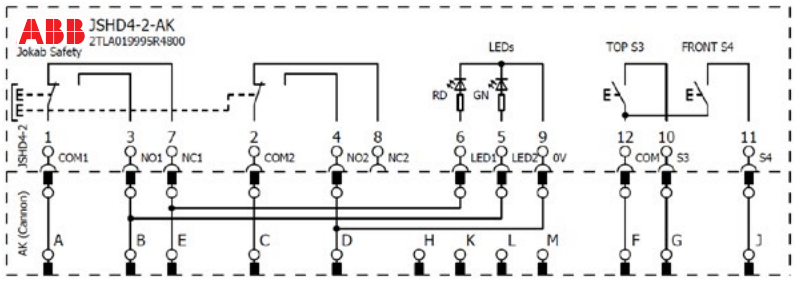


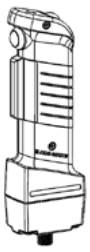
JSHD4-2-AB-A, Cannon 12 pins



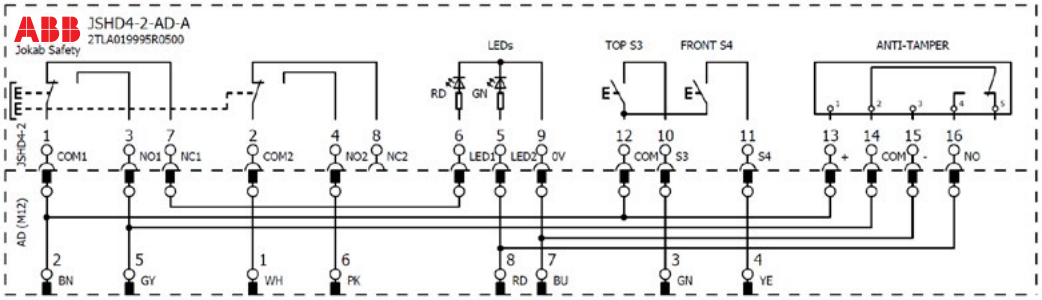


JSHD4-2-AK, Cannon 12 pins





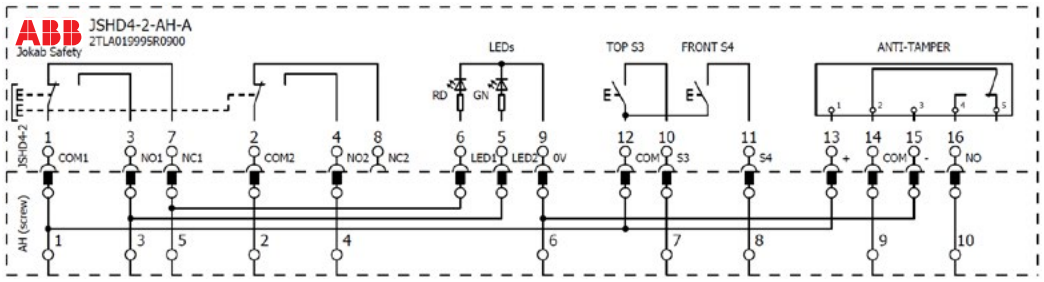
JSHD4-2-AD-A, M12-8



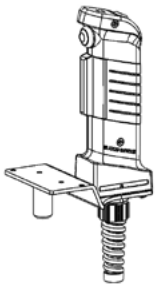
Electrical wiring diagrams

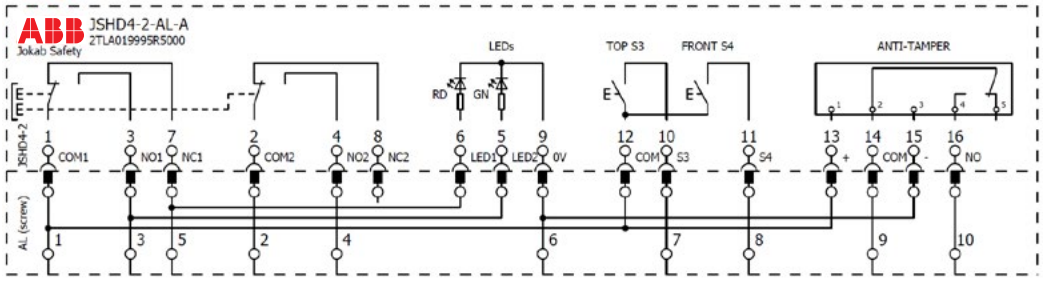
Examples with JSHD4-2 models

JSHD4-2-AH-A, cable gland and 10 screw connection

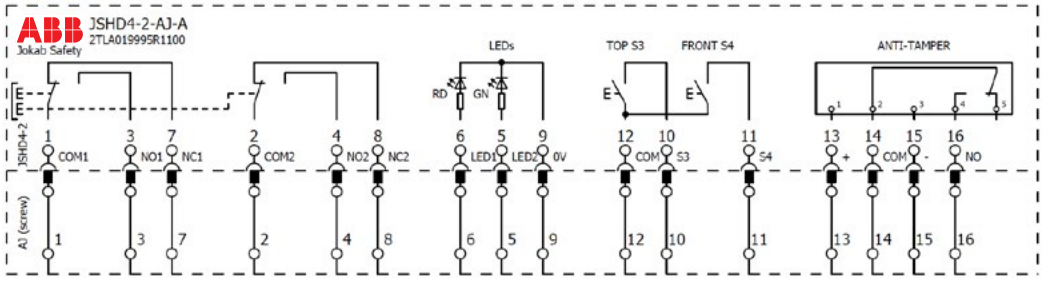


JSHD4-2-AL-A, cable gland and 10 screw connection





JSHD4-2-AJ-A, cable gland and 16 screw connection



Technical data
JSHD4

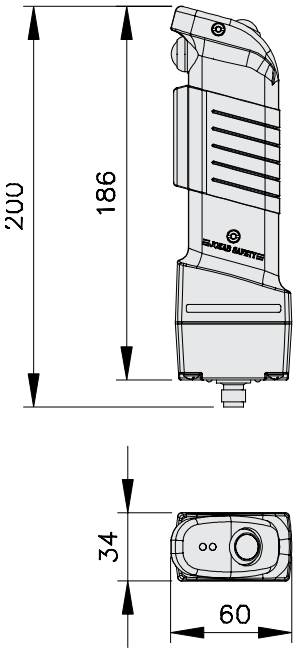
Technical data	
Approvals	Inspecta
Conformity	CE 2006/42/EC - Machines 2014/30/EU - EMC 2011/65/EU - RoHS EN ISO 12100-1:2010, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN 60204-1:2006+A1:2009, EN 61000-6-2:2005, EN 61000-6-3:2007
Functional safety data	
EN ISO 13849-1:2016	Up to PL e (depending on number of operations per year) B_{10d}: 2 000 000 to middle position, 968 000 to bottom position
Electrical data	
Current allowed, three-position button	Per channel: Maximum +30 VDC, 20 mA, (Minimum +10 VDC, 8 mA)
Current allowed, extra button	Maximum 500 mA
Operation force	Approx. 15 N for three-position buttons (ON)
	Approx. 45 N for three-position buttons (OFF)
	Approx. 2.5 N for top/front push button
Mechanical data	
Operating temperature	- 10 ...+50 °C
Protection class	IP65
Mechanical life	1 000 000 cycles to middle position
Weight	Approx. 0.2 kg without cable

***More information**
Fore more information, e.g. the complete technical information, see product manual for:
JSHD4 - 2TLC172072M0201

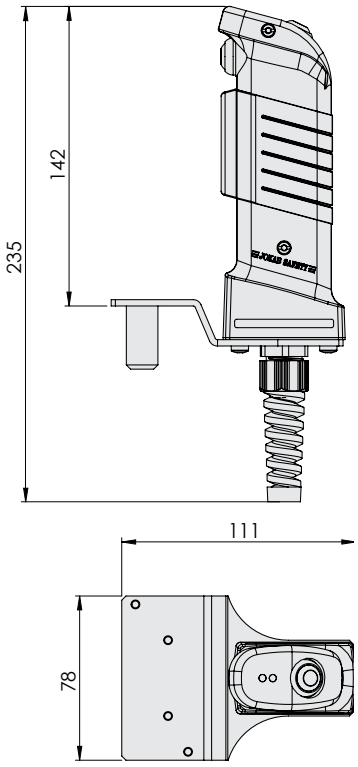
Dimension drawings

JSHD4

JSHD4-2-AD



JSHD4-2-AL



All dimensions in mm

Three-position device
HD5

HD5 is a three-position device developed to meet most demands of the Food and Beverage industry.

A three-position device is used to allow a limited movement of the machine when the operator is in the dangerous area, for example during troubleshooting, test running and programming. The operator pushes the larger black button to a middle position in order to allow a movement. In case of danger, the operator will either release the button or squeeze it to its bottom position and the machine will stop.

The housing of the HD5 is made of PPh, that not only is approved for contact with foodstuff, but also resists the most commonly used chemicals during cleaning in the Food and Beverage industry. Without sharp edges, there are no places where dirt and bacteria can be accumulated. The construction of the HD5 prevents condensation inside the product when subject to temperature changes in a wet environment. The PPh used is fiberglass reinforced to prevent breakage and minimize risk of small broken bits falling in the foodstuff.

Safety and protection

Safe inspection
Up to PL e/Cat 4, with TÜV and cULus approval.
Home position sensor to detect when the device is out of its holder.

Optimum interface

Ergonomic, flexible and suitable for Food and Beverage
HD5 is easy to operate with additional buttons, integrated emergency stop button and flash-light.
Housing material minimizes risk of breakage and is approved for contact with foodstuff.
No places where dirt and bacteria can be accumulated.

Continuous operation

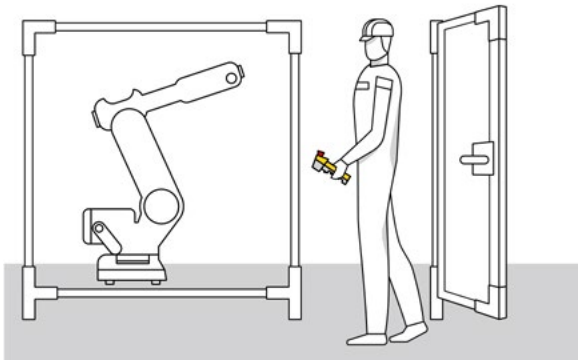
Avoid unnecessary process stops
HD5 allows the operators to safely inspect the manufacturing process without completely stopping the machine.
Resistant to most cleaning fluids and chemicals in Food and Beverage.

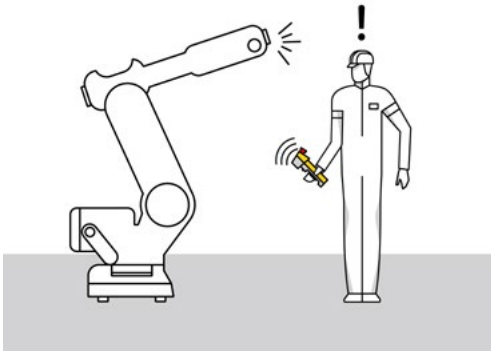
Applications and features
HD5

Applications

Safe troubleshooting, programming and testing
If the operator has to enter a risk area for troubleshooting or test running, it is extremely important that he/she is able to stop the machinery without having to rely on someone else pushing a stop button. In addition, no-one else should be able to start the machinery after it has been stopped by the operator. An operator who is under pressure must also be able to give a stop signal, whether in panic he/she pushes harder on the button or just releases it.

HD5 three-position control device can be used for troubleshooting, programming and test running in situations where no other protection is available or feasible. HD5 allows the operator to safely inspect the process without completely stopping the machine. The big black button has 3 distinct positions: released, pressed gently and pressed hard. The middle position allows the machine to run with limited speed or range, but when released or pressed hard the machine stops.





Features

Indication LEDs
Green and a red high intensity LEDs are integrated in the top of the houding. Their function is user-defined and they can be used, e.g. to indicate whether the three-position device is in the middle position or not.

Front button and top buttons
The function of the additional buttons is user-defined. They can be used, e.g. for a start/stop function for individual movements etc.

Flashlight
An integrated flashlight can be used to help e.g. troubleshooting in dark spaces.

Home position sensor
Used with an active holder, this sensor detects whether the HD5 is in place in its holder.

Emergency stop button with integrated LED in housing
Some models are fitted with an emergency stop button and two rows of LEDs are integrated into the housing of the HD5, below the emergency stop button, one green and one red.

Adapted to food and beverage
HD5 is specifically developed with focus on the requirements in food and beverage applications.

- It has an hygienic design with rounded edges and leaning surfaces to prevent collection of water and dirt.
- The operating surfaces of the buttons are directly injected in the housing.
- The plastics used are approved for food and beverage industry (PHH G30).
- The markings are laser permanent in order not to contaminate any food.
- An anti-condensation membrane prevents moist from building up inside.

Ordering information

HD5

HD5 ordering information

Emergency stop with LED	Home position sensor	Motion sensor	LED flashlight	Connector	Two top buttons	Type	Order code
No	No	No	No	M23-12	No	HD5-S-102	2TLA023001R0000
					Yes	HD5-S-104	2TLA023001R0200
Yes	Yes	Yes	Yes	M23-19	Yes	HD5-S-111	2TLA023001R0100

HD5 accessories

Description	Suitable for	Type	Order code
Active holder (for home position sensor)	All models	HD5-M-001	2TLA920509R0001
Passive holder	All models	HD5-M-002	2TLA920509R0002
10 m cable with M23-12 female connector	HD5-S-102/104	JSD-TK10-12	2TLA930051R0000
5 m cable with M23-12 female connector	HD5-S-102/104	JSD-TK5-12	2TLA930050R0000
10 m spiral cable with M23-12 female connector	HD5-S-102/104	JSD-TK100S-12	2TLA930034R0000

Technical data

HD5

Technical data	
Approvals	
Conformity	CE 2006/42/EC - Machines 2014/30/EU - EMC 2011/65/EU - RoHS 2 2015/863/EU - RoHS 3 EN ISO 12100-1:2010, EN ISO 13849-1:2015, EN 62061:2015, EN 60204-1:2006+A1:2009
Functional safety data	
Three-position switches	Up to PL e, category 4, SILCL3
Emergency stop button	B_{10d}: 2 000 000 released to middle to released position B_{10d}: 968 000 middle to end to middle position
EN ISO 13849-1:2016	B_{10d}: 250 000
Electrical data	
Operational voltage	24 VDC, tolerance 20.4 - 27.6 VDC
Overall power consumption	< 150 mA
Connection	M23 male connector, 12 or 19 pin
Actuating force	
Three-position button	Approx. 20 N from release to middle position Approx. 45 N from middle to end position
Additional buttons	Approx. 3 N for front button Approx. 7 N for top button
Mechanical data	
Operating temperature	- 10 ...+50 °C (no icing, no direct sunlight)
Protection class	IP65
Weight	Approx. 0.2 kg without connection cable
Material	
Housing	Fiberglass reinforced plastic, PPh + 30% glass fibre
Holders	Fiberglass reinforced plastic, PPh + 30% glass fibre
Operating buttons	TPE

More information

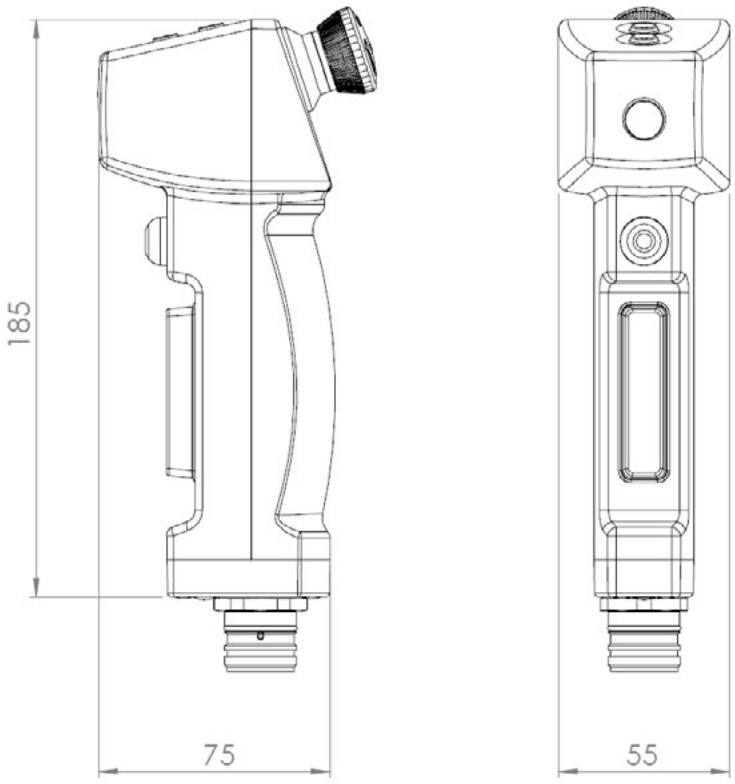
Fore more information, e.g. the complete technical information, see product manual for:

HD5 2TLC010052M0201

Dimension drawings

HD5

Dimension drawings



HD5-S-111

All dimensions in mm

6

Emergency stops

Emergency stops

Introduction and overview	179
Emergency stop buttons Smile, INCA and EStrong	183
Safety stop buttons Smile and INCA	193
Pull wire emergency stop switch LineStrong	201
Reset button Smile	211

Introduction and overview
Selection guide

ABB offers a full range of buttons and pull wires for emergency stop functions, as well as pilot devices for e.g. reset functions.

	Emergency stop buttons	**Safety stop buttons**
Name	**Smile, Inca and EStrong**	**Smile, Inca**
Description	Emergency stop buttons for external mounting and panel mounting in different sizes and material	Safety stop buttons for external mounting and panel mounting
Applications	Safely stop dangerous machine functions	Safely stop a limited part of a dangerous machine
Advantages	Models with: • Compact size • Robust enclosure for harsh environments • Quick installation with M12 connectors • LED indication	Models with: • Compact size • Robust enclosure for harsh environments • Quick installation with M12 connectors • LED indication

	Reset buttons	Pull wire emergency stop switches
Name	**Smile**	**LineStrong**
Description	Small and easy to install reset button	Emergency stop switches in robust enclosures for pull wires of various lengths.
Applications	Pushbutton for resetting safety devices	Emergency stop line to safely stop conveyor belts and long transportation lines.
Advantages	• Compact size • Quick installation • M12 connector • LED indication	• Up to 200 m wire with one switch • Reliable mechanical connection • Robust construction

Introduction and overview
Selection orientation

Why an emergency stop is necessary
If a machine breaks down or if someone is in danger, anyone should be able to stop the machine, regardless of their knowledge of the specific application.

When a safety stop could be used
A safety stop (also called machine stop) should be used to safely stop a part of the machine, e.g. as a stop for an individual hazardous motion. It should not be used as an emergency stop and stop the complete machine. Likewise, an emergency stop with red push button must not be used as a safety stop.

In order to separate the safety stop function from the emergency stop function, the safety stop buttons should be coloured black.

When a pull wire emergency stop could be used
A pull wire emergency stop is easier to install than a system of several emergency stop buttons along a carriage path which makes it ideal for installations over long distances. LineStrong can handle wires up to 200 m on one single switch and the emergency command can be initiated from any point along the installed wire length.

Introduction and overview
Standards

Important standards to follow when implementing emergency stop functions are e.g. EN ISO 13850 and EN ISO 60204-1.

Stop categories

The following stop categories are defined in the standards:

Stop Category 0	stopping by immediate removal of power to the machine actuators
Stop Category 1	a controlled stop with power available to the machine actuators to achieve the stop and then removal of power when the stop is achieved
Stop Category 2	a controlled stop with power left available to the actuators

Note that these categories should not be confused with the categories used to describe the architecture when calculating PL in EN ISO 13849. The risk assessment should determine which stop category to use, but stop category 2 is normally considered not to be suitable for emergency stops.

Text and symbols

Neither the emergency stop nor its background should be labelled with text or symbols. It has previously been common with white arrows indicating the direction of unlatching, but this is not allowed anymore.

Location and signs

The risk assessment should determine the locations of the emergency stop buttons, but they should in general be placed at operator stations, at locations where man/machine interaction is required and at entry/exit points. Signs to mark the location of emergency stops are not required, but if used they should be green with white markings.

Emergency stop buttons
Smile, INCA and EStrong

Emergency stop buttons are used to safely stop dangerous machine functions.

ABB offers a wide range of emergency stop buttons for external mounting or panel mounting, with plastic or metal housing and for different types of connections.

Easy to install

Compact size
Models with a compact and appealing housing saves space and makes it easy to place.

Quick installation
Quick and easy installation of models with features such as centered mounting holes, removable terminal blocks and M12 connectors.

Serial connection
Tina models save cable length and installation time with serial connection.

Optimum interface

Highly adaptable
Several models to choose between depending on position, installation and function.

Reliable in extreme conditions
Robust models and models in stainless steel for use in demanding environments.

Continuous operation

LED diagnostics
Models with integrated LED diagnostics reduce downtime when troubleshooting.

Models and application
Emergency stop buttons

Models for external mounting

Smile
Smile is a small and easy to install emergency stop button. Its size allows mounting in reduced spaces, and its centered mounting holes makes it especially easy to mount on aluminum extrusions (e.g. Quick-Guard fencing system). Smile is available with M12 connectors or cable. Smile has an integrated LED in the button that shows the status and simplifies error tracking. The standard models of Smile have 2 contacts and can be used with safety controllers from all brands. Smile Tina models belong to the ABB DYNlink solution, with the advantages of serial connection using only one channel and still reaching Cat. 4/PL e.

EStrong
EStrong is an emergency stop button designed to provide a robust unit for exposed and severe environments. The unit has a stainless steel enclosure with IP69K rating that withstands high pressure and high temperature wash-down. It is therefore ideally suited for industries with special demands, such as food processing or chemical industry.

Models for panel mounting

INCA
INCA is an emergency stop button for panel mounting, designed for installation in 22.5 mm holes. Its removable terminal block facilitates connection and exchange. INCA has an integrated LED in the button that shows the status and simplifies error tracking. The standard model of INCA has 2 contacts and can be used with safety controllers from all brands. INCA Tina models belong to the ABB DYNlink solution, with the advantages of serial connection using only one channel and still reaching Cat. 4/PL e.

Smile Reverse
Smile Reverse is identical to the regular Smile emergency stop button aside from being reversed in order to be mounted on the back side of a panel. Smile Reverse has an IP65 housing that makes it suitable in panels where moisture and dust may occur. Smile Reverse has an integrated LED in the button that shows the status and simplifies error tracking. The standard model of Smile Reverse has 2 contacts and can be used with safety controllers from all brands. The Smile Reverse Tina model belongs to the ABB DYNlink solution, with the advantages of serial connection using only one channel and still reaching Cat. 4/PL e.

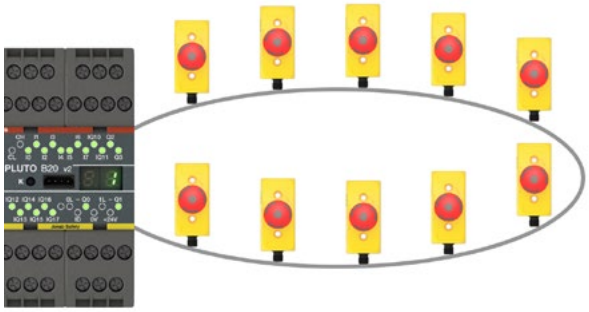
Features

Emergency stop buttons

Communication features

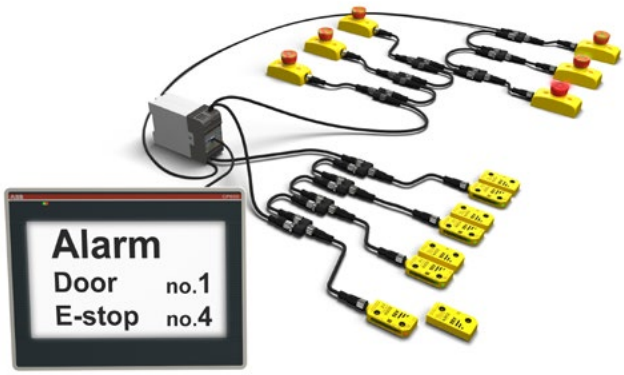
DYNlink

Emergency stop buttons with Tina in their name belong to the DYNlink solution, which enables serial connection using only one channel and still reaching Cat. 4/PL e. DYNlink devices must be used with a Vital safety controller or a Pluto programmable safety controller. Up to 30 DYNlink devices can be connected in series to Vital and up to 10 can be connected to each input on Pluto.



StatusBus

StatusBus is a simple and cost effective way to collect the status information of emergency stops and safety sensors. The StatusBus functionality is available with some DYNlink devices and allows you to collect the status of each individual safety device, even when connected in series. A Pluto programmable safety controller must be used to read the StatusBus information, and a single input on Pluto can collect the status of up to 30 safety devices. The devices are connected using standard cable and M12-5 connectors. No specific bus cable or extra communication module is necessary.



Ordering information

Emergency stop buttons

External mounting

Description	Type of safety signal	Connection type	Feature	Type	Order code
Compact size Plastic housing IP65	DYNlink	1 m cable from bottom	Status LED	Smile 10 EA Tina	2TLA030050R0400
		1 x M12-5 male	Status LED	Smile 11 EA Tina	2TLA030050R0000
		1 x M12-5 male	Status LED, StatusBus	Smile 11 EC Tina	2TLA030050R0900
		2 x M12-5 male	Status LED	Smile 12 EA Tina	2TLA030050R0200
	2 NC	1 m cable from bottom	Status LED	Smile 10 EA	2TLA030051R0400
		1 m leads from bottom	-	Smile 10 EK	2TLA030051R0600
		1 x M12-5 male	Status LED	Smile 11 EA	2TLA030051R0000
		2 x M12-5 male	Status LED	Smile 12 EA	2TLA030051R0200
Metal housing IP67 and IP69K	2 NO + 2 NC	3 x NPT conduits	-	EStrongZ	2TLA050220R1020
			Locked	EstrongZ	2TLA050220R1422
			Status LED	EStrongZ LED	2TLA050220R1222
		3 x M20 conduits	Status LED	EstrongZ LED	2TLA050220R0222

Panel mounting

IP rating	Depth	Connection type	Type of safety signal	Feature	Type	Order code
IP65	26 mm	1 x M12-5 male	DYNlink	Status LED	Smile 11 EAR Tina	2TLA030050R0100
			2 NC	Status LED	Smile 11 EAR	2TLA030051R0100
Button IP65, connector IP20	53 mm	Removable terminal block	DYNlink	Status LED	INCA 1 Tina	2TLA030054R0000
				Status LED, StatusBus	INCA 1 EC Tina	2TLA030054R1400
			2 NC	Status LED	INCA 1	2TLA030054R0100

Accessories

Emergency stop buttons

Connection accessories

Description	Type	Order code
Connection accessories		
M12 Y-connector for serial connection of device with StatusBus functionality.	M12-3S	2TLA020055R0600
M12 Y-connector for serial connection of devices without StatusBus functionality.	M12-3A	2TLA020055R0000
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Connection block for the serial connection of up to 4 DYNlink devices with 12-5 connectors.	Tina 4A	2TLA020054R0300
Connection block for the serial connection of up to 8 DYNlink devices with 12-5 connectors.	Tina 8A	2TLA020054R0500
Adaptation unit for DYNlink solution with M20 fitting. For e.g. Compact.	Tina 2A*	2TLA020054R0100
Adaptation unit for DYNlink solution, internal assembly. For e.g. Compact.	Tina 2B*	2TLA020054R1100
Adaptation unit for DYNlink solution with M20 fitting and M12 connector. For e.g. connecting Compact to Pluto/Vital.	Tina 3A*	2TLA020054R0200
Termination for Smile 12	JST2	2TLA030051R1300
Accessories		
Emergency stop sign, yellow, no text, for INCA (22.5mm)	E-Sign 22.5	2TLA030054R0900
Emergency stop sign, yellow, no text, for Smile (32.5mm)	E-Sign 32.5	2TLA030054R1000
Yellow surround for Inca	Surround for Inca	2TLA030054R0400
Stainless steel cable gland, for EStrong	Gland M20x1.5	2TLA050040R0002
Stainless steel conduit plug, for EStrong	Conduit Plug M20x1.5	2TLA050040R0004
LED Green/Red 230 VAC, for EStrong	LED 230	2TLA050211R0003

* For more information about Tina adapter units, please see Pluto and Vital chapters.

Cable and connectors

Emergency stop buttons

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
		0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
			Angled female connector	M12-C1012V2	2TLA020056R6700
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
		10 m		M12-C102	2TLA020056R1200

Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050

Technical data

Emergency stop buttons

Technical data	
Approvals	
Smile, INCA	Inspecta
Smile Tina, INCA Tina	TÜV NORD
EStrong	
Conformity	
Smile, INCA	CE 2006/42/EC – Machinery 2011/65/EU - RoHS EN ISO 12100:2010, EN ISO 13849-1:2008/AC:2009, EN 60204-1:2006+A1:2008, EN ISO 13850:2008
Smile Tina, INCA Tina	CE 2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 12100:2010, EN ISO 13849-1:2008, EN 62061:2005, EN 60204-1:2006+A1:2009, IEC 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 60947-5-5:2005, EN ISO 13850:2006
EStrong	CE 2006/42/EG – Machinery 2011/65/EU - RoHS EN ISO 12100:2010, EN ISO 13850:2015, EN 60204-1:2006:+A1:2009+AC:2010, EN 60947-5-5:1997:+A1:2017, EN 60947-5-1:2004:+A1:2009
Functional safety data	
EN 61508:2010	Up to SIL3, depending on system architecture
EN 62061:2005	Up to SILCL3, depending on system architecture
EN ISO 13849-1:2008	Up to Cat. 4, PL e, depending on system architecture
Smile, INCA	$B10_d$ = 100 000
Smile Tina, INCA Tina	$PFH_D = 4.66 \times 10^{-9}$
EStrong	$B10_d$ = 1 500 000

More information
Fore more information, e.g. the complete technical information, see product manual for:
Smile 2TLC172097M0201
INCA 2TLC172163M0201

Technical data

Emergency stop buttons

Technical data	
Electrical data	
Operating voltage	
Smile, INCA	17-27 VDC ± 10%
Smile Tina, INCA Tina	+24 VDC +15% -25%
EStrong	230 VAC / +24 VDC (the LED is +24 VDC originally, but can be replaced with a 230 VAC accessory)
Mechanical data	
Mechanical life	>50 000 operations
Operating temperature	
Smile, INCA	-10…+55 °C
EStrong	-25…+80 °C
Protection class	
Smile, INCA	IP65
EStrong	IP67, IP69K
Weight	
Smile	65 g
INCA	45 g
EStrong	820 g
Material	
Smile	Polyamide PA66, Macromelt, polybutylenterephthalate PBT, Polypropene PP, UL 94 V0
INCA	Polyamide PA66, Macromelt, polybutylenterephthalate PBT, Polypropene PP, UL 94 V0
EStrong	Stainless steel 316 housing

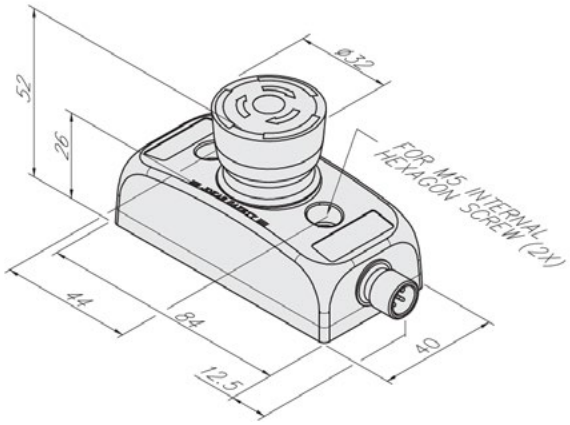
***More information**
Fore more information, e.g. the complete technical information, see product manual for:
Smile - 2TLC172097M0201
INCA - 2TLC172163M0201
EStrong - 2TLC172247M0201

Connection diagrams
For connection diagrams of emergency stop buttons please see https://library.abb.com/

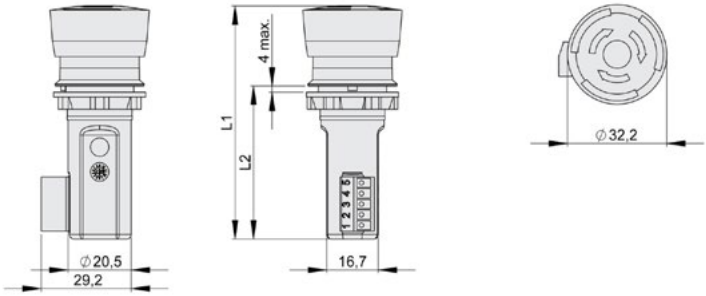
Dimension drawings

Emergency stop buttons

Smile

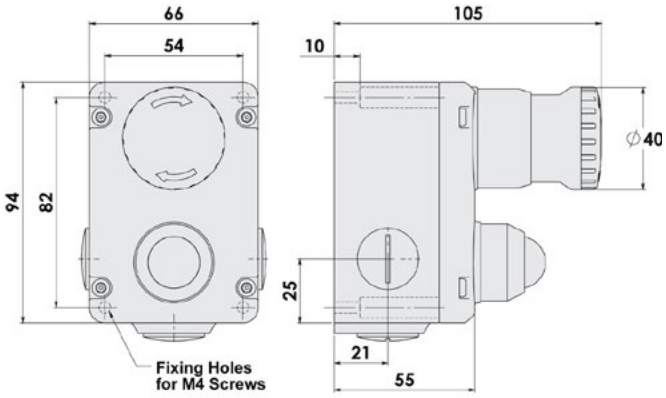


INCA



Type	L1 mm	L2 mm
INCA 1 EC Tina	75.5	49.5 ± 0.5
INCA 1	80	54 ± 0.5
INCA 1 Tina	80	54 ± 0.5

EStrong



All dimensions in mm

Notes

Safety stop buttons
Smile and INCA

Safety stop buttons are used to safely stop a certain part of a dangerous machine.

ABB offers safety stop buttons to suit different needs of connection and communication. Various models are available for e.g. external mounting, panel mounting, adapted for the DYNlink solution or with 2 NC contacts.

Easy to install

Compact size
Models with a compact and appealing housing saves space and makes it easy to place.

Quick installation
Quick and easy installation of models with features such as centered mounting holes, removable terminal blocks and M12 connectors.

Serial connection
Tina models save cable length and installation time with serial connection.

Optimum interface

Highly adaptable
Several models to choose between depending on position, installation and function.

Continuous operation

LED diagnostics
Models with integrated LED diagnostics reduce downtime when troubleshooting.

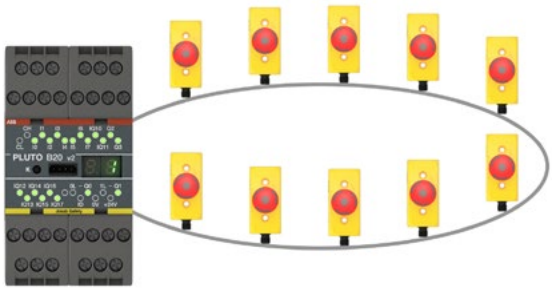
Applications and features
Safety stop buttons

Applications

A safety stop (also called machine stop) can be used to safely stop a part of the machine, e.g. as a stop for an individual hazardous machine function. It may not be used as an emergency stop and stop the complete machine or production line. Likewise, an emergency stop with red push button should not be used as a safety stop. In order to separate the safety stop function from the emergency stop function, the safety stop buttons should be coloured black.

Features

DYNlink
Safety stop buttons with Tina in their name belong to the DYNlink solution, which enables serial connection using only one channel and still reaching Cat. 4/PL e. DYNlink devices must be used with a Vital safety controller or a Pluto programmable safety controller. Up to 30 DYNlink devices can be connected in series to Vital and up to 10 can be connected to each input on Pluto.



Models

Safety stop buttons

Safety stop buttons for external mounting

Smile
Smile is a small and easy to install safety stop button. Its size allows mounting in reduced spaces, and its centered mounting holes makes it especially easy to mount on aluminum extrusions (e.g. Quick-Guard fencing system).

Smile has an integrated LED in the button that shows the status and simplifies error tracking.

The standard model of Smile has 2 contacts and can be used with safety controllers from all brands. The Smile Tina model belongs to the ABB DYNlink solution, with the advantages of serial connection using only one channel and still reaching Cat. 4/PL e.

Smile safety stops are identical to the corresponding Smile emergency stops apart from the colour of the button.

Safety stops for panel mounting

INCA
INCA is a safety stop button for panel mounting, designed for installation in 22.5 mm holes. Its removable terminal block facilitates connection and exchange.

INCA has an integrated LED in the button that shows the status and simplifies error tracking.

The standard model of INCA has 2 contacts and can be used with safety controllers from all brands. INCA Tina belongs to the ABB DYNlink solution, with the advantages of serial connection using only one channel and still reaching Cat. 4/PL e.

INCA safety stop is identical to INCA emergency stop apart from the colour of the button.

Ordering information

Safety stop buttons

Safety stop buttons

Mounting	Type of safety signal	Connection type	Feature	Type	Order code
External	DYNlink	1 m cable from bottom	Status LED	Smile 11 SA Tina	2TLA030050R0500
	2 NC	1 x M12-5	Status LED	Smile 11 SA	2TLA030051R0900
Panel	DYNlink	5 pole terminal block	Status LED	INCA 1S Tina	2TLA030054R0200
	2 NC	5 pole terminal block	Status LED	INCA 1S	2TLA030054R0300

Accessories

Description	Type	Order code
M12 Y-connector for serial connection of devices without StatusBus functionality.	M12-3A	2TLA020055R0000
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Connection block for the serial connection of up to 4 DYNlink devices with 12-5 connectors.	Tina 4A	2TLA020054R0300
Connection block for the serial connection of up to 8 DYNlink devices with 12-5 connectors.	Tina 8A	2TLA020054R0500
Adaptation unit for DYNlink solution with M20 fitting. For e.g. Compact.	Tina 2A *	2TLA020054R0100
Adaptation unit for DYNlink solution, internal assembly. For e.g. Compact.	Tina 2B *	2TLA020054R1100
Adaptation unit for DYNlink solution with M20 fitting and M12 connector. For e.g. connecting Compact to Pluto/Vital.	Tina 3A *	2TLA020054R0200

* For more information about Tina adapter units, please see Pluto and Vital chapters.

Cable and connectors

Safety stop buttons

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
		0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
			Angled female connector	M12-C1012V2	2TLA020056R6700
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
	Male	6 m		M12-C62	2TLA020056R0200
		10 m		M12-C102	2TLA020056R1200

Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050

Technical data
Safety stop buttons

Technical data	
Approvals	
Smile, INCA	
Smile Tina, INCA Tina	TÜV NORD
Conformity	
Smile, INCA	2006/42/EC – Machinery 2011/65/EU - RoHS EN ISO 12100:2010, EN ISO 13849-1:2008/AC:2009, EN 60204-1:2006+A1:2008, EN ISO 13850:2008
Smile Tina, INCA Tina	2006/42/EC - Machinery 2004/108/EC - EMC EN ISO 12100:2010, EN ISO 13849-1:2008, EN 62061:2005, EN 60204-1:2006+A1:2009, IEC 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 60947-5-5:2005, EN ISO 13850:2006
Functional safety data	
EN 61508:2010	Up to SIL3, depending on system architecture
EN 62061:2005	Up to SILCL3, depending on system architecture
EN ISO 13849-1:2008	Up to Cat. 4, PL e, depending on system architecture
Smile, INCA	$B10_d$ = 100 000
Smile Tina, INCA Tina	$PFH_D = 4.66 \times 10^{-9}$
Electrical data	
Operating voltage	
Smile, INCA	17-27 VDC ± 10%
Smile Tina, INCA Tina	+24 VDC +15% -25%
Mechanical data	
Mechanical life	>50 000 operations
Operating temperature	
Smile, INCA	-10...+55 °C
Protection class	
Smile, INCA	IP65
Weight	
Smile	65 g
INCA	45 g
Material	
Smile	Polyamide PA66, Macromelt, polybutylenterephthalate PBT, Polypropene PP, UL 94 V0
INCA	Polyamide PA66, Macromelt, polybutylenterephthalate PBT, Polypropene PP, UL 94 V0

More information

Fore more information, e.g. the complete technical information, see product manual for:

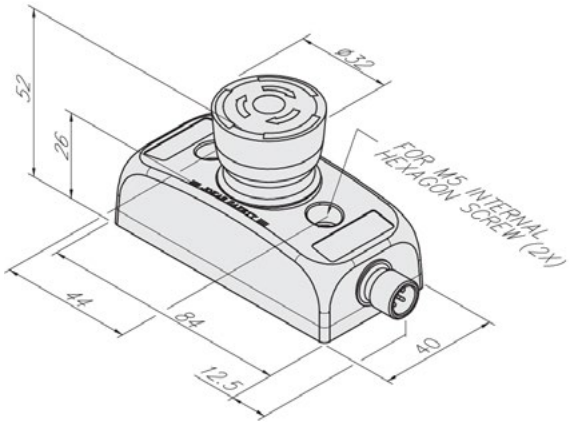
Smile 2TLC172097M0201

INCA 2TLC172163M0201

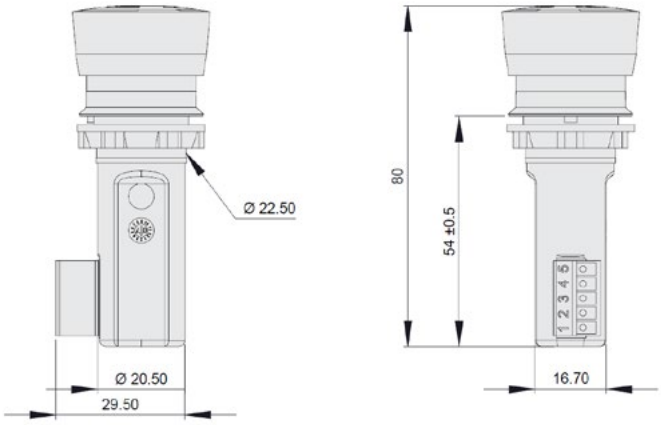
Dimension drawings

Safety stop buttons

Smile



INCA



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All dimensions in mm

Notes

Pull wire emergency stop switch LineStrong

LineStrong is a pull wire emergency stop switch, used for easy reach of the emergency stop function along machines and sections of conveyors.

A pull wire emergency stop switch allows you to initiate the emergency stop command from any point along the installed wire length by pulling the wire. It replaces a series of emergency stop buttons and is easier to install.

LineStrong is also available in different models for different lengths of wires, with different housing material.

Easy to install

Quick installation
A pull wire emergency stop switch is easier to install than a system of several emergency stop buttons along a carriage path.

Highly adaptable
Several models to choose from, gives a variety of mounting possibilities and features.

Long wire length
Can handle wires up to 200 m on a single switch.

Safety and protection

Easily accessible
Easy reach of the emergency stop function along machines, conveyors and processes.

High level of safety
The positive forced disconnect contacts provide a high level of safety and are double switching, i.e. triggers emergency stop in both directions of the wire.

Continuous operation

Reliable in extreme conditions
Robust construction makes LineStrong ideal for use in demanding environments.

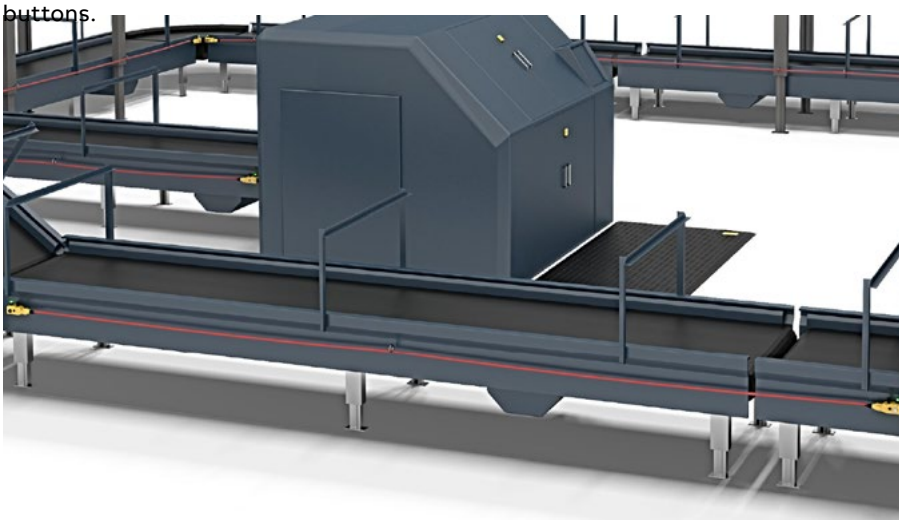
LED diagnostics
Integrated LED diagnostics ensures status can be seen easily from a distance.

Applications
LineStrong

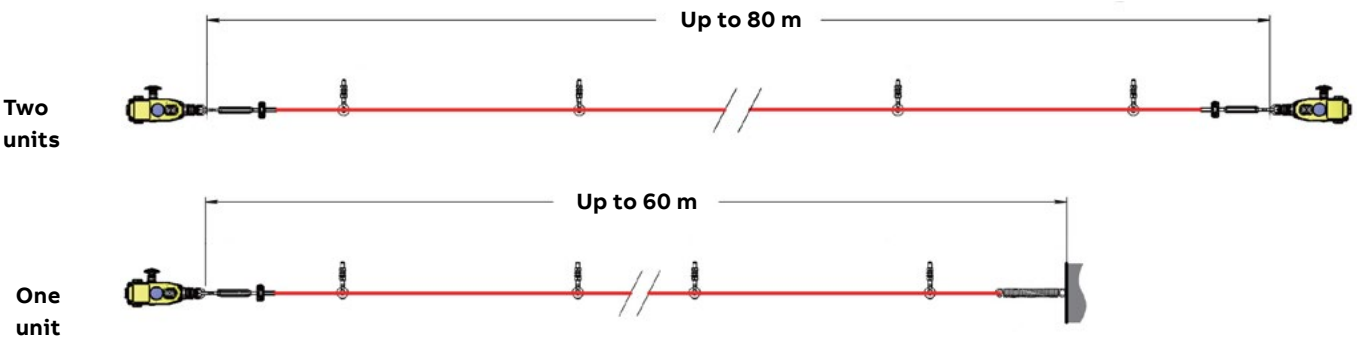
Instead of multiple emergency stops
A pull wire emergency stop switch is often placed along conveyor belts or carriage paths where access to the stop function must be possible along the whole line. It is often easier to install a pull wire emergency stop switch than to place multiple emergency stop buttons if the distance is longer.

LineStrong can handle wires up to 200 m on one single switch and since the emergency stop command can be initiated from any point along the wire, this gives better access to the emergency stop function than using emergency stop buttons.

As protective device in low risk applications
LineStrong can be used as protection, for example along conveyors with low risks where the wire can be installed at waist height in front of the conveyor, which provides an emergency stop if someone walks or falls towards the conveyor, hence pulling the wire.



One, two or several switches
The maximum length of the wire attached to LineStrong depends on if there is a LineStrong unit attached to both ends of the wire or if one end is attached to a wall/fixed object. In the image below LineStrong2 is used as an example.



Features
LineStrong

Positive forced disconnected contacts
The contacts in LineStrong are positive force disconnected, which ensures that the contacts will not be held in a normally closed position due to a failure of the spring mechanism or the welding/sticking of the contacts.

Reset button
All models of LineStrong have an integrated reset button that needs to be pressed in order to reset the emergency stop if the emergency stop function has been triggered.

Emergency stop button
Most LineStrong models have an integrated emergency stop button on the housing of the switch. Since the first half meter of the wire is not intended to pull in order to trigger the emergency stop function, the integrated emergency stop button provides quick and simple access to the emergency stop function if you are standing right in front of LineStrong. The emergency stop button of LineStrong 2 can be moved to either side of LineStrong to enable best access depending on position and height of LineStrong.

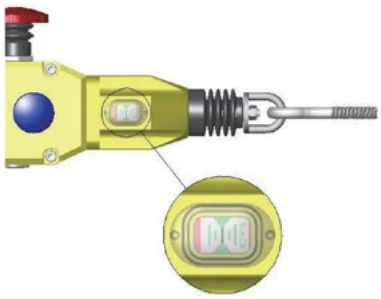
Integrated LED
LineStrong2 and LineStrong3 have an integrated 2-colour LED that shows if the emergency stop function has been triggered or not. The LED is also available as spare part.

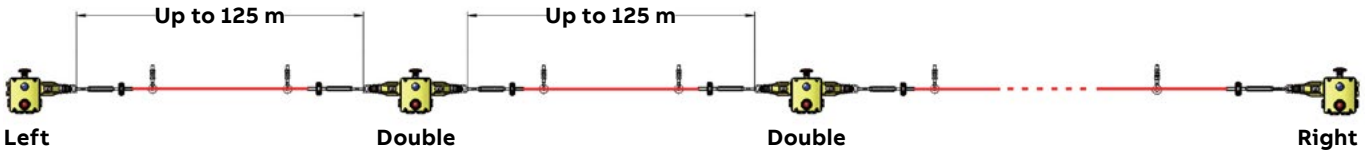
Material
LineStrong is available with a housing in yellow die cast aluminum alloy or with a housing in stainless steel 316 which is recommended for severe applications e.g. food processing and chemical industries.

Left hand, right hand or both sides
LineStrong1 and LineStrong2 can be mounted in any direction. Linestrong3 is available in different models depending on installation. L (left hand) should be used if the placement of the grab wire switch is to the left in the installation. R (right hand) should be used if the grab wire switch is to the right in the installation. D (double wire) has wire entries from both sides of the grab wire switch.

Wire breakage monitoring
The contacts are double switching which means that the emergency stop command is given both when someone pulls the wire and if the wire should break.

Indication of wire tension
All models are equipped with an indicator of the tension of the wire which simplifies installation and adjustment.





Features

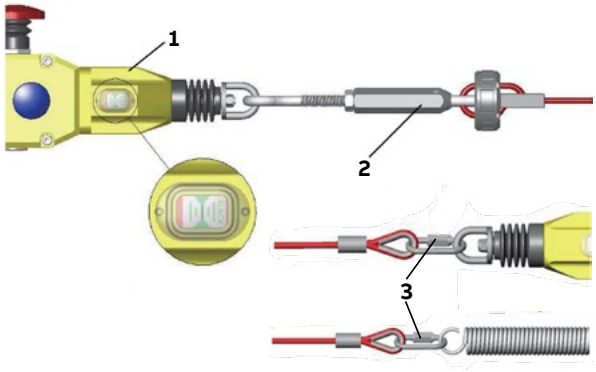
LineStrong

Easier installation with tensioner/gripper

The tensioner/gripper accessory significantly reduces the installation time. Traditional grab wire systems normally need turnbuckle and clamps, which are difficult to tension and adjust, and normally require frequent re-tensioning. The tensioner/gripper integrates an eye hook, a tensioner thimble and a wire strength gripper in one assembly which enables rapid connection to the switch eye bolt and fast and accurate tensioning of the wire.

Thanks to the switch tension indicator, it is easy to adjust the system accurately and quickly. The double clamp mechanism prevents wire slippage and significantly reduces machine downtime which can occur with traditional turnbuckle systems.

For systems longer than 50 m, the tensioner/gripper is necessary on both sides.



1. Tension to mid position as indicated by the green arrows in the viwing window of each switch
2. The tensioner thimble allows immediate accurate and final tensioning of the wire, whilst viewing the tension marker through the viewing window on the switch.
3. Quick Link termination.

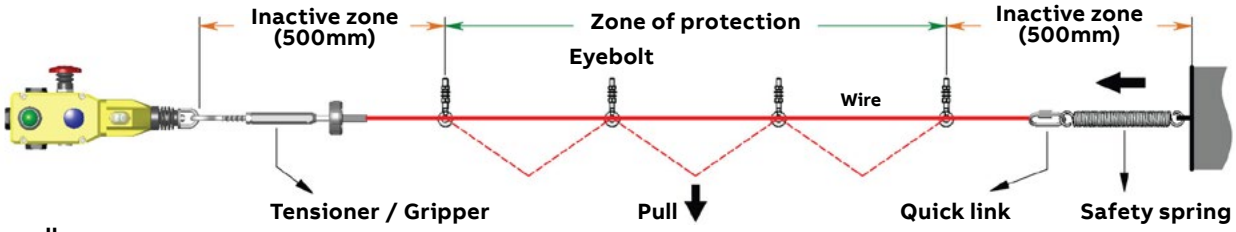
Quick-link termination

The quick link termination is provided for easy connection to the safety spring or the switch eyebolt for systems up to 50 m.

Mounting accessories

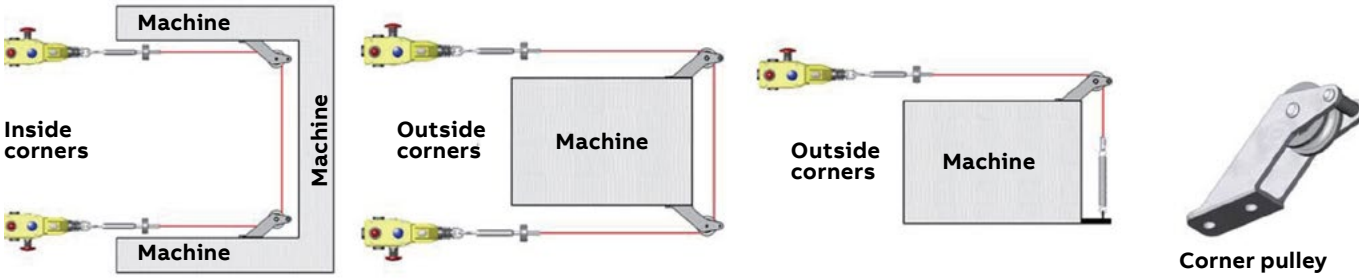
The wire pull kits contain the suitable accessories for the included wire length.

- When using one switch, the wire must be anchored at the other end using a safety spring.
- The first eye bolt support must be placed no more than 500 mm from the switch eye bolt or safety spring.
- The part of the wire from the wire end to the first eye bolt support shall not be used as part of the active protection coverage.
- Wire support eye bolt must be fitted at 2.5 - 3 meter intervals along the complete wire length.
- The tensioner/gripper is used to adjust the correct tension



Corner pulley

A corner pulley can be used to navigate inside or outside corners without causing damage to the wire. They are in stainless steel and can be rigidly mounted. When using a safety spring, a maximum of one corner pulley may be used, to ensure that the complete length of the wire is visible from either the switch or the spring anchorage.



Examples of using the corner pulley

Ordering information
LineStrong

LineStrong

IP rating	Material	E-stop button	Contacts	Max. wire length (m) 1 unit	Max. wire length (m) 2 units	Feature	Type	Order code
IP67	Yellow die cast aluminum alloy	No	2NO + 2NC	30	50	-	LineStrong1	2TLA050200R1030
		No	2NO + 2NC	60	80	-	LineStrong2	2TLA050202R1030
		Yes	2NO + 2NC	60	80	-	LineStrong2	2TLA050202R1332
IP67, IP69K	Stainless steel 316	Yes	2NO + 2NC	80	100	-	LineStrong2Z	2TLA050202R1120
		Yes	2NO + 2NC	80	100	-	LineStrong2Z	2TLA050202R0322
		Yes	2NO + 2NC	80	100	-	LineStrong2Z	2TLA050202R1322
IP67	Yellow die cast aluminum alloy	No	4NO + 4NC	200	250	Both sides	LineStrong3D	2TLA050204R1030
		No	4NO + 4NC	200	250	Both sides	LineStrong3D	2TLA050204R1233
		Yes	4NO + 4NC	200	250	Both sides	LineStrong3D	2TLA050204R1332
IP67, IP69K	Stainless steel 316	Yes	4NO + 4NC	200	250	Both sides	LineStrong3DZ	2TLA050204R1322
IP67	Yellow die cast aluminum alloy	No	2NO + 4NC	100	125	Left hand	LineStrong3L	2TLA050206R1233
IP67	Yellow die cast aluminum alloy	No	2NO + 4NC	100	125	Right hand	LineStrong3R	2TLA050208R1030
		No	2NO + 4NC	100	125	Right hand	LineStrong3R	2TLA050208R1233

Accessories
LineStrong

Mounting Accessories

Description	Material	Length	Type	Order code
Wire pull kit including wire, eye bolts, tensioner/gripper and Allen key in right quantity for the included wire length	Galvanized	10 m wire	10 m wire kit, gal	2TLA050210R0130
		20 m wire	20 m wire kit, gal	2TLA050210R0330
		30 m wire	30 m wire Kit, Gal	2TLA050210R0430
		80 m wire	80 m wire kit, gal	2TLA050210R0630
	Stainless steel	10 m wire	10 m wire Kit, SS	2TLA050210R0120
		30 m wire	30 m wire Kit, SS	2TLA050210R0420
		50 m wire	50 m wire kit, SS	2TLA050210R0520
		100 m wire	100 m wire kit, SS	2TLA050210R0720
Wire tensioner/gripper	Galvanized		Wire tensioner, gal	2TLA050210R4030
	Stainless steel		Wire tensioner, SS	2TLA050210R4020
Corner pulley	Galvanized		Corner pulley, gal	2TLA050210R6030
	Stainless steel		Corner pulley, SS	2TLA050210R6020
Eyebolt M8 x 1.25	Galvanized		Eyebolt M8x1.25, gal	2TLA050210R8030
Safety spring, 220mm	Stainless steel		Spring 220 mm, SS	2TLA050211R0004
Wire only	Stainless steel	30 m wire	Wire Only 30M	2TLA050210R2320

Other accessories

Description	Type	Order code
Screwdriver, anti-tamper, Torx T20	Screwdriver T20	2TLA050211R0006
Spare parts		
LineStrong LED Green/Red +24 VDC	LineStrong LED 24	2TLA050211R0001
LineStrong2 and LineStrong3 Emergency stop button.	LineStrong E-Stop	2TLA050211R0005
LineStrong contact block	Con Block 2NC/2NO	2TLA050240R0103

Cables
LineStrong

LineStrong

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Technical data
LineStrong

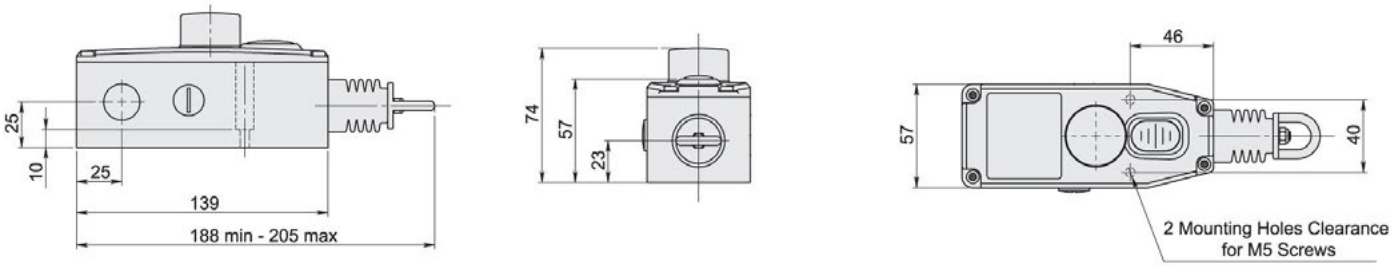
Technical data	
Approvals	
LineStrong	
Conformity	CE
LineStrong	2006/42/EC - Machinery EN ISO 12100:2010, EN ISO 13850:2008, EN 60204-1:2006+A1:2009, EN 60947-1:2007+A1:2011, EN 60947-5-1:2004+A1:2009, EN 60947-5-5:1997+A1:2005
Functional safety data	
EN ISO 13849-1:2008	Up to Cat. 4, PL e, depending on system architecture.
EN/IEC 62061:2005	Up to SILCL3, depending on system architecture.
IEC 61508	Up to SIL3, depending on system architecture.
$B10_d$	1 500 000
Electrical data	
Utilization category	240 VAC / 3 A +24 VDC / 2.5 A
LED	+24 VDC
Mechanical data	
Operating temperature	-25...+80 °C
Protection class	
LineStrong1, LineStrong2, LineStrong3	IP67
LineStrong2Z, LineStrong3Z	IP66, IP67, IP69K
Weight	
LineStrong1	675 g
LineStrong2	880 g
LineStrong2Z	1635 g
LineStrong3L/R	1100 g
LineStrong3LZ/RZ	2000 g
LineStrong3D	1320 g
LineStrong3DZ	2200 g
Material	
LineStrong1, LineStrong2, LineStrong3D/L/R	Die cast painted yellow
LineStrong2Z, LineStrong3LZ/RZ/DZ	Stainless steel 316
Wire type	PVC sheath steel wire 4.0 mm outside diameter
Conduit entries	
LineStrong1/2	3 x M20 x 1.5
LineStrong3	4 x M20 x 1.5

More information
Fore more information, e.g. the complete technical information, see product manual for:
LineStrong - 2TLC172248M0201

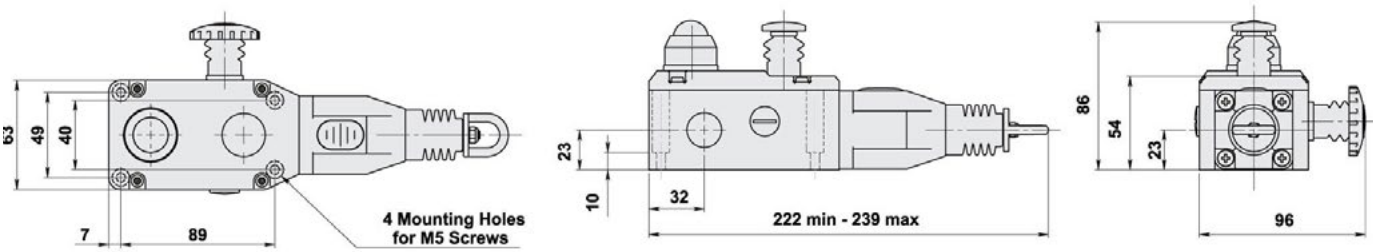
Dimension drawings

LineStrong

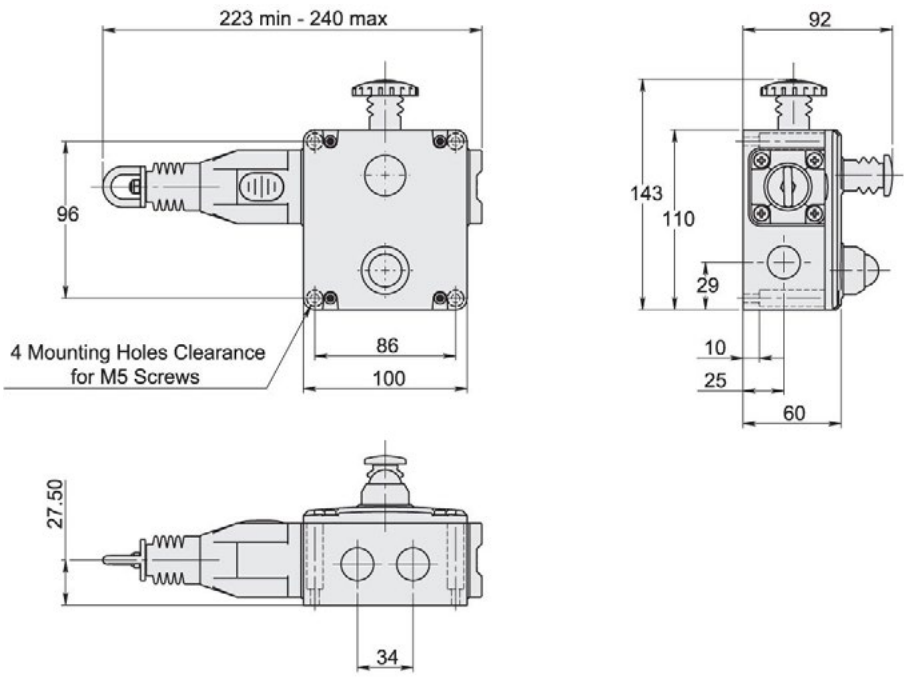
LineStrong1



LineStrong2



LIneStrong3L-R



All dimensions in mm

Notes

Reset button
Smile

Smile reset buttons have compact housings with M12 connectors for easy connection.

The reset button contains an integrated white LED, and all buttons are delivered with a kit of coloured filters to snap on the top of the button. This way the colour of the button can be chosen after delivery and is also possible to change later.

The different models also allow a choice of:
- local reset connected directly to the sensor, or
- global reset connected to the safety control module.

Easy to install

Easy to attach to profiles
The centered mounting holes make Smile easy to attach e.g. aluminum extrusion profiles.

Speed up installation
The housing requires no assembly and the M12 connectors speed up installation and reduce the risk of connection error.

Local reset
Local reset allows to have the reset button close to the safety device while reducing cabling.

Space saving

Compact housing
A compact and appealing housing saves space and makes it easy to place.

Optimum interface

Several button colours
All reset buttons are illuminated with a white LED and the colour of each button can be chosen after delivery and changed later using coloured snap-on filters.

Ordering information

Smile reset buttons

Ordering details

Type of contact	Intended use	Connectors	Type	Order code
1 NO	Most reset applications	M12-5 male	Smile 11 RA	2TLA030053R0000
1 NO	Pluto Safety PLC light button function*	M12-5 male	Smile 11 RB	2TLA030053R0100
1 NO	Local reset of Orion1 Base	M12-5 male	Smile 11RO1	2TLA022316R3000
1 NC	Local reset of Orion2 Base and Extended, and Orion3 Extended	M12-5 male	Smile 11RO2	2TLA022316R3100
1 NC	Local reset of Orion3 Base	M12-5 male	Smile 11RO3	2TLA022316R3200
1 NO	Local reset of Eden DYN-Reset M12-5 and Eden OSSD-Reset M12-5	M12-5 male + female	Smile 12 RF	2TLA030053R2600
1 NO	Local reset of Eden OSSD-Reset M12-8	M12-8 male + female	Smile 12 RG	2TLA030053R2700

* See Pluto hardware manual for more information about the light button function

Accessories

Description	Type	Order code
Y-connector for series connection of DYNlink devices with M12-5 connectors, e.g. Eden.	M12-3A	2TLA020055R0000
Y-connector for series connection of Adam OSSD M12-8 with M12-5 cables	M12-3H	2TLA020055R0800
Y-connector for series connection of Adam OSSD M12-8 with M12-8 cables	M12-3G	2TLA020055R0700
Y-connector for connection of Smile reset button to Orion.	M12-3R	2TLA022316R0000
Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.	M12 Safety seal	2TLA020053R0800
Adaptation unit of OSSD outputs to DYNlink signals for use with Vital control module or Pluto Safety PLC. Tina 10B has an extra M12 connector for connection of a reset button.	Tina 10B v2	2TLA020054R1310

Spare parts

Description	Type	Order code
Kit of coloured filters (yellow, green, white, blue, red)	Coloured filters	2TLA030059R2600

Cables

Smile reset buttons

Cables for Smile 12 RF (with Eden DYN/OSSD Reset M12-5)

Description	Female/male	Length	Type	Order code	Eden Reset M12-5 to Smile 12 RF	Smile 12 RF to M12-3A	M12-3A to M12 3A	El-cabinet to M12-3A	M12-3A to el-cabinet
M12-5	Female	6 m	M12-C61	2TLA020056R0000				•	
		10 m	M12-C101	2TLA020056R1000				•	
		20 m	M12-C201	2TLA020056R1400				•	
	Female + male	1 m	M12-C112	2TLA020056R2000	•	•	•		
		3 m	M12-C312	2TLA020056R2100	•	•	•		
		6 m	M12-C612	2TLA020056R2200	•	•	•		
		10 m	M12-C1012	2TLA020056R2300	•	•	•		
		20 m	M12-C2012	2TLA020056R2400	•	•	•		
	Male	6 m	M12-C62	2TLA020056R0200					•
		10 m	M12-C102	2TLA020056R1200					•

Cables for Smile 12 RG (with Eden DYN/OSSD Reset M12-8)

Connector	Female/male	Length	Type	Order code	Eden Reset M12-8 to Smile 12 RG	Smile 12 RG to M12-3G or M12-3H	M12-3G to M12-3G	El-cabinet to M12-3G	M12-3G to el-cabinet	M12-3H to M12-3H	El-cabinet to M12-3H	M12-3H to el-cabinet
M12-5	Female	6 m	M12-C61	2TLA020056R0000							•	
		10 m	M12-C101	2TLA020056R1000							•	
		20 m	M12-C201	2TLA020056R1400							•	
	Female + male	1 m	M12-C112	2TLA020056R2000						•		
		3 m	M12-C312	2TLA020056R2100						•		
		6 m	M12-C612	2TLA020056R2200						•		
		10 m	M12-C1012	2TLA020056R2300						•		
		20 m	M12-C2012	2TLA020056R2400						•		
	Male	6 m	M12-C62	2TLA020056R0200								•
		10 m	M12-C102	2TLA020056R1200								•
M12-8	Female	6 m	M12-C63	2TLA020056R3000				•				
		10 m	M12-C103	2TLA020056R4000				•				
		20 m	M12-C203	2TLA020056R4100				•				
	Female + male	1 m	M12-C134	2TLA020056R5000	•	•	•					
		3 m	M12-C334	2TLA020056R5100	•	•	•					
	Male	By meter	M12-C04	2TLA020055R1700					•			

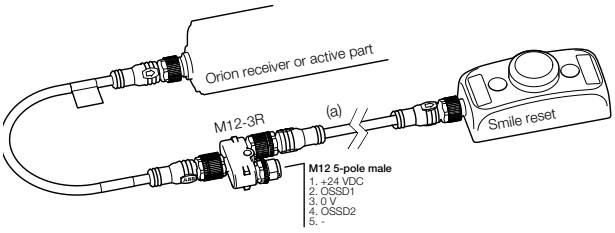
Cables for Smile 11 RX and ROx

Connector	Female/male	Length	Type	Order code	Smile11 Rx to another M12	Smile 11 Rx to el-cabinet	Smile 11 ROx to Tina 10B	Tina 10B to el-cabinet	Smile 11 ROx to M12-3R	M12-3R to el-cabinet	Tina 10B to M12-3A	M12-3A to M12 3A	El-cabinet to M12-3A	M12-3A to el-cabinet
M12-5	Female	6 m	M12-C61	2TLA020056R0000		•		•		•			•	
		10 m	M12-C101	2TLA020056R1000		•		•		•			•	
		20 m	M12-C201	2TLA020056R1400		•		•		•			•	
	Female + male	1 m	M12-C112	2TLA020056R2000	•		•		•		•	•		
		3 m	M12-C312	2TLA020056R2100	•		•		•		•	•		
		6 m	M12-C612	2TLA020056R2200	•		•		•		•	•		
		10 m	M12-C1012	2TLA020056R2300	•		•		•		•	•		
		20 m	M12-C2012	2TLA020056R2400	•		•		•		•	•		
	Male	6 m	M12-C62	2TLA020056R0200										•
		10 m	M12-C102	2TLA020056R1200										•

Connection examples

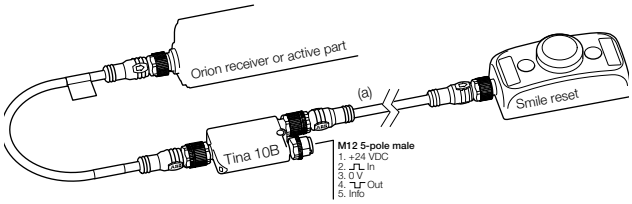
Smile reset buttons

Local reset to Orion with Tina 10A/C



Connection of Smile 11 ROx to Orion through M12-3R. For connection to any control module compatible with OSSD outputs.

Local reset to Orion with Tina 10B



Connection of Smile 11 ROx to Orion through Tina 10B.
For connection to Vital control module or Pluto Safety PLC.

Local reset to Eden

Serial connection of Eden with local Smile reset buttons:

- Adam OSSD-Reset M12-8 with Smile 12 RG and M12-3G or M12-3H
- Adam DYN-Reset with Smile 12 RF and M12-3A

Global vs local reset

A global reset is connected directly to the control cabinet with separate cables. The safety controller in the control cabinet supervises the reset and decides the function and actions.

A local reset is connected directly to the safety device, and requires no communication with the control cabinet. The safety device supervises the reset and decides the actions. A local reset simplifies installation and minimizes cabling.

Technical data

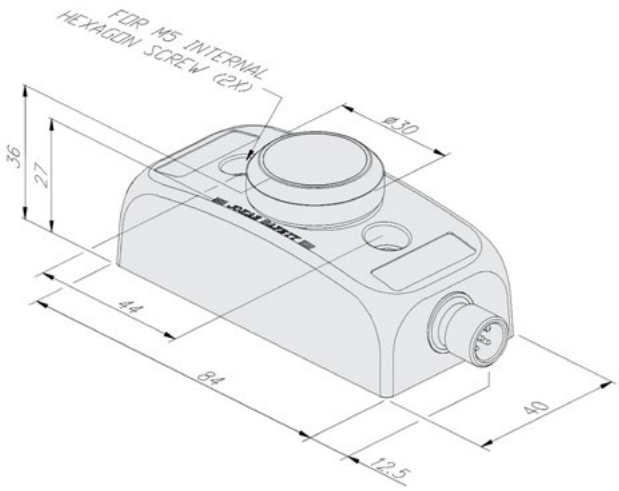
Smile reset buttons

Technical data	
Approvals	
Power supply	
LED operating voltage	+24 VDC (maximum +33 VDC)
LED current consumption	20 mA at +24 VDC, 30 mA at +33 VDC
Push button operating voltage	Min: +5 V, max: +35 V
Push button current	Min: 1 mA, max: 100 mA
Push button rated power	Max: 250 mW
Mechanical data	
Colour - Enclosure	Yellow
Colour - Push button	White
Material - Housing	Polyprobylene PP
Material - Contact	Au
Weight	Approx. 60 g
Protection class	IP65
Mechanical life	1 000 000 operations at 10 mA / +24 VDC
Switching reliability	10×10^{-6} at 5 mA / +24 VDC
Environmental data	
Ambient temperature	-25...+55 °C
Humidity range	35 to 85% (with no icing or condensation)

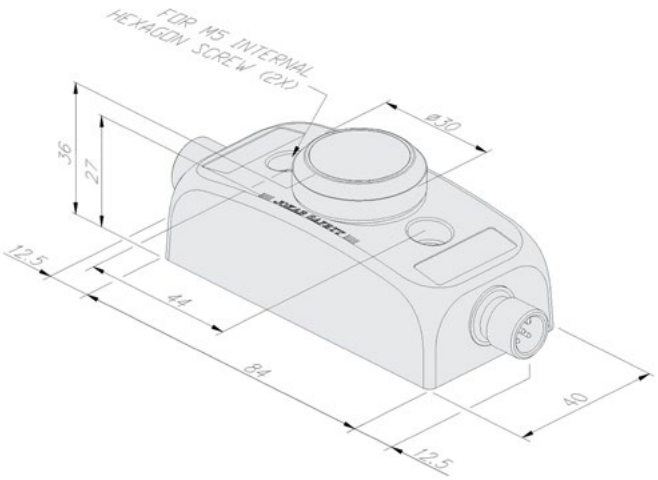
More information
Fore more information, e.g. the complete technical information, see product manual for:
Smile reset buttons - 2TLC172097M0201

Dimension drawings
Smile reset buttons

Smile 11 R



Smile 12 R



All dimensions in mm

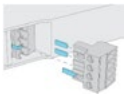
7

Quick reference

Quick reference

	Product name	Order code	Description
	Sentry BSR10 24VDC	2TLA010040R0000	BSR10 is a safety/expansion relay with relay outputs, 3 NO + 1 NC, and a +24 VDC supply voltage. BSR10 is designed to connect safety devices, such as emergency stops, directly in the voltage supply circuit of the relay. BSR10 is also suitable as expansion relay for a safety relay/ safety PLC, in order to increase the number of safe outputs.
	Push-in spring terminal: BSR10P	2TLA010040R0001	
	Sentry BSR11 24VDC	2TLA010040R0200	BSR11 is a safety/expansion relay with relay outputs, 4 NO, and a +24 VDC supply voltage. BSR11 is designed to connect safety devices, such as emergency stops, directly in the voltage supply circuit of the relay. BSR11 is also suitable as expansion relay for a safety relay/safety PLC, in order to increase the number of safe outputs.
	Push-in spring terminal: BSR11P	2TLA010040R0201	
	Sentry BSR23 24VDC	2TLA010041R0600	BSR23 is a safety expansion relay with relay outputs, 4 NO + 1 NC, and a +24 VDC supply voltage. BSR23 is used as expansion relay for a safety relay/safety PLC, in order to increase the number of safe outputs.
	Push-in spring terminal: BSR23P	2TLA010041R0601	
	Sentry SSR10 24VDC	2TLA010050R0000	SSR10 is a safety relay with relay outputs, 3 NO + 1 NC, and a +24 VDC supply voltage. SSR10 is used with safety devices with contacts, 1 or 2 channels , and safety devices with OSSD outputs. The reset function, automatic or manual, is set with a switch on the front.
	Push-in spring terminal: SSR10P	2TLA010050R0001	
	Sentry SSR10M VAC/VDC	2TLA010050R0100	SSR10M is a safety relay with relay outputs, 3 NO + 1 NC, and a 85-265 VAC (50/60 Hz)/120-375 VDC supply voltage. SSR10M is used with safety devices with 2 channels contacts. The reset function, automatic or manual, is set with a switch on the front.
	Push-in spring terminal: SSR10MP	2TLA010050R0101	
	Sentry SSR20 24VDC	2TLA010051R0000	SSR20 is a safety relay with relay outputs, 3 NO + 1NC, and a +24 VDC supply voltage. SSR20 is used with two-hand devices. The reset function, automatic or manual, is set with a switch on the front.
	Push-in spring terminal: SSR20P	2TLA010051R0001	
	Sentry SSR20M VAC/VDC	2TLA010051R0100	SSR20M is a safety relay with relay outputs, 3 NO + 1 NC, and a 85-265 VAC (50/60 Hz)/120-375 VDC supply voltage. SSR20M is used with two-hand devices. The reset function, automatic or manual, is set with a switch on the front.
	Push-in spring terminal: SSR20MP	2TLA010051R0101	
	Sentry SSR32 24VDC	2TLA010052R0400	SSR32 is a safety relay with relay outputs, 2 NO + 2 delayed NO, and a +24 VDC supply voltage. SSR32 is used with safety devices with contacts, 1 or 2 channels , and safety devices with OSSD outputs. The reset function, automatic or manual, is set with a switch on the front. The two delayed NO relay outputs have an OFF-delay time of 0,5 second.
	Push-in spring terminal: SSR32P	2TLA010052R0401	
	Sentry SSR42 24VDC	2TLA010053R0400	SSR42 is a safety relay with relay outputs, 2 NO + 2 delayed NO, and a +24 VDC supply voltage. SSR42 is used with safety devices with contacts, 1 or 2 channels , and safety devices with OSSD outputs. The reset function, automatic or manual, is set with a switch on the front. The two delayed NO relay outputs have an OFF-delay time of 1,5 seconds.
	Push-in spring terminal: SSR42P	2TLA010053R0401	
	Sentry TSR10 24VDC	2TLA010060R0000	TSR10 is a safety relay/safety timer with delayable relay outputs, 3 NO+ 1 NC, and a +24 VDC power supply. TSR10 offers 0-999 seconds timer functions with a better accuracy than 1%: OFF-delay, ON-delay, Time bypass and Time reset. A display on its front facilitate configuration and troubleshooting by displaying error codes and error log. A custom configuration can be protected by password. Automatic reset function only.
	Push-in spring terminal: TSR10P	2TLA010060R0001	
	Sentry TSR20 24VDC	2TLA010061R0000	TSR20 is a safety expansion timer with delayed relay outputs, 3 NO + 1 NC, and a +24VDC power supply. The OFF-delay time (0,5s or 1,5s) is set with a switch on the front.
	Push-in spring terminal: TSR20P	2TLA010061R0001	

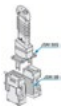
Quick reference

	Product name	Order code	Description
	Sentry TSR20M VAC/VDC	2TLA010061R0100	TSR20M is a safety expansion timer with delayed relay outputs, 3 NO + 1 NC, and a 85-265 VAC (50/60 Hz)/120-375 VDC power supply. The OFF-delay time (0,5s or 1,5s) is set with a switch on the front.
	Push-in spring terminal: TSR20MP	2TLA010061R0101	
	Sentry USR10 24VDC	2TLA010070R0000	USR10 is a universal safety relay/safety timer with delayable relay outputs, 3 NO +1 NC, and a +24 VDC power supply. USR10 is used with safety devices with contacts, 1 or 2 channels , safety devices with OSSD outputs, two-hand devices, safety mats and safety edges/bumpers. USR10 offers 0-999 seconds timer functions with a better accuracy than 1%: OFF-delay, ON-delay, Time bypass and Time reset. A display on its front facilitate configuration and troubleshooting by displaying error codes and error log. A custom configuration can be protected by password. The reset function is selectable between Automatic and Manual.
	Push-in spring terminal: USR10P	2TLA010070R0001	
	Sentry USR22 24VDC	2TLA010070R0400	USR22 is a universal safety relay/safety timer with relay outputs, 2 NO + 2 delayable NO, and a +24VDC power supply. USR22 is used with safety devices with contacts, 1 or 2 channels , safety devices with OSSD outputs, two-hand devices, safety mats and safety edges/bumpers. USR22 offers 0-999 seconds timer functions with a better accuracy than 1%: OFF-delay, ON-delay, Time bypass and Time reset. A display on its front facilitate configuration and troubleshooting by displaying error codes and error log. A custom configuration can be protected by password. The reset function is selectable between Automatic and Manual.
	Push-in spring terminal: USR22P	2TLA010070R0401	
	Sentry S30A Screw-in contact block	2TLA010099R0000	Screw-in terminal block for Sentry safety relays. One piece.
	Sentry S30C Push-in terminal contact block	2TLA010099R0001	Push-in terminal block for Sentry safety relays. One piece.
	Sentry S30B Coding kit	2TLA010099R0100	Coding kit for terminal blocks for Sentry safety relays. Should be enough for one Sentry relay.
	Vital 1	2TLA020052R1000	Safety module with one single channel input for dynamic sensors. Relay outputs 2NO.
	JSHD4-1-AA	2TLA019995R0000	Three-position device. Top part with no LED, no extra buttons. Bottom part with cable gland.
	JSHD4-1-AC	2TLA019995R0100	Three-position device. Top part with no LED, no extra buttons. Bottom part with M12-5 connector.
	JSHD4-2-AB	2TLA019995R0200	Three-position device. Top part with LEDs, front button and top button. Bottom part with Cannon connector.
	JSHD4-2-AD	2TLA019995R0400	Three-position device. Top part with LEDs, front button and top button. Bottom part with M12-8 connector.

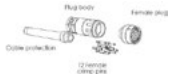
Quick reference

	Product name	Order code	Description
	JSHD4-1 Top part	2TLA020006R2100	Three-position device.
	JSHD4-2 Top part	2TLA020006R2200	Three-position device incl. LEDs, front button and top button.
	JSHD4-2 Top part black	2TLA020006R2201	Three-position device incl. LEDs, front button and top button. Black.
	JSHD4-3 Top part	2TLA020006R2300	Three-position device incl. LEDs.
	JSHD4-4 Top part	2TLA020006R2400	Three-position device incl. LEDs and front button.
	JSHD4-5 Top part	2TLA020006R2500	Three-position device incl. LEDs and top button.
	JSHD4 AA	2TLA020005R1000	Bottom part with cable gland
	JSHD4 AB	2TLA020005R1100	Bottom part with Cannon connection
	JSHD4 AC	2TLA020005R1200	Bottom part with M12 connection (5 poles).
	JSHD4 AD	2TLA020005R1300	Bottom part with M12 connection (8 poles).
	JSHD4 AE	2TLA020005R1400	Bottom part with M12 connection (8 poles) and emergency stop.
	JSHD4 AH	2TLA020005R1700	Bottom part with cable gland and PCB with 10 screw connections
	JSHD4 AJ	2TLA020005R1800	Bottom part with cable gland and PCB with 16 screw connections.
	JSHD4 AL	2TLA020005R2000	Bottom part with JSM 53A and cable gland

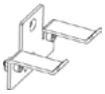
Quick reference

	Product name	Order code	Description
	JSHD4 Anti-tamper	2TLA020005R0900	Accessories JSHD4. Anti-tamper PCB. Works with top part JSHD4-2 to JSHD4-5, combined with botten part AB, AD, AF, AG, AH or AJ.
	JSHD4 Coat	2TLA020200R4600	Extra protection coat for JSHD4.
	JSM 54A	2TLA020205R2800	Wall bracket to mount Adam. Used with JSHD4 three position devices having an AL bottom part, i.e. JSHD4-x-AL(-A). The AL bottom part has a holder for Eva. Adam and Eva are ordered separately.
	JSM 50G	2TLA020205R6300	Big bottom plate for mounting of two actuators/keys of safety interlock switches on the JSHD4 in order to monitor the position of the JSHD4 when not in use. If used with Mkey5, use bracket JSM5B for the switches.
	JSM 50H	2TLA020205R6400	Bottom plate for mounting of an Eva on the JSHD4 in order to monitor the position of the JSHD4 when not in use. Adam and Eva are sold separately.
	JSM 55	2TLA040005R0500	Wall bracket for JSHD4 enabling device.
	JSM 5B	2TLA040005R0700	Wall bracket for 2 pcs Mkey5 interlock switches. Mkey5 switches are ordered separately.
	JSHD2C type E	2TLA020001R1000	JSHD2C type E 3-position pushbutton, 3 cables 200mm, Au, IP54
	JSHD2C type A	2TLA020001R1100	JSHD2C type A 3-position pushbutton, 3 cables 190mm, Au, IP40
	JSHD2C type K	2TLA020001R1300	JSHD2C type K 3-position pushbutton, 2 cables 290mm, Ag, IP54
	JSHD2C type F	2TLA020001R1400	JSHD2C type F 3-position pushbutton, 3 cables 850mm, Au, IP54
	JSHD4H2A 0,15m	2TLA020002R0200	JSHD4H2A Three-position control device for external panel mounting. 6x150mm leads.
	JSHD4H2B 0,15m	2TLA020002R0210	JSHD4H2B Three-position control device for external panel mounting. 6x150mm leads.
	JSHD4H2 0,15m	2TLA020002R3100	JSHD4H2 Three-position control device for internal panel mounting. 6x150mm leads.
	JSHD4H2 1,2m	2TLA020002R4500	JSHD4H2 Three-position control device for internal panel mounting. 6x1200mm leads.

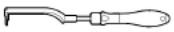
Quick reference

	Product name	Order code	Description
	HD5-M-001	2TLA920509R0001	Active holder (for home position sensor)
	HD5-M-002	2TLA920509R0001	Passive holder
	JSHK0	2TLA020003R0300	12 pole female Cannon connector for JSHD4.
	JSHK1-C	2TLA020003R0700	12-pole male Cannon connector for cabinet mounting.
	JSHK1-A	2TLA020003R0800	12-pole female Cannon connector for cabinet mounting.
	JSHK1-B	2TLA020003R0900	12-pole male Cannon connector for cable mounting.
	HK40S4	2TLA020003R3500	Spiral cable 4m and 12 leads with Cannon female connector. PUR.
	HK60S4	2TLA020003R3600	Spiral cable 6m and 12 leads with Cannon female connector. PUR.
	HK5	2TLA020003R4700	Cable 5m and 12 leads with Cannon female connector.
	HK10	2TLA020003R4800	Cable 10m and 12 leads with Cannon female connector.
	HK20	2TLA020003R4900	Cable 20 m and 12 leads with Cannon female connector.
	HK16S4	2TLA020003R5000	Spiral cable 1.6m and 12 leads with Cannon female connector.
	HK20S4	2TLA020003R5100	Spiral cable 2m and 12 leads with Cannon female connector. PUR.
	HK32S4	2TLA020003R5200	Spiral cable 3.2m and 12 leads with Cannon female connector. PUR
	HK80S4	2TLA020003R5300	Spiral cable 8m and 12 leads with Cannon female connector. PUR.
	JSD-TK5-12	2TLA930050R0000	5 m cable with M23-12 female connector
	JSD-TK10-12	2TLA930051R0000	10 m cable with M23-12 female connector
	JSD-TK100S-12	2TLA930034R0000	10 m spiral cable with M23-12 female connector
	JSD-TK5-19	2TLA930057R0000	5 m cable with M23-19 female connector

Quick reference

	Product name	Order code	Description
	JSD-TK10-19	2TLA930058R0000	10 m cable with M23-19 female connector
	M12-C51-ASi	2TLA910093R0000	5 m unshielded cable with M12-5 female connector
	M12-C251S-ASi	2TLA910094R0000	2.5 m unshielded spiral cable with M12-5 female connector
	JSTD1-A	2TLA020007R3000	JSTD1-A Safeball, 1NO + 1NC, 2 m cable (4 leads). Ergonomic design with several grip possibilities and low activation force (approx. 2N) and flexible mounting options. Provides highest level of safety for use in two hand control applications when using two Safeballs in conjunction with appropriate safety relay or Pluto Safety PLC. Maximum load of 30VDC, 2A resistive, IP67 protection degree, plastic body.
	JSTD1-B	2TLA020007R3100	JSTD1-B Safeball, 1NO + 1NC, 0.2m wires x 4 for direct connection into an enclosure. Ergonomic design with several grip possibilities and low activation force (approx. 2N) and flexible mounting options. Provides highest level of safety for use in two hand control applications when using two Safeballs in conjunction with appropriate safety relay or Pluto Safety PLC. Maximum load of 30VDC, 2A resistive, IP67 protection degree, plastic body.
	JSTD1-C	2TLA020007R3200	JSTD1-C Safeball, 1NO + 1NC, 10 m cable (4 leads). Ergonomic design with several grip possibilities and low activation force (approx. 2N) and flexible mounting options. Provides highest level of safety for use in two hand control applications when using two Safeballs in conjunction with appropriate safety relay or Pluto Safety PLC. Maximum load of 30VDC, 2A resistive, IP67 protection degree, plastic body.
	JSTD1-E	2TLA020007R3400	JSTD1-E Safeball, 2 NO, 0.2m wires x 4 for direct connection into an enclosure. Ergonomic design with several grip possibilities and low activation force (approx. 2N) and flexible mounting options. Provides highest level of safety for use in two hand control applications when using two Safeballs in conjunction with appropriate safety relay or Pluto Safety PLC. Maximum load of 30VDC, 2A resistive, IP67 protection degree, plastic body.
	JSM C5	2TLA020007R0900	Accessories Safeball. Ball & socket for flexible mount for mounting the Safeball to Enclosures, machines or table tops.
	JSM C7	2TLA020007R1200	Suspension shelf in stainless steel for JSTD25 F/G/H/K
	Safeball Coat	2TLA020007R1900	Extra protection coat for Safeball.
	JSTD25F	2TLA020007R6000	Two-hand device with JSTD1-B Safeballs. Buttons are side mounted on a 44x88 extruded aluminum profile designed for two-hand applications. Pre-wired to a M12 5-pin connector with protective flanges of the safeballs. Highest level of safety can be achieved when used in conjunction with a JSBR4 safety relay or Pluto Safety PLC.
	JSTD25H	2TLA020007R6300	Two-hand device with JSTD1-B Safeballs. Buttons are side mounted on a 44x88 extruded aluminum profile designed for two-hand applications. Pre-wired to a M12 8-pin connector with protective flanges of the safeballs. Highest level of safety can be achieved when used in conjunction with a JSBR4 safety relay or Pluto Safety PLC.
	JSTD25K	2TLA020007R6900	Two-hand device with JSTD1-B Safeballs. Buttons are side mounted on a 44x88 extruded aluminum profile designed for two-hand applications. On top there is a Smile 10 EA mounted. All pre-wired to a M12 8-pin connector. The safeballs have protective flanges. Highest level of safety can be achieved when used in conjunction with a JSBR4 safety relay or Pluto Safety PLC.
	Eva General code	2TLA020046R0800	Eva actuator with general code for use with Adam DYN/OSSD sensors in the Eden sensor system, IP69K, yellow, 4pcs of DA 2B spacer rings are included.

Quick reference

	Product name	Order code	Description
	Eva Unique code	2TLA020046R0900	Eva actuator with unique code for use with Adam DYN/OSSD sensors in the Eden sensor system, IP69K, yellow, 4pcs of DA 2B spacer rings are included.
	Adam DYN-Info M12-5	2TLA020051R5100	Adam safety sensor unit with DYNlink signal and information output. M12-5 male connector, IP69K, yellow. 4pcs of DA 1B distance plates and 4pcs of DA 2B distance rings are included.
	Adam DYN-Status M12-5	2TLA020051R5200	Adam safety sensor unit with DYNlink signal, StatusBus, fixed 5-pole M12 male connector, IP69K, yellow, 4pcs of DA 1B protection plate and 4pcs of DA 2B spacer rings are included.
	Adam DYN-Reset M12-5	2TLA020051R5300	Adam safety sensor unit with DYNlink signal and reset with indication. M12-5 male connector, IP69K, yellow. 4pcs of DA 1B distance plate and 4pcs of DA 2B distance rings are included.
	Adam OSSD-Info M12-5	2TLA020051R5400	Adam safety sensor unit with OSSD signals and information output. M12-5 male connector, IP69K, yellow. 4pcs of DA 1B distance plates and 4pcs of DA 2B distance rings are included.
	Adam OSSD-Reset M12-5	2TLA020051R5600	Adam safety sensor unit with OSSD signals and reset with indication. M12-5 male connector, IP69K, yellow. 4pcs of DA 1B distance plates and 4pcs of DA 2B distance rings are included.
	Adam OSSD-Info M12-8	2TLA020051R5700	Adam safety sensor unit with OSSD signals and information output. M12-8 male connector, IP69K, yellow. 4pcs of DA 1B distance plates and 4pcs of DA 2B distance rings are included.
	Adam OSSD-Reset M12-8	2TLA020051R5900	Adam safety sensor unit with OSSD signals and reset with indication. M12-8 male connector, IP69K, yellow. 4pcs of DA 1B distance plates and 4pcs of DA 2B distance rings are included.
	DA 2B Distance ring	2TLA020053R0300	Spare part. 4 distance rings 4.5 x 8 x 4 mm in black polyamide. To be mounted in Adam/Eva mounting holes.
	DA 3A Convert. plate	2TLA020053R0600	Converting plate in stainless steel for replacing Eden E with Eden DYN or Eden OSSD.
	DA 1B Distance plate	2TLA020053R0700	Spare part. 4 distance plates in yellow PBT. Thickness 2.5 mm. For all Adam and Eva except Adam E and Eva E.
	M12 Safety seal	2TLA020053R0800	Heat shrinking tubes for M12 connectors. Protects M12 connectors in harsh environments and provides extra protection against tampering.
	M12 Torque wrench	2TLA020053R0900	Wrench for tightening of M12 connectors according to specified torque: 0,6 Nm. Robust, glass-fibre reinforced plastic, high quality hexagonal stainless steel insert and chrome-vanadium-molybdenum steel tongue.
	JSM D20 Slide lock	2TLA020302R1000	Sliding lock for Eden on conventional doors. Made in steel, yellow. Eden is not included.

Quick reference

	Product name	Order code	Description
	JSOP-1 Terminator	2TLA020053R7000	Termination plug M12-5. For Adam OSSD with M12-3H. Connects pin 1 with pin 2 and 4.
	JSOP-2 Terminator	2TLA020053R7100	Termination plug M12-8. For Adam OSSD with M12-3G. Connects pin 2 with pin 3 and 4.
	Tina 1A	2TLA020054R0000	Tina 1A blind plug is connected to the unused M12 connectors of the connection blocks Tina 4A or Tina 8A. M12-5 male connector.
	Tina 2A	2TLA020054R0100	Adaptation of devices with 2 positively driven force-guided contacts like emergency stop buttons and key switches, to the DYNlink solution. Tina 2A is mounted directly on the device enclosure to a M20 cable entry.
	Tina 3A	2TLA020054R0200	Adaptation of devices with 2 positively driven force-guided contacts like emergency stop buttons and key switches, to the DYNlink solution. Tina 3A is mounted directly on the device enclosure to a M20 cable entry and has a M12-5 male connector for connection to the DYNlink loop.
	Tina 4A	2TLA020054R0300	Connection block for series connection of up to 4 DYNlink devices. Four M12-5 female connectors for the devices. The information signal of each device can be wired separately. The cable used for the connection to the Tina 4A should have a diameter 7 - 12 mm. If less than a devices are connected, complete with Tina 1A blind plugs.
	Tina 8A	2TLA020054R0500	Connection block for series connection of up to 8 DYNlink devices. Eight M12-5 female connectors for the devices. The information signal of each device can be wired separately. The cable used for the connection to the Tina 8A should have a diameter 7 - 12 mm. If less than 8 devices are connected, complete with Tina 1A blind plugs.
	Tina 7A	2TLA020054R0700	Adaptation of devices with 2 positively driven force-guided contacts like emergency stop buttons and key switches, to the DYNlink solution. Tina 7A is mounted on a DIN rail in the electrical cabinets and the connected safety device(s) must be mounted on the same cabinet, e.g. an emergency-stop button mounted on the cabinet. Electrical connection via detachable terminal blocks.
	Tina 2B	2TLA020054R1100	Adaptation of devices with 2 positively driven force-guided contacts like emergency stop buttons and key switches, to the DYNlink solution. Tina 2B is placed inside the safety device enclosure.
	Tina 10A V2	2TLA020054R1210	Adaptation of devices with OSSD outputs, like light guards, to the DYNlink solution. Tina 10A V2 has one M12-5 male connector towards the DYNlink loop and one M12-8 female connector towards the OSSD device.
	Tina 10B V2	2TLA020054R1310	Adaptation of devices with OSSD outputs, like light guards, to the DYNlink solution with possibility to connect a local reset button. Tina 10B V2 has one M12-5 male connector towards the DYNlink loop, one M12-8 female connector towards the OSSD device and one M12-5 female connector for the local reset button.
	Tina 3Aps	2TLA020054R1400	Adaptation of devices with 2 positively driven force-guided contacts like E-stop buttons and key switches, to the DYNlink solution, with extra conductor for the supply of the safety device. Tina 3A is mounted directly on the device enclosure to a M20 cable entry and has a M12-5 male connector for connection to the DYNlink loop. Connection to +24VDC and 0V on the device side.
	Tina 10C V2	2TLA020054R1610	Adaptation of devices with OSSD outputs, like light guards, to the DYNlink solution with possibility to power the transmitter. Tina 10C V2 has one M12-5 male connector towards the DYNlink loop, one M12-8 female connector towards the OSSD device and one M12-5 female connector for the supply of the transmitter (0V and +24VDC)
	Tina 11A	2TLA020054R1700	Connection block for series connection of 2 DYNlink devices with M12-5 connectors. Two M12-5 female connectors for the devices and one M12-5 male connector towards the DYNlink loop.
	Tina 12A	2TLA020054R1800	Connection block for series connection of 2 DYNlink devices with M12-8 connectors, e.g. Magne, Dalton M12 with Eden DYN or Knox (M12-8). Two M12-8 female connectors for the devices and one M12-8 male connector towards the DYNlink loop.

Quick reference

	Product name	Order code	Description
	M12-3A	2TLA020055R0000	M12 Y-connector for series connection of DYNlink devices such as Eden sensors, Smile Tina and Inca Tina emergency stop buttons, Spot single beam, and Tina adapters. One M12-5 pole female connector (#2) for connection of the safety device, one M12-5 male connector (#1) for connection of +24VDC, 0V and the incoming dynamic signal and one M12-5 female connector (#3) for continuation of the circuit towards another safety device or Vital/Pluto safety PLC.
	M12-3B	2TLA020055R0100	M12 Y-connector for parallel connection of 2 DYNlink devices such as Eden sensors, Spot singel beams and Tina adapters. Two M12-5 female connectors (#2, #3) for connection of the safety devices and one M12-5 male connector (#1) for connection towards the DYNlink loop.
	M12-3E	2TLA020055R0200	M12 Y-connector for the connection of 2 DYNlink devices or one DYNlink and one light button to Pluto safety PLC with only one cable. One M12-5 female connector (#2) for connection of the first circuit. One M12-5 female connector (#3) for connection of the second circuit. One M12-5 male connector (#1) for connection to IQs on the Pluto safety PLC.
	M12-3D	2TLA020055R0300	M12 Y-connector for easier installation of a light guard with transmitter and receiver. One M12-8 female connector for the receiver (#2), one M12-5 female connector for the transmitter (#3) and one M12-8 male connector (#1) for cabling to safety control unit.
	M12-3S	2TLA020055R0600	M12-3S M12 Y-connector for series connection of DYNlink devices with the StatusBus function. One M12-5 pole female connector (#2) for connection of the safety device, one M12-5 male connector (#1) for connection of +24VDC, 0V, the incoming dynamic signal and the StatusBus and one M12-5 female connector (#3) for the outgoing inverted dynamic signal towards another safety device or Vital/Pluto safety PLC.
	M12-3G	2TLA020055R0700	M12 Y-connector for series connection of Adam OSSD M12-8 safety sensor with M12-8 cables. One M12-8 female connector (#2) for connection of the safety sensor one M12-8 male connector (#1) for connecting +24VDC, 0V and the incoming OSSD signals and one M12-8 female connector (#3) for continuation of the circuit towards another safety device or the safety control device.
	M12-3H	2TLA020055R0800	M12 Y-connector for series connection of Adam OSSD M12-8 safety sensor with M12-5 cables. One M12-8 female connector (#2) for connection of the safety sensor one M12-5 male connector (#1) for connecting +24VDC, 0V and the incoming OSSD signals and one M12-5 female connector (#3) for continuation of the circuit towards another safety device or the safety control device.
	M12-C01	2TLA020055R1000	Straight M12-5 female connector with cable screw connection. Cable diameter range 2.5–6.5 mm.
	M12-C02	2TLA020055R1100	Straight M12-5 male connector with cable screw connection. Cable diameter range 2.5–6.5 mm.
	M12-C03	2TLA020055R1600	Straight M12-8 female connector with cable screw connection. Cable diameter range 2.5–6.5 mm.
	M12-C04	2TLA020055R1700	Straight M12-8 male connector with cable screw connection. Cable diameter range 2.5–6.5 mm.
	M12 protection cap	2TLA020055R2100	Protection of the M12 male connector from dust.
	M12-C61	2TLA020056R0000	6 m cable 5 x 0.34 mm2 + shield with straight M12-5 female connector.
	M12-C62	2TLA020056R0200	6 m cable 5 x 0.34 mm2 + shield with straight M12 male connector. Shield connected to pin3 (0V) on male connector.
	M12-C31	2TLA020056R0500	3 m cable 5 x 0.34 mm2 + shield with straight M12-5 female connector.

Quick reference

	Product name	Order code	Description
	M12-C61V2	2TLA020056R0600	6 m cable 5 x 0.34 mm2 + shield with angled M12-5 female connector.
	M12-C101	2TLA020056R1000	10 m cable 5 x 0.34 mm2 + shield with straight M12-5 female connector.
	M12-C102	2TLA020056R1200	10 m cable 5 x 0.34 mm2 + shield with straight M12-5 male connector. Shield connected to pin3 (0V) on male connector.
	M12-C201	2TLA020056R1400	20 m cable 5 x 0.34 mm2 + shield with straight M12-5 female connector.
	M12-C101V2	2TLA020056R1500	10 m cable 5 x 0.34 mm2 + shield with angled M12-5 female connector.
	M12-C112	2TLA020056R2000	1 m cable 5 x 0.34 mm2 + shield with straight M12-5 female + male connectors. Shield connected to pin3 (0V) on male connector.
	M12-C312	2TLA020056R2100	3 m cable 5 x 0,.34 mm2 + shield with straight M12-5 female + male connectors. Shield connected to pin3 (0V) on male connector.
	M12-C612	2TLA020056R2200	6 m cable 5 x 0,34 mm2 + shield with straight M12-5 female + male connectors. Shield connected to pin3 (0V) on male connector.
	M12-C1012	2TLA020056R2300	10 m cable 5 x 0.34 mm2 + shield with straight M12 female + male connectors. Shield connected to pin3 (0V) on male connector.
	M12-C2012	2TLA020056R2400	20 m cable 5 x 0.34 mm2 + shield with straight M12 female + male connectors. Shield connected to pin3 (0V) on male connector.
	M12-C63	2TLA020056R3000	6 m cable 8 x 0.34 mm2 + shield with straight M12-8 female connector.
	M12-C103	2TLA020056R4000	10 m cable 8 x 0.34 mm2 + shield with straight M12-8 female connector.
	M12-C203	2TLA020056R4100	20 m cable 8 x 0.34 mm2 + shield with straight M12-8 female connector.
	M12-C134	2TLA020056R5000	1 m cable 8 x 0.34 mm2 + shield with straight M12-8 female + male connector. Shield connected to pin7 (0V) on male connector.
	M12-C334	2TLA020056R5100	3 m cable 8 x 0.34 mm2 + shield with straight M12-8 female + male connectors. Shield connected to pin7 (0V) on male connector.
	M12-C1612	2TLA020056R5400	16 m cable 5 x 0.34 mm2 with straight M12-5 female connector.
	M12-C0312	2TLA020056R5800	0.3 m cable 5 x 0.34 mm2 with M12-5 female + male connectors.
	M12-C00612	2TLA020056R6300	60 mm cable 5 x 0.34 mm2 with straight M12-5 female+male connectors.

Quick reference

	Product name	Order code	Description
	M12-C00634	2TLA020056R6400	60 mm cable 8 x 0.34 mm2 with straight M12.8 female + male connectors.
	M12-C1012V2	2TLA020056R6700	10 m cable 5 x 0.34 mm2 with straight male + angled female connectors.
	M12-C65	2TLA020056R7200	6 m cable 12×0.13 mm2 + shield with straight M12-12 female connector.
	M12-C105	2TLA020056R7300	10 m cable 12×0.13 mm2 + shield with straight M12-12 female connector.
	M12-C205	2TLA020056R7500	20 m cable 12×0.13 mm2 + shield with straight M12-12 female connector.
	M12-C61HE	2TLA020056R8000	Sensor cable suitable for Harsh Environments. 6 m cable 5 x 0.34 mm2 + shield with straight M12-5 female connector. Ambient temperature (operation) -40 °C ... 105 °C (Plug/socket). Degree of protection IP65/IP67/ IP69K. Cable type Halogen-free PP gray.
	M12-C101HE	2TLA020056R8100	Sensor cable suitable for Harsh Environments. 10 m cable 5 x 0.34 mm2 + shield with straight M12-5 female connector. Ambient temperature (operation) -40 °C ... 105 °C (Plug/socket). Degree of protection IP65/IP67/ IP69K. Cable type Halogen-free PP gray.
	C5 cable 100m	2TLA020057R0010	C5 cable 5x0.34 shielded 100m on spool.
	C5 cable 200m	2TLA020057R0020	C5 cable 5x0.34 shielded 200m on spool.
	C5 cable 500m	2TLA020057R0050	C5 cable 5x0.34 shielded 500m on spool.
	C8 cable 200m	2TLA020057R1020	C8 cable 8x0.34 shielded 200m on spool.
	C8 cable 500m	2TLA020057R1050	C8 cable 8x0.34 shielded 500m on spool.
	C9 cable 150m	2TLA020057R1515	C9 cable 7x0.51+2x0.82 shielded 150m on spool.
	C9 cable 350m	2TLA020057R1535	C9 cable 7x0.51+2x0.82 shielded 350m on spool.

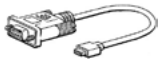
Quick reference

	Product name	Order code	Description
	C13 cable 100m	2TLA020057R2010	C13 cable 11x0.51+2x0.82 shielded 100m on spool.
	C13 cable 250m	2TLA020057R2025	C13 cable 11x0.51+2x0.82 shielded 250m on spool.
	M12-CT0212	2TLA020060R0400	Transfer cable, L=20 cm, 5 x 0.34 mm2 + shield with straight M12-5 female + male connectors. Shield connected to pin3 (0V) on male connector. Can be used for connection of DYNlink devices to Tina 4A/Tina 8A where the “info-pin” of each M12 connector works like a individual safe signal. Note: Only allowed when connected to a Pluto IQ input.
	RSA 597 1.5m cable	2TLA020070R3300	Pluto safe absolute encoder RSA 597, single turn, 1.5m cable, 6mm solid shaft.
	RHA 597 2m cable	2TLA020070R3400	Pluto safe absolute encoder RHA 597, single turn, 2m cable, hollow shaft, 12mm hole.
	RSA 597 connector	2TLA020070R3600	Pluto safe absolute encoder RSA 597, single turn, connector, 10mm solid shaft.
	RHA 597 10m cable	2TLA020070R5900	Absolute encoder RHA 597, singel turn, 10m cable, hollow shaft, 12mm hole. 2TLA020070R3600
	RSA 698 10mm solid	2TLA020070R3700	Pluto safe absolute encoder RSA 698, multi-turn, M12 connector, 10mm shaft.
	Connector for RSA 597	2TLA020070R3900	Female 12 pole connector for absolute encoder “RSA 597 connector”. Connector to be mounted on the cable.
	M12-CANend	2TLA020061R0300	M12-5 plug with Pluto safety bus termination resistor for encoders. To be used when the encoder is at one end of the Pluto safety bus.
	Pluto A20 v2	2TLA020070R4500	Safety PLC with Pluto safety bus. Totally 20 I/O: 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individually failsafe relay outputs + 2 individually failsafe transistor outputs. Current monitoring on Q16 + Q17. NOTE: Version 2 hardware/processor.
	Pluto B20 v2	2TLA020070R4600	Safety PLC with Pluto safety bus. Totally 20 I/O: 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individually failsafe relay outputs + 2 individually failsafe transistor outputs. NOTE: Version 2 hardware/ processor.
	Pluto B46 v2	2TLA020070R1700	Safety PLC with Pluto safety bus. Totally 46 I/O: 24 failsafe inputs + 16 non-failsafe outputs/failsafe inputs + 4 individually failsafe relay outputs + 2 individually failsafe transistor outputs.
	Pluto S20 v2	2TLA020070R4700	Safety PLC. Totally 20 I/O: 8 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individually failsafe relay outputs + 2 individually failsafe transistor outputs. (Without Pluto safety bus). NOTE: Version 2 hardware/processor.

Quick reference

	Product name	Order code	Description
	Pluto B22	2TLA020070R4800	Safety PLC with Pluto safety bus. Totally 22 I/O: 14 failsafe inputs + 8 non-failsafe outputs/failsafe inputs. (Without Pluto safety outputs)
	Pluto D20	2TLA020070R6400	Safety PLC with Pluto safety bus and analogue inputs. Totally 20 I/O: 4 combined failsafe analogue and digital inputs + 4 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individually failsafe relay outputs + 2 individually failsafe transistor outputs. Analogue input range 0-10V/4-20mA.
	Pluto D20 (Harsh Env)	2TLA020070R6401	Safety PLC with Pluto safety bus and analogue inputs. Totally 20 I/O: 4 combined failsafe analogue and digital inputs + 4 failsafe inputs + 8 non-failsafe outputs/failsafe inputs + 2 individually failsafe relay outputs + 2 individually failsafe transistor outputs. Analogue input range 0-10V/4-20mA. Coated PCBs.
	Pluto D45	2TLA020070R6600	Safety PLC with Pluto safety bus and analogue inputs. Totally 45 I/O: 8 combined failsafe analogue and digital inputs + 16 failsafe inputs + 15 non-failsafe outputs/failsafe inputs + 4 individually failsafe relay outputs + 2 individually failsafe transistor outputs. Analogue input range 0-10V/4-20mA.
	Pluto D45 (Harsh Env)	2TLA020070R6601	Safety PLC with Pluto safety bus and analogue inputs. Totally 45 I/O: 8 combined failsafe analogue and digital inputs + 16 failsafe inputs + 15 non-failsafe outputs/failsafe inputs + 4 individually failsafe relay outputs + 2 individually failsafe transistor outputs. Analogue input range 0-10V/4-20mA. Coated PCBs.
	Pluto O2	2TLA020070R8500	Safety PLC output module with Pluto safety bus. Safety output module. Totally 6 I/O: 2 Failsafe inputs for monitoring + 2 non-failsafe outputs/failsafe inputs + 2 individually failsafe relay outputs (with 3 contacts each).
	Pluto S46 v2	2TLA020070R1800	Safety PLC. Totally 46 I/O: 24 failsafe inputs + 16 non-failsafe outputs/failsafe inputs + 4 individually failsafe relay outputs + 2 individually failsafe transistor outputs. (Without Pluto safety bus)
	GATE-P2	2TLA020071R8000	Gateway for 2-way communication between the Pluto bus and Profibus.
	GATE-C2	2TLA020071R8100	Gateway for 2-way communication between the Pluto bus and CANopen.
	GATE-D2	2TLA020071R8200	Gateway for 2-way communication between the Pluto bus and Devicenet.
	GATE-EIP	2TLA020071R9000	Gateway for 2-way communication between the Pluto bus and Ethernet. Ethernet protocol EtherNet I/P.
	GATE-EC	2TLA020071R9100	Gateway for 2-way communication between the Pluto bus and Ethernet. Ethernet protocol EtherCAT.
	GATE-S3	2TLA020071R9200	Gateway for 2-way communication between the Pluto bus and Ethernet. Ethernet protocol SERCOS III.
	GATE-PN	2TLA020071R9300	Gateway for 2-way communication between the Pluto bus and Ethernet. Ethernet protocol PROFINET.

Quick reference

	Product name	Order code	Description
	GATE-MT	2TLA020071R9400	Gateway for 2-way communication between the Pluto bus and Ethernet. Ethernet protocol Modbus TCP.
	FIXA	2TLA020072R2000	Handheld terminal for addressing, configuration and testing of StatusBus devices, DYNlink devices and conventional PNP devices.
	Pluto cable serial	2TLA020070R5600	Pluto programming and on-line monitoring cable from a PC serial port, 9-pole D-sub connector, to the Pluto programming port.
	Pluto cable HMI	2TLA020070R5700	Cable for connecting a HMI-panel to the Pluto programming port. Connector on HMI-side: 15-pole D-sub. On Pluto side: 90 degrees angled Modbus contact.
	Pluto cable USB	2TLA020070R5800	Pluto programming and on-line monitoring cable from a PC USB port to the Pluto programming port.
	Pluto cable CP400	2TLA020070R6700	Cable for connecting HMI-panel ABB CP400 to Pluto programming port. Connector at HMI-side: 9-pole D-sub.
	PCABLE-100	2TLA020070R6810	CAN-Bus cable 2x0.75mm2, yellow. UL & CSA approved. 100 meter ring.
	PCABLE-500	2TLA020070R6850	CAN-Bus cable 2x0.75mm2, yellow. UL & CSA approved. 500 meter drum.
	Pluto cable CP600	2TLA020070R6900	Cable for connecting HMI-panel ABB CP600 to Pluto programming port. Connector at HMI-side: 9-pole D-sub.
	IDFIX-R	2TLA020070R2000	Identifier, read only, for assigning an address to the Pluto it is connected to. Each Pluto connected to the Pluto safety bus needs an IDFIX. The IDFIX number is fixed at delivery.
	IDFIX-RW	2TLA020070R2100	Identifier, read/write, for assigning an address to the Pluto it is connected to. Each Pluto connected to the Pluto safety bus needs an IDFIX. The IDFIX number is programmable, i.e. the user can choose the number.
	R120 Resistor	2TLA020070R2200	Terminating resistor for Pluto safety bus. Delivered with each Pluto. Necessary for each stand-alone Pluto and on the Pluto units at each end of the Pluto safety bus. Should be removed from the other Pluto units.
	IDFIX-PROG 10k	2TLA020070R2600	External program memory, 10 kbyte. For projects with only one Pluto the memory can store the PLC program.
	CP604 4.3IN	1SAP504100R0001	CP604 ECO CONT PANEL 4.3IN TFT HMI
	CP607 7IN	1SAP507100R0001	CP607 ECO CONT PANEL 7IN TFT HMI

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	Product name	Order code	Description
	CP610 10IN	1SAP510100R0001	CP610 ECO CONT PANEL 10.1IN TFT
	CP620 4.3IN	1SAP520100R0001	CP620 CONT PANEL 4.3IN TFT HMI
	CP630 5.7IN	1SAP530100R0001	CP630 CONT PANEL 5.7IN TFT HMI
	CP635 7IN	1SAP535100R0001	CP635 CONT PANEL 7IN TFT HMI
	CP651 10.4IN	1SAP551100R0001	CP651 CONT PANEL 10.4IN TFT HMI
	CP661 12.1IN	1SAP561100R0001	CP661 CONT PANEL 12.1IN TFT HMI
	CP665 13.3IN	1SAP565100R0001	CP665 CONT PANEL 13.3IN TFT HMI
	CP676 15IN	1SAP576100R0001	CP676 CONT PANEL 15IN TFT HMI
	Mute R2	2TLA022044R0500	MUTE R2 Retroreflex photoelectric sensor
	REFLECT 1	2TLA022044R2000	REFLECT 1 - Reflector diam. 63 mm
	REFLECT 2	2TLA022044R3000	REFLECT 2 - Reflector diam. 82 mm
	Orion1-4-14-015-B	2TLA022300R0000	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=150mm, Range=0.2-6m, Type 4.
	Orion1-4-14-030-B	2TLA022300R0100	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=300mm, Range=0.2-6m, Type 4.

Quick reference

	Product name	Order code	Description
	Orion1-4-14-045-B	2TLA022300R0200	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=450mm, Range=0.2-6m, Type 4.
	Orion1-4-14-060-B	2TLA022300R0300	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=600mm, Range=0.2-6m,Type 4.
	Orion1-4-14-075-B	2TLA022300R0400	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=750mm, Range=0.2-6m, Type 4.
	Orion1-4-14-090-B	2TLA022300R0500	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=900mm, Range=0.2-6m, Type 4.
	Orion1-4-14-105-B	2TLA022300R0600	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1050mm, Range=0.2-6m, Type 4.
	Orion1-4-14-120-B	2TLA022300R0700	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1200mm, Range=0.2-6m, Type 4.
	Orion1-4-14-135-B	2TLA022300R0800	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1350mm, Range=0.2-6m, Type 4.
	Orion1-4-14-150-B	2TLA022300R0900	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1500mm, Range=0.2-6m, Type 4.
	Orion1-4-14-165-B	2TLA022300R1000	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1650mm, Range=0.2-6m, Type 4.
	Orion1-4-14-180-B	2TLA022300R1100	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1800mm, Range=0.2-6m, Type 4.
	Orion1-4-14-030-E	2TLA022301R0100	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=300mm, Range=0.2-7m, Type 4.
	Orion1-4-14-045-E	2TLA022301R0200	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=450mm, Range=0.2-7m, Type 4.

Quick reference

	Product name	Order code	Description
	Orion1-4-14-060-E	2TLA022301R0300	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=600mm, Range=0.2-7m,Type 4.
	Orion1-4-14-075-E	2TLA022301R0400	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=750mm, Range=0.2-7m, Type 4.
	Orion1-4-14-090-E	2TLA022301R0500	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=900mm, Range=0.2-7m, Type 4.
	Orion1-4-14-105-E	2TLA022301R0600	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1050mm, Range=0.2-7m, Type 4.
	Orion1-4-14-120-E	2TLA022301R0700	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1200mm, Range=0.2-7m, Type 4.
	Orion1-4-14-135-E	2TLA022301R0800	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1350mm, Range=0.2-7m, Type 4.
	Orion1-4-14-150-E	2TLA022301R0900	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1500mm, Range=0.2-7m, Type 4.
	Orion1-4-14-165-E	2TLA022301R1000	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1650mm, Range=0.2-7m, Type 4.
	Orion1-4-14-180-E	2TLA022301R1100	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=14mm, Protected height=1800mm, Range=0.2-7m, Type 4.
	Orion1-4-30-015-B	2TLA022302R0000	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=150mm, Range=0.2-19m, Type 4.
	Orion1-4-30-030-B	2TLA022302R0100	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=300mm, Range=0.2-19m, Type 4.
	Orion1-4-30-045-B	2TLA022302R0200	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=450mm, Range=0.2-19m, Type 4.
	Orion1-4-30-060-B	2TLA022302R0300	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=600mm, Range=0.2-19m, Type 4.

Quick reference

	Product name	Order code	Description
	Orion1-4-30-075-B	2TLA022302R0400	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=750mm, Range=0.2-19m, Type 4.
	Orion1-4-30-090-B	2TLA022302R0500	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=900mm, Range=0.2-19m, Type 4.
	Orion1-4-30-105-B	2TLA022302R0600	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1050mm, Range=0.2-19m, Type 4.
	Orion1-4-30-120-B	2TLA022302R0700	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1200mm, Range=0.2-19m, Type 4.
	Orion1-4-30-135-B	2TLA022302R0800	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1350mm, Range=0.2-19m, Type 4.
	Orion1-4-30-150-B	2TLA022302R0900	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1500mm, Range=0.2-19m, Type 4.
	Orion1-4-30-165-B	2TLA022302R1000	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1650mm, Range=0.2-19m, Type 4.
	Orion1-4-30-180-B	2TLA022302R1100	Orion1 Base Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1800mm, Range=0.2-19m, Type 4.
	Orion1-4-30-030-E	2TLA022303R0100	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=300mm, Range=0.2-20m, Type 4.
	Orion1-4-30-045-E	2TLA022303R0200	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=450mm, Range=0.2-20m, Type 4.
	Orion1-4-30-060-E	2TLA022303R0300	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=600mm, Range=0.2-20m, Type 4.
	Orion1-4-30-075-E	2TLA022303R0400	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=750mm, Range=0.2-20m, Type 4.

Quick reference

	Product name	Order code	Description
	Orion1-4-30-090-E	2TLA022303R0500	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=900mm, Range=0.2-20m, Type 4.
	Orion1-4-30-105-E	2TLA022303R0600	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1050mm, Range=0.2-20m, Type 4.
	Orion1-4-30-120-E	2TLA022303R0700	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1200mm, Range=0.2-20m, Type 4.
	Orion1-4-30-135-E	2TLA022303R0800	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1350mm, Range=0.2-20m, Type 4.
	Orion1-4-30-150-E	2TLA022303R0900	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1500mm, Range=0.2-20m, Type 4.
	Orion1-4-30-165-E	2TLA022303R1000	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1650mm, Range=0.2-20m, Type 4.
	Orion1-4-30-180-E	2TLA022303R1100	Orion1 Extended Light Curtain, Transmitter + Receiver, Resolution=30mm, Protected height=1800mm, Range=0.2-20m, Type 4.
	Orion2-4-K2-050-B	2TLA022304R0000	Orion2 Base Light Grids, Transmitter + Receiver, 2 beams, Protected height=500mm, Range=0.5-50m, Type 4.
	Orion2-4-K3-080-B	2TLA022304R0100	Orion2 Base Light Grids, Transmitter + Receiver, 3 beams, Protected height=800mm, Range=0.5-50m, Type 4.
	Orion2-4-K4-090-B	2TLA022304R0200	Orion2 Base Light Grids, Transmitter + Receiver, 4 beams, Protected height=900mm, Range=0.5-50m, Type 4.
	Orion2-4-K4-120-B	2TLA022304R0300	Orion2 Base Light Grids, Transmitter + Receiver, 4 beams, Protected height=1200mm, Range=0.5-50m, Type 4.
	Orion2-4-K2-050-E	2TLA022305R0000	Orion2 Extended Light Grids, Transmitter + Receiver, 2 beams, Protected height=500mm, Range=0.5-50m, Type 4.
	Orion2-4-K3-080-E	2TLA022305R0100	Orion2 Extended Light Grids, Transmitter + Receiver, 3 beams, Protected height=800mm, Range=0.5-50m, Type 4.

Quick reference

	Product name	Order code	Description
	Orion2-4-K4-090-E	2TLA022305R0200	Orion2 Extended Light Grids, Transmitter + Receiver, 4 beams, Protected height=900mm, Range=0.5-50m, Type 4.
	Orion2-4-K4-120-E	2TLA022305R0300	Orion2 Extended Light Grids, Transmitter + Receiver, 4 beams, Protected height=1200mm, Range=0.5-50m, Type 4.
	Orion3-4-K1C-050-B	2TLA022306R0000	Orion3 Base Light Grids, Active unit, 2 beams, Protected height=500mm, Range=0.5-8m, Type 4.
	Orion3-4-K2C-080-B	2TLA022306R0100	Orion3 Base Light Grids, Active unit, 3 beams, Protected height=800mm, Range=0.5-8m, Type 4.
	Orion3-4-K2C-090-B	2TLA022306R0200	Orion3 Base Light Grids, Active unit, 4 beams, Protected height=900mm, Range=0.5-6.5m, Type 4.
	Orion3-4-K2C-120-B	2TLA022306R0300	Orion3 Base Light Grids, Active unit, 4 beams, Protected height=1200mm, Range=0.5-8m, Type 4.
	Orion3-4-M1C-050	2TLA022306R1000	Orion3 Light Grids, Passive unit, 2 beams, Protected height=500mm.
	Orion3-4-M2C-080	2TLA022306R1100	Orion3 Light Grids, Passive unit, 3 beams, Protected height=800mm.
	Orion3-4-M2C-090	2TLA022306R1300	Orion3 Light Grids, Passive unit, 4 beams, Protected height=900mm.
	Orion3-4-M2C-120	2TLA022306R1400	Orion3 Light Grids, Passive unit, 4 beams, Protected height=1200mm.
	Orion3-4-K1C-050-E	2TLA022307R0000	Orion3 Extended Light Grids, Active unit, 2 beams, Protected height=500mm, Range=0.5-8m, Type 4.
	Orion3-4-K2C-080-E	2TLA022307R0100	Orion3 Extended Light Grids, Active unit, 3 beams, Protected height=800mm, Range=0.5-8m, Type 4.
	Orion3-4-K2C-090-E	2TLA022307R0200	Orion3 Extended Light Grids, Active unit, 4 beams, Protected height=900mm, Range=0.5-6.5m, Type 4.

Quick reference

	Product name	Order code	Description
	Orion3-4-K2C-120-E	2TLA022307R0300	Orion3 Extended Light Grids, Active unit, 4 beams, Protected height=1200mm, Range=0.5-8m, Type 4.
	SPOT 10 T/R	2TLA020009R0600	SPOT 10 T/R SAFETY LIGHT BEAM
	JSM7A	2TLA040006R0500	Mirror for 0-20 m, adjustable mirror plate. Dimensions: 115 x 80 x 30 mm. Screws for bracket included.
	JSM64	2TLA040007R0200	Adjustable mounting bracket with rotational knuckle for 18mm barrel style sensors, for example, Spot 10T/R or MUTE R (FSTR1).
	JSM Orion01	2TLA022310R0000	JSM Orion01 - 4 standard brackets for Orion1 & Orion2. For all lengths, 2 brackets should be used per unit (transmitter or receiver unit). These are spare parts since the necessary number of bracket are delivered with the light-guard.
	JSM Orion03	2TLA022310R0100	JSM Orion03 - 4 rotation brackets for Orion1 Base. For all lengths, 2 brackets should be used per unit (transmitter or receiver unit).
	JSM Orion04	2TLA022310R0200	JSM Orion04 - 4 rotation brackets for Orion2. For all lengths, 2 brackets should be used per unit (transmitter or receiver unit).
	JSM Orion05	2TLA022310R0300	JSM Orion05 - 4 rotation brackets for Orion3. For 500, 800 and 900 mm units, 2 brackets should be used per unit (active or passive unit). For 1200 mm units, 3 brackets should be used per unit.
	JSM Orion06	2TLA022310R0400	JSM Orion06 - Kit for mounting of Orion1 & Orion2 in Stand (4 brackets) - For light guards shorter than 1200 mm
	JSM Orion07	2TLA022310R0500	JSM Orion07 - Kit for mounting of Orion1 & Orion2 in Stand (6 brackets) - For light guards with a height from 1200 mm
	JSM Orion08	2TLA022310R0600	JSM Orion08 - Kit for mounting of Orion3 in Stand (4 brackets) - For light guards shorter than 1200 mm
	JSM Orion09	2TLA022310R0700	JSM Orion09 - Kit for mounting Orion3 in Stand (6 brackets) - For light guards with a height from 1200 mm
	JSM Orion10	2TLA022310R0800	JSM Orion10 - Kit Orion1 Mirror on wall
	JSM Orion11	2TLA022310R0900	JSM Orion11 - Kit for mounting Orion1 Mirror in Stand

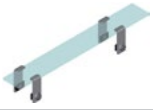
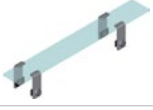
Quick reference

	Product name	Order code	Description
	JSM Orion02	2TLA022310R1000	JSM Orion02 - 4 standard brackets for Orion3. For 500, 800 and 900 mm units, 2 brackets should be used per unit (active or passive unit). For 1200 mm units, 3 brackets should be used per unit (active or passive unit). These are spare parts since the necessary number of bracket are delivered with the light-guard.
	Orion Laser	2TLA022310R5000	Orion Laser pointer - Alignment tool
	Orion TP-14	2TLA022310R5200	Orion TP-14 - Test Piece 14 mm
	Orion TP-30	2TLA022310R5300	Orion TP-30 - Test Piece 30 mm
	Orion1 Mirror 060	2TLA022311R0100	Orion1 Mirror 060 - Deviating mirror exclusive stand - for Orion1 - Length = 600 mm - The lenght of the mirror must be at at least 100 mm longer than the protected height of the light curtain
	Orion1 Mirror 090	2TLA022311R0200	Orion1 Mirror 090 - Deviating mirror exclusive stand - for Orion1 - Length = 900 mm - The lenght of the mirror must be at at least 100 mm longer than the protected height of the light curtain
	Orion1 Mirror 120	2TLA022311R0300	Orion1 Mirror 120 - Deviating mirror exclusive stand - for Orion1 - Length = 1200 mm - The lenght of the mirror must be at at least 100 mm longer than the protected height of the light curtain
	Orion1 Mirror 165	2TLA022311R0400	Orion1 Mirror 165 - Deviating mirror exclusive stand - for Orion1 - Length = 1650 mm - The lenght of the mirror must be at at least 100 mm longer than the protected height of the light curtain
	Orion1 Mirror 190	2TLA022311R0500	Orion1 Mirror 190 - Deviating mirror exclusive stand - for Orion1 - Length = 1900 mm - The lenght of the mirror must be at at least 100 mm longer than the protected height of the light curtain
	Orion Stand 060	2TLA022312R0000	Orion Stand 060 - Protective stand for light guard with an actual length shorter than 60 cm - The actual length is longer than the protected height - Fits Orion1 Mirror 060 and shorter
	Orion Stand 100	2TLA022312R0100	Orion Stand 100 - Protective stand for light guard with an actual length shorter than 100 cm - The actual length is longer than the protected height - Fits Orion1 Mirror 090 and shorter
	Orion Stand 120	2TLA022312R0200	Orion Stand 120 - Protective stand for light guard with an actual length shorter than 120 cm - The actual length is longer than the protected height - Fits Orion1 Mirror 120 and shorter
	Orion Stand 165	2TLA022312R0300	Orion Stand 165 - Protective stand for light guard with an actual length shorter than 165 cm - The actual length is longer than the protected height - Fits Orion1 Mirror 165 and shorter
	Orion Stand 190	2TLA022312R0400	Orion Stand 190 - Protective stand for light guard with an actual length shorter than 190 cm - The actual length is longer than the protected height - Fits Orion1 Mirror 190 and shorter
	Orion Mirror K050	2TLA022312R1000	Orion Mirror K050 - Deviating mirror in stand - For corresponding Orion2 or Orion3

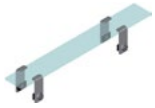
Quick reference

	Product name	Order code	Description
	Orion Mirror K080	2TLA022312R1100	Orion Mirror K080 - Deviating mirror in stand - For corresponding Orion2 or Orion3
	Orion Mirror K090	2TLA022312R1200	Orion Mirror K090 - Deviating mirror in stand - For corresponding Orion2 or Orion3
	Orion Mirror K120	2TLA022312R1300	Orion Mirror K120 - Deviating mirror in stand - For corresponding Orion2 or Orion3
	Orion Stand Plate	2TLA022312R5000	Orion Stand Plate - Adjustment of Stand
	Orion WET-015	2TLA022313R0000	Orion WET-015 - Protective tube for corresponding Orion1 Base
	Orion WET-030	2TLA022313R0100	Orion WET-030 - Protective tube for corresponding Orion1 Base
	Orion WET-045	2TLA022313R0200	Orion WET-045 - Protective tube for corresponding Orion1 Base
	Orion WET-060	2TLA022313R0300	Orion WET-060 - Protective tube for corresponding Orion1 Base
	Orion WET-075	2TLA022313R0400	Orion WET-075 - Protective tube for corresponding Orion1 Base
	Orion WET-090	2TLA022313R0500	Orion WET-090 - Protective tube for corresponding Orion1 Base
	Orion WET-105	2TLA022313R0600	Orion WET-105 - Protective tube for corresponding Orion1 Base
	Orion WET-120	2TLA022313R0700	Orion WET-120 - Protective tube for corresponding Orion1 Base
	Orion WET-135	2TLA022313R0800	Orion WET-135 - Protective tube for corresponding Orion1 Base

Quick reference

	Product name	Order code	Description
	Orion WET-150	2TLA022313R0900	Orion WET-150 - Protective tube for corresponding Orion1 Base
	Orion WET-165	2TLA022313R1000	Orion WET-165 - Protective tube for corresponding Orion1 Base
	Orion WET-180	2TLA022313R1100	Orion WET-180 - Protective tube for corresponding Orion1 Base
	Orion WET-K050	2TLA022313R3000	Orion WET-K050 - Protective tube for corresponding Orion2
	Orion WET-K080	2TLA022313R3100	Orion WET-K080 - Protective tube for corresponding Orion2
	Orion WET-K090	2TLA022313R3200	Orion WET-K090 - Protective tube for corresponding Orion2
	Orion WET-K120	2TLA022313R3300	Orion WET-K120 - Protective tube for corresponding Orion2
	Orion Shield-015	2TLA022313R5000	Orion Shield-015 - Lens shield for corresponding Orion1 Base
	Orion Shield-030	2TLA022313R5100	Orion Shield-030 - Lens shield for corresponding Orion1 Base
	Orion Shield-045	2TLA022313R5200	Orion Shield-045 - Lens shield for corresponding Orion1 Base
	Orion Shield-060	2TLA022313R5300	Orion Shield-060 - Lens shield for corresponding Orion1 Base
	Orion Shield-075	2TLA022313R5400	Orion Shield-075 - Lens shield for corresponding Orion1 Base
	Orion Shield-090	2TLA022313R5500	Orion Shield-090 - Lens shield for corresponding Orion1 Base

Quick reference

	Product name	Order code	Description
	Orion Shield-105	2TLA022313R5600	Orion Shield-105 - Lens shield for corresponding Orion1 Base
	Orion Shield-120	2TLA022313R5700	Orion Shield-120 - Lens shield for corresponding Orion1 Base
	Orion Shield-135	2TLA022313R5800	Orion Shield-135 - Lens shield for corresponding Orion1 Base
	Orion Shield-150	2TLA022313R5900	Orion Shield-150 - Lens shield for corresponding Orion1 Base
	Orion Shield-165	2TLA022313R6000	Orion Shield-165 - Lens shield for corresponding Orion1 Base
	Orion Shield-180	2TLA022313R6100	Orion Shield-180 - Lens shield for corresponding Orion1 Base
	Orion Shield-K050	2TLA022313R8000	Orion Shield-K050 - Lens shield for corresponding Orion2
	Orion Shield-K080	2TLA022313R8100	Orion Shield-K080 - Lens shield for corresponding Orion2
	Orion Shield-K090	2TLA022313R8200	Orion Shield-K090 - Lens shield for corresponding Orion2
	Orion Shield-K120	2TLA022313R8300	Orion Shield-K120 - Lens shield for corresponding Orion2
	M12-C02PT2T	2TLA022315R0100	M12-C02PT2T - Transmitter cable for Orion1 Extended
	M12-C02PT6RB	2TLA022315R0200	M12-C02PT6RB - Receiver cable Blanking Orion1 Extended
	M12-C02PT62RM	2TLA022315R0300	M12-C02PT62RM - Receiver cable Muting Orion1 Extended

Quick reference

	Product name	Order code	Description
	PT-C1PT	2TLA022315R1000	PT-C1PT - Cascade cable for Orion1 Extended, 1 m
	PT-C05PT	2TLA022315R1100	PT-C05PT - Cascade cable for Orion1 Extended, 0.5 m
	PT-C005PT	2TLA022315R1200	PT-C005PT -Cascade cable for Orion1 Extended, 0.05 m
	M12-CTO1BA	2TLA022315R3000	Transfer cable, L=0.2 m, 8 x 0.34 mm2 + shield with straight M12-8 pole male + female connectors. Shield connected to pin 7 (0 V) on male connector. Can be used when connecting an Orion1 Base in auto reset to Tina 10A or Tina 10C.
	M12-CTO1BM	2TLA022315R3100	Transfer cable, L=0.2 m, 8 x 0.34 mm2 + shield with straight M12-8 pole male + female connectors. Shield connected to pin 7 (0 V) on male connector. Can be used when connecting an Orion1 Base in manual reset to Tina 10B or M12-3R.
	M12-CTO3B	2TLA022315R3200	Transfer cable, L=0.2 m, 8 x 0.34 mm2 + shield with straight M12-8 pole male + female connectors. Shield connected to pin 7 (0 V) on male connector. Can be used when connecting an Orion3 Base to Tina 10A/B/C or M12-3R.
	M12-3R	2TLA022316R0000	M12 Y-connector for connection of a reset light button to Orion1 Base (M12-CTO1BM necessary), Orion 2 Base/Extended, Orion3 Base (M12-CTO3B necessary) and Orion3 Extended. One M12-8 pole female connector (#2) for connecting Orion, one M12-5 pole male connector (#1) for connecting +24 VDC, 0 V and the OSSD signals and one M12-5 pole female connector (#3) for connecting a reset light button like Smile.
	M12-CYMUTE	2TLA022316R0100	M12 Y-cable for connection of muting sensors to Orion2 Extended and Orion3 Extended. One M12-8 pole female connector (#1) for connecting Orion, one M12-8 pole male connector (#2) for connecting Orion to another equipment and one M12-5 pole male connector (#3) for connecting the muting sensors (e.g. using OMC1).
	OMC1	2TLA022316R2000	Connection box for two or four muting sensors. Connection to Orion1 Extended using M12-C02PT62RM and to Orion2 Extended and Orion3 Extended using M12-CYMUTE. Four M12-5 pole female connectors for muting sensors (A1, A2, B1, B2).
	Smile 11RO1	2TLA022316R3000	Reset light button in Smile enclosure for connection to Orion1 Base using M12-3R or Tina 10B (M12-CTO1BM necessary). One M12-5 pole male connector.
	Smile 11RO2	2TLA022316R3100	Reset light button in Smile enclosure for connection to Orion2 Base, Orion2 Extended and Orion3 Extended using M12-3R or Tina 10B. One M12-5 pole male connector.
	Smile 11RO3	2TLA022316R3200	Reset light button in Smile enclosure for connection to Orion3 Base using M12-3R or Tina 10B (M12-CTO3B necessary). One M12-5 pole male connector.
	Smile 11 EA Tina	2TLA030050R0000	Emergency stop button in Smile enclosure, Tina adaptation unit to DYNlink included, Status LED in button, 1 x M12 5-pin male connector.

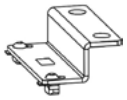
Quick reference

	Product name	Order code	Description
	Smile 11 EAR Tina	2TLA030050R0100	Emergency stop button in Smile enclosure, Tina adaptation unit to DYNlink included, Status LED in button, 1 x M12 5-pin male connector, reversed button attachement(from bottom).
	Smile 12 EA Tina	2TLA030050R0200	Emergency stop button in Smile enclosure, Tina adaptation unit to DYNlink included, Status LED in button, 1 x M12 5-pin male connector and 1 x M12 5-pin female connector.
	Smile 10 EA Tina	2TLA030050R0400	Emergency stop button in Smile enclosure, Tina adaptation unit to DYNlink included, Status LED in button, 1 meter 5-pole cable out from bottom.
	Smile 11 SA Tina	2TLA030050R0500	Safety stop button (black) in Smile enclosure, Tina adaptation unit to DYNlink included, Status LED in button, 1 x M12 5-pin male connector.
	Smile 11 EC Tina	2TLA030050R0900	Emergency stop in Smile enclosure, Tina adaptation unit included for dynamic ciruit with StatusBus functionality, Status LED in button, 1 x M12 5-pin male connector.
	Smile 11 EA	2TLA030051R0000	Emergency stop button in Smile enclosure, 2 x NC, Status LED in button, 1 x M12 5-pin male connector.
	Smile 11 EAR	2TLA030051R0100	Emergency stop button in Smile enclosure, 2 x NC, Status LED in button, 1 x M12 5-pin male connector, reversed button attachement(from bottom).
	Smile 12 EA	2TLA030051R0200	Emergency stop button in Smile enclosure, 2 x NC, Status LED in button, 1 x M12 5-pin male connector and 1 x M12 5-pin female connector.
	Smile 10 EA	2TLA030051R0400	Emergency stop button in Smile enclosure, 2 x NC, Status LED in button, 1 meter 5-pole cable out of bottom.
	Smile 10 EK	2TLA030051R0600	Emergency stop button in Smile enclosure, 2 x NC, 1 meter 4-pole cable out of bottom.
	Smile 11 SA	2TLA030051R0900	Machine stop(Black button) in Smile enclosure, 2 x NC, Status LED in button, 1 x M12 5-pin male connector.
	JST2	2TLA030051R1300	Termination for Smile 12 EA, when the last Smile is not a Smile 11 EA. Connects pin 1 with pin 5, and pin 2 with pin 4.
	Smile 11 RA	2TLA030053R0000	Reset button in Smile enclosure, 1 x NO button, 1 x Blue LED, 1 x M12 5-pin male connector.
	Smile 11 RB	2TLA030053R0100	Reset button in Smile enclosure, Pluto Lightbutton connection, 1 button+Blue LED, 1 x M12 5-pin male connector.

Quick reference

	Product name	Order code	Description
	Smile 12 RF M12-5	2TLA030053R2600	Reset button in Smile enclosure for local reset of Adam Reset M12-5. Blue LED, M12-5 male + female connectors.
	Smile 12 RG M12-8	2TLA030053R2700	Reset button in Smile enclosure for local reset of Adam Reset M12-8. Blue LED, M12-8 male + female connectors.
	INCA 1 Tina	2TLA030054R0000	Emergency stop button for panel mounting, 22.5 mm holes, Tina adaptation to DYNlink, status LED in button, terminal blocks.
	INCA 1	2TLA030054R0100	Emergency stop button for panel mounting, 22.5 mm holes, 2 NC contacts, status LED in button, terminal blocks.
	INCA 1S Tina	2TLA030054R0200	Safety stop (black button) for panel mounting, 22.5 mm holes, Tina adaptation to DYNlink, status LED in button, terminal blocks.
	INCA 1S	2TLA030054R0300	Safety stop (black button) for panel mounting, 22.5 mm holes, 2 NC contacts, status LED in button, terminal blocks.
	Inca 1 EC Tina	2TLA030054R1400	Emergency stop button for panel mounting, 22.5 mm holes, Tina adaptation to DYNlink and StatusBus functionality, Indication LED in button, detachable terminal blocks.
	Surround for Inca	2TLA030054R0400	Elevated yellow surround for panel mounted emergency stop button.
	E-Sign 22.5	2TLA030054R0900	Yellow surround for panel mounted emergency stop button, for 22.5 mm hole.
	E-Sign 32.5	2TLA030054R1000	Yellow surround for panel mounted emergency stop button, for 32.5 mm hole.
	Coloured filters	2TLA030059R2600	Kit of coloured filters (yellow, green, white, blue, red)
	Magne 3X M12-5	2TLA042022R2700	Electromagnetic lock with M12-5 connector. Locking with +24VDC. Holding force 1500N. Protection class IP67. Anchor plate and cellular rubber are not included.
	Magne 4X DYN M12-5	2TLA042022R3000	Electromagnetic lock with integrated Adam DYN for safe interlocking and M12-5 connector. Locking with +24VDC. Holding force 1500N. Protection class IP67. Eva actuactor and anchor plate must be ordered separately: “Eva General code” or “Eva Unique code”, “Magne Anchor 32A” or “Magne Anchor 32B”.
	Magne 4 DYN-Info	2TLA042022R3400	Electromagnetic lock with integrated ADAM DYN-Info for safe interlocking and M12-8 connector. Both “Locked” and “Closed” information outputs. Locking with +24VDC. Holding force 1500N. Protection class IP67. Eva actuactor and anchor plate must be ordered separately: “Eva General code” or “Eva Unique code”, “Magne Anchor 32A” or “Magne Anchor 32B”.
	Magne 4 DYN-2Info	2TLA042022R3410	Electromagnetic lock with integrated ADAM DYN-Info for safe interlocking and M12-8 connector. Both “Locked” and “Closed” information outputs. Locking with +24VDC. Holding force 1500N. Protection class IP67. Eva actuactor and anchor plate must be ordered separately: “Eva General code” or “Eva Unique code”, “Magne Anchor 32A” or “Magne Anchor 32B”.

Quick reference

	Product name	Order code	Description
	Magne 4 OSSD-Info	2TLA042022R4600	Electromagnetic lock with integrated ADAM OSSD-Info for safe interlocking and M12-8 connector. Both “Locked” and “Closed” information outputs. Locking with +24VDC. Holding force 1500N. Protection class IP67. Eva actuactor and anchor plate must be ordered separately: “Eva General code” or “Eva Unique code”, “Magne Anchor 32A” or “Magne Anchor 32B”.
	JSM D28	2TLA042023R0100	Aluminum profile used as both door handle and mounting kit for Magne. Completely covers the Magne unit when the door is closed.
	JSM D23	2TLA042023R0200	Mounting kit for Magne on sliding door. Fits all Magne.
	JSM D24	2TLA042023R0300	Mounting kit for Eva on conventional door when used with Magne with integrated Adam.
	Magne Anchor 32B	2TLA042023R0400	Anchor plate with permanent magnet. Holding force: 30N. Delivered with cellular rubber. A permanent magnet keeps the door/hatch closed when the Magne is unlocked. The door can still easily be opened.
	Magne Anchor 32D	2TLA042023R0410	Anchor plate without permanent magnet. Delivered with Magne rubber. Without permanent magnet, there is no magnetic field when the Magne is unlocked, which avoid the accumulation of metallic particles on the anchor plate.
	Magne Anchor 32E	2TLA042023R0420	Anchor plate with permanent magnet. Holding force: 30N. Delivered with Magne rubber. A permanent magnet keeps the door/hatch closed when the Magne is unlocked. The door can still easily be opened.
	JSM D21B	2TLA042023R0500	Mounting kit for Magne. For conventional door (5–15 mm door gap). Fits all Magne. Note: when used with Magne with integrated Adam, a mounting kit is also required for Eva (JSM D24).
	JSM D27	2TLA042023R1000	Handle and screws for use with JSM D21B.
	Magne Anchor 32A	2TLA042023R1300	Anchor plate without permanent magnet. Delivered with cellular rubber. Without permanent magnet, there is no magnetic field when the Magne is unlocked, which avoid the accumulation of metallic particles on the anchor plate.
	Magne rubber	2TLA042023R3600	Spare part. Cellular rubber for Magne anchor plate. 10 mm thick. Delivered with Magne.
	LineStrong1	2TLA050200R1030	LINESTRONG1, 2NC/2NO, NPT
	LineStrong2	2TLA050202R1030	LINESTRONG2, 2NC/2NO, NPT
	LineStrong2	2TLA050202R1332	LINESTRONG2, 2NC/2NO, NPT ESTOP/LE
	LineStrong2Z	2TLA050202R1120	LINESTRONG2Z 2NC/2NO NPT E.S. SS

Quick reference

	Product name	Order code	Description
	LineStrong2Z	2TLA050202R0322	Emergency stop grab wire safety switch, 2NC + 2NO, Up to 100m length, stainless steel 316 body, LED status indication, Conduit entry 3xM20
	LineStrong2Z	2TLA050202R1322	LINESTRONG2Z 2NC/2NO NPT E.S.LED SS
	LineStrong3D	2TLA050204R1030	LINESTRONG3D, 4NC/4NO, NPT
	LineStrong3D	2TLA050204R1233	LINESTRONG3D, 4NC/4NO, NPT LED
	LineStrong3D	2TLA050204R1332	LINESTRONG3D 4NC/4NO NPT E.S.LED
	LineStrong3DZ	2TLA050204R1322	LINESTRONG3DZ 4NC/4NO NPT E.S.LEDSS
	LineStrong3L	2TLA050206R1233	LINESTRONG3L, 4NC/2NO, NPT LED
	LineStrong3R	2TLA050208R1030	LINESTRONG3R, 4NC/2NO, NPT
	LineStrong3R	2TLA050208R1233	LINESTRONG3R, 4NC/2NO, NPT LED
	Wire Tensioner, SS	2TLA050210R4020	Wire Tensioner/Gripper for Emergency Pull Wire Switch systems, Stainless Steel.
	Wire Tensioner, Ga	2TLA050210R4030	Wire Tensioner/Gripper for Emergency Pull Wire Switch systems, Galvanized.
	Corner pulley, SS	2TLA050210R6020	Corner pulley for Emergency Pull Wire Switch systems, Stainless Steel. For navigating corners, both inside and outside.
	Corner pulley, Gal	2TLA050210R6030	Corner pulley for Emergency Pull Wire Switch systems, Galvanized. For navigating corners, both inside and outside.
	Eyebolt M8x1.25 SS	2TLA050210R8020	Eyebolt M8x1.25 for Emergency Pull Wire Switch systems, 8 pcs, Stainless Steel.
	Eyebolt M8x1.25 Gal	2TLA050210R8030	Eyebolt M8x1.25 for Emergency Pull Wire Switch systems, 8pcs, Galvanized.

Quick reference

	Product name	Order code	Description
	LineStrong LED 24	2TLA050211R0001	Spare part LED for LineStrong and EStrong. Steady Green/Steady Red 24VDC
	LED GN/RD 110VAC	2TLA050211R0002	LINESTRONG ACCES. LED GN/RD 110VDC
	Spring, 220mm, SS	2TLA050211R0004	Spring for Emergency Pull Wire Switch systems, 220mm, Stainless Steel. When using one Emergency pull wire switch the wire should be anchored at the other end using this Spring.
	LineStrong E-Stop	2TLA050211R0005	Spare part Emergency stop button for LineStrong.
	Screwdriver T20	2TLA050211R0006	Screwdriver, Anti-Tamper, Torx T20
	5M Wire Kit, Gal	2TLA050210R0030	5M ROPE KIT, GALV. W/ALLEN KEY
	10M Wire Kit, Gal	2TLA050210R0130	10m Galvanized wire pull kit. Includes 10m Wire (One end is terminated with thimble and permanent clamp), 5 pcs Eyebolts, 1 pcs Tensioner, 1 pcs Allen Key.
	20M Wire Kit, Gal	2TLA050210R0330	20m Galvanized wire pull kit. Includes 20m Wire (One end is terminated with thimble and permanent clamp), 9 pcs Eyebolts, 1 pcs Tensioner, 1 pcs Allen Key.
	30M Wire Kit, Gal	2TLA050210R0430	30M ROPE KIT, GALV. W/ALLEN KEY
	50M Wire Kit, Gal	2TLA050210R0530	50M ROPE KIT, GALV. W/ALLEN KEY
	80M Wire Kit, Gal	2TLA050210R0630	80m Galvanized wire pull kit. Includes 80m Wire, 30 pcs Eyebolts, 2 pcs Tensioner, 1 pcs Allen Key.
	5M Wire Kit, SS	2TLA050210R0020	LINESTRONG ACCES. 5M KIT SS W/ KEY
	10M Wire Kit, SS	2TLA050210R0120	LINESTRONG ACCES. 10M ROPE KIT SS W

Quick reference

	Product name	Order code	Description
	15M Wire Kit, SS	2TLA050210R0220	LINESTRONG ACCES. 15M KIT SS W/ KEY
	30M Wire Kit, SS	2TLA050210R0420	LINESTRONG ACCES. 30M ROPE KIT SS W
	50M Wire Kit, SS	2TLA050210R0520	50m Stainless steel wire pull kit. Includes 50m Wire (One end is terminated with thimble and permanent clamp), 20 pcs Eyebolts, 1 pcs Tensioner, 1 pcs Allen Key.
	100M Wire Kit, SS	2TLA050210R0720	100m Stainless steel wire pull kit. Includes 100m Wire, 37 pcs Eyebolts, 2 pcs Tensioner, 1 pcs Allen Key.
	Wire Only 50M	2TLA050210R2420	LINESTRONG ACCES. 50M ROPE ONLY
	Wire Only 100M	2TLA050210R2620	LINESTRONG ACCES. 100M ROPE ONLY
	Wire Only 500M	2TLA050210R2820	LINESTRONG ACCES. 100M ROPE ONLY
	Con Block 2NC/2NO	2TLA050240R0103	LINESTRONG ACCES. CON BLOCK 2NC/2NO
	Con Block 4NC	2TLA050240R0105	LINESTRONG ACCES. CONTACT BLOCK 4NC
	Mkey1	2TLA050021R1100	MKEY1, COMPACT NPT, 2NC/1N0 ANGLE
	Mkey1	2TLA050021R1300	MKEY1, COMPACT NPT, 2NC/1N0 FLEX K
	Mkey4	2TLA050001R1100	MKEY4, NPT, 2NC/1N0 STD. KEY
	Mkey4+	2TLA050001R1101	MKEY4+, NPT, 2NC/1N0 STD. KEY 40N
	Mkey5	2TLA050003R1100	MKEY5, NPT, 2NC/1N0 STD. KEY
	Mkey5+	2TLA050003R1101	MKEY5+, NPT, 2NC/1N0 STD. KEY 40N
	Mkey6	2TLA050005R1130	MKEY6,NPT,2NC/1NO STD. KEY

Quick reference

	Product name	Order code	Description
	Mkey6+	2TLA050005R1431	MKEY6+, NPT, 2NC/1N0 MET. FLEX KEY
	MKey8 24VDC	2TLA050011R1132	MKEY8, SOL NPT, 24V STD. KEY
	MKey8 110VAC	2TLA050011R1133	MKEY8, SOL NPT, 110V STD. KEY
	MKey8 24VDC	2TLA050011R2132	MKEY8, SOL QC, 24V STD. KEY
	MKey8Z 24VDC	2TLA050011R1122	MKEY8Z, SS SOL NPT, 24V STD. KEY
	MKey8M 24VDC	2TLA050013R1132	MKEY8M, SOL NPT, 24V STD. KEY
	MKey8ER 24VDC	2TLA050015R1132	MKEY8ER, SOL NPT, 24V STD. KEY
	MKey8ERZ 24VDC	2TLA050015R0122	MKEY8ERZ, SS SOL M20, 24V STD. KEY
	MKey9 24VDC	2TLA050007R1112	MKEY9, SOL NPT, 24V STD. KEY
	MKey Key 1	2TLA050040R0201	Standard key for MKey safety switches with plastic head. Key in stainless steel 316.
	MKey Key 2	2TLA050040R0202	Standard key for MKey safety switches with metal head. Key in stainless steel 316.
	MKey Key 5	2TLA050040R0203	Flexible key for MKey safety switches. Stainless steel 316 key, die cast metal housing.
	MKey Key 6	2TLA050040R0204	Flexible key for MKey safety switches. Stainless steel 316 key with stainless steel housing.

Quick reference

	Product name	Order code	Description
	MKey Key 3	2TLA050040R0220	Flat key for Mkey safety switches. Stainless steel 316 key with plastic shroud.
	Mkey Key	2TLA050040R0200	MKEY1 ANGLED ACTUATOR
	MKey8Z Manual release	2TLA050040R0400	Bit for manual unlocking of MKey8Z. Stainless steel
	MKey Slide lock left	2TLA050040R0500	Slide lock for MKey8 and MKey9, left. Rugged metal construction that withstands shearing forces of up to 10000N (1000kg) on large hinged doors. MKey not included.
	MKey Slide lock right	2TLA050040R0501	SLIDE LOCK MKEY8,9 RIGHT
	MKey Slide lock rear	2TLA050040R0510	Rear handle for MKey Slide lock. The rear handle is necessary to open or close the slide lock from inside the protected area.
	MKey Slide lock catch	2TLA050040R0511	Spring loaded catch for Mkey Slide lock. The catch is used to prevent accidental movement of the slide lock: when mounted, the catch has to be drawn out in order to open or close the slide lock.
	Sense 4 10M	2TLA050072R6120	SENSE 4, SS 10M CABLE, 2NC/1NO
	Sense 4 QC	2TLA050072R2120	SENSE 4, SS QC CABLE, 2NC/1NO
	Sense 5Z 5M	2TLA050054R5120	SENSE 5Z, SS 5M CABLE, 2NC/1NO LED
	Sense 5Z 10M	2TLA050054R6120	SENSE 5Z, SS 10M CABLE, 2NC/1NO LE
	Sense 6 QC	2TLA050074R2120	SENSE 6, SS QC CABLE, 2NC/1NO
	Sense 7 2M	2TLA050056R4100	SENSE 7, 2M CABLE, 2NC/1NO LED
	Sense 7 5M	2TLA050056R5100	SENSE 7, 5M CABLE, 2NC/1NO LED
	Sense 7 10M	2TLA050056R6100	SENSE 7, 10M CABLE, 2NC/1NO LED

Quick reference

	Product name	Order code	Description
	Sense 7 QC	2TLA050056R2100	SENSE 7, QC CABLE, 2NC/1NO LED
	Sense7Z 5M	2TLA050056R5120	Safety magnetic switch complete with actuator, 2NC+1NO (guard closed and actuator present), stainless steel, LED, 5m cable (8 leads).
	Sense7Z 10M	2TLA050056R6120	Safety magnetic switch complete with actuator, 2NC+1NO (guard closed and actuator present), stainless steel, LED, 10m cable (8 leads).
	Sense 7Z QC	2TLA050056R2120	SENSE 7Z, SS QC CABLE, 2NC/1NO LED
	Sense 8 2M	2TLA050076R4100	SENSE 8, 2M CABLE, 2NC/1NO
	Sense 8 5M	2TLA050076R5100	SENSE 8, 5M CABLE, 2NC/1NO
	Sense 11 5M	2TLA050060R5100	SENSE 11, 5M CABLE, 2NC/1NO LED
	Sense 12 10M	2TLA050080R6120	SENSE 12, SS 10M CABLE, 2NC/1NO
	Sense7Z Key SS	2TLA050040R0212	Actuator to safety magnetic switch Sense7Z, stainless steel. This is a spare part since Sense7Z is delivered complete with actuator.
	Sense 7 Key	2TLA050040R0211	SENSE 7, SPARE ACTUATOR
	Edge1 Roller Plunger	2TLA050101R0100	EDGE1, ROLLER PLUNGER NPT, 2NC/1NO
	Edge1 Hinge Lever	2TLA050102R0100	EDGE1, HINGE LEVER NPT, 2NC/1NO
	Edge1 Adj Roller Lever	2TLA050105R0100	EDGE1 ADJ. ROLLER LEVER NPT 2NC/1NO
	Edge1 Roller Lever	2TLA050111R0100	EDGE1, ROLLER LEVER NPT, 2NC/1NO

Quick reference

	Product name	Order code	Description
	Edge2 Pin 3M End	2TLA050120R4000	EDGE2, PIN 3M END CABLE, 2NC/1NO
	Edge2 Roller 3M	2TLA050121R4000	EDGE2, ROLLER 3M END CABLE, 2NC/1N
	Edge2 Roller 3M Side Cable	2TLA050121R4008	EDGE2, ROLLER 3M SIDE CBL, 2NC/1NO
	Estrongz E	2TLA050220R1020	ESTRONGZ E-STOP 2NC/2NO, NPT, SS
	EstrongZ LED	2TLA050220R0222	Emergency stop, 2NC/2NO, stainless steel 316 body, LED status indication, Conduit entry 3xM20
	Estrongz Estop	2TLA050220R1222	ESTRONGZ ESTOP 2NC/2NO NPT SS LED
	Estrongz E	2TLA050220R1422	ESTRONGZ E-STOP 2NC/2NO, NPT, SS L
	GKey4 RU	2TLA050304R0002	Safety lock GKey with 4 positions for pilot devices, die-cast housing, escape release and manual unlock function. Can be mounted on hinged doors and on sliding doors, both on the left and on the right. Delivered with mechanical tongue actuator, RFID actuator, entry cover and screw bit.
	FHS GKey4	2TLA050310R0032	Front slide handle for GKey4. Can be mounted on hinged doors and on sliding doors, both on the left and on the right. Includes a mounting plate for GKey4.
	RHS GKey MKey	2TLA050040R0510	Rear handle for GKey front slide handle and MKey slide lock. The rear handle is necessary to open or close the slide handle from inside the protected area.
	SCS GKey MKey	2TLA050040R0511	Spring loaded catch for GKey slide handle and Mkey slide lock. The catch prevents from closing the door by mistake: when the sliding handle is in open position, the catch must be pulled in order to push back the handle to closed position.
	OCB-1A	2TLA020055R3000	OCB-1A is a connection box for up to four Eden OSSD sensors with M12-8 pin connector, or other compatible safety sensors. Safety signals are connected in serial. Individual information signal from each Eden sensor.
	OCB-2A	2TLA020055R3100	OCB-2A is a connection box for up to four safety sensors with M12-5 pin connector. Safety signals are connected in serial. Individual information signal from each sensor.
	OCB-3A	2TLA020055R3200	OCB-3A is a connection box for up to four Eden OSSD sensors with M12-5 pin connector, or other compatible safety sensors. Safety signals are connected individually and can have different safety functionality.

Quick reference

	Product name	Order code	Description
	OCB-4A	2TLA020055R3300	OCB-4A is a connection box for up to four safety sensors with M12-5 pin connector. Safety signals are connected individually and can have different safety functionality.
	JSOP-8	2TLA020055R2400	OSSD termination plug. Required for unused connectors on OCB-1A

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