

Instruction Manual for the installation of the KWS

Original instructions





THIS MANUAL AND ALL INSTRUCTIONS CONTAINED HEREIN MUST BE READ CAREFULLY AND UNDERSTOOD BEFORE INSTALLING OR MAINTAINING THE AUTEC KWS.

FAILURE TO READ AND COMPLY WITH ALL APPLICABLE WARNINGS AND INSTRUCTIONS OR ANY ONE OF THE LIMITATIONS NOTED IN THIS MANUAL CAN RESULT IN SERIOUS BODILY INJURY OR DEATH, AND/OR PROPERTY DAMAGE.

THE AUTEC KWS IS NOT A STANDALONE PRODUCT AND IS INTENDED ONLY AS A COMPONENT ON A MACHINE:

- **ON WHICH AND WHERE THE INSTALLATION OF A KWS IS APPROPRIATE,**
- **THAT CAN BE OPERATED SAFELY AND IN ACCORDANCE WITH ALL APPLICABLE LAWS, REGULATIONS AND STANDARDS BY SUCH KWS.**

ACCORDINGLY, IT IS THE RESPONSIBILITY OF THE MANUFACTURER OF THE MACHINE ON WHICH THE AUTEC KWS IS TO BE INSTALLED to make a full and proper risk assessment to determine whether the installation of the Autec KWS is appropriate for the safe and effective operation of the Machine and for the purposes intended, also taking into account the reasonably foreseeable misuse, so that the installation and maintenance of the Autec KWS, and of all its components, are done solely and completely in accordance with this Manual and with all local applicable laws, safety rules and standards (all of the foregoing referred to herein as “Laws, Regulations and Standards”).

With reference to the USA market the Laws, Regulations and Standards include all safety rules and regulations of the Occupational Safety & Health Administration (OSHA) (<http://www.osha.gov>), all federal, state and local laws, regulations and building and electrical codes, and all applicable standards, including but not limited to ANSI Standards.

It is the responsibility of the Manufacturer and of the design professionals of the Machine on which the Autec KWS is to be installed and used to be certain that the structure, condition, organization and markings of the Machine as installed at the facility are appropriate and will allow for the safe and reliable use and control of the Machine through the Autec KWS's interface.

IT IS THE RESPONSIBILITY OF THE OWNER AND FACILITY OPERATOR, AND THEIR DESIGN PROFESSIONALS, that the installation and maintenance of the Autec KWS and of all its components are done solely and completely in accordance with this Manual and with all applicable Laws, Regulations and Standards, even local. It is also the responsibility of the Manufacturer of the Machine on which the Autec KWS is to be installed and used, and the facility operator and their design professionals, to be certain that the structure, condition, organization and markings of the Machine as installed at the facility are appropriate for and will allow for the safe and reliable use and control of the Machine through the Autec KWS's interface.

FAILURE TO PROPERLY INSTALL, OPERATE, MAINTAIN AND SERVICE THE Autec KWS CAN RESULT IN SERIOUS BODILY INJURY OR DEATH AND/OR PROPERTY DAMAGE. Refer to this Manual and each of its Parts for further assistance or contact Autec. Autec is not and cannot be held responsible for any maintenance operation on the Autec KWS that will be not performed in conformity with all instruction and warnings provided by Autec and with all applicable Laws, Regulations and Standards, even local.

Autec is not and cannot be held responsible if the Autec KWS is modified or tampered with, or if non-genuine Autec components or products are used with or built in the KWS itself.

IT IS THE RESPONSIBILITY OF THE OWNER AND FACILITY OPERATOR, AND THEIR DESIGN PROFESSIONALS, to be certain that the Autec KWS is properly maintained and serviced at all times in compliance with all Autec instructions and warnings, and with all applicable Laws, Regulations and Standards, even local.

IT IS THE RESPONSIBILITY OF THE OWNER AND FACILITY OPERATOR, AND THEIR ASSIGNED PERSONNEL, MANAGERS AND SUPERVISORS, to be certain that the area where the Machine, on which the Autec KWS is installed, operates is clearly defined and indicated, in compliance with all Autec instructions and warnings, and in conformity with the applicable Laws, Regulations and Standards, even local.

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1 Information on the use of instructions

1.1 Structure of the Instruction Manual

The instruction Manual for the installation and maintenance of the Autec KWS must be read carefully, understood and applied by the KWS Owner, User and by all those Persons that, for any reasons, may operate with the KWS or with the Machine where it is installed.

The instructions for the installation and the maintenance as a whole are to be considered an integral part of the Autec KWS, of the Machine, of the system, device and/or facility equipped with the KWS.

The Manufacturer of the Machine or machinery system where the KWS is installed, as well as the Owner and the User of the Machine, must make sure that the Instruction Manual is included in the Machine's instruction manual.

1.2 Caption and terminology



Contact Autec if any of the instructions, symbols, warnings or images are not clear and understandable.

The terms listed here below have the stated meaning throughout the Manual:

- **KWS (Kit Wireless System)**: control system consisting of a TWS and an RWS communicating with each other through a radio link.
- **TWS (Transmitting Wireless Sub-system)**: part of the KWS that is physically connected to a Machine's control system, and that is intended to send commands to the RWS.
- **RWS (Receiving Wireless Sub-system)**: part of the KWS that is physically connected to a Machine's control system, and that is intended to receive information sent by the TWS.
- **Radio link**: (cableless control) uninterrupted communication between TWS and RWS, without physical connection.
- **Machine**: the machine, as defined in the Directive 2006/42/EC and in any other local standards, and any other device, machinery, equipment, machinery system, application etc., where the Autec KWS is installed, or that is controlled by it.
- **Manufacturer**: the Person who plans and/or manufactures a Machine and decides to install a KWS on it to control the Machine.
- **Installer**: the Person, qualified technician, who plans and/or performs the installation of the Autec KWS on a Machine to act on its commands.
- **Maintenance technician**: the Person, qualified technician, who carries out routine or special maintenance on the Autec KWS, to keep it whole and in working order.
- **Manual or Instruction Manual**: document made up of this manual and of the Technical Data Sheet.
- **Person**: individual, natural or legal person and/or any entity, however it is considered
- **Owner**: the owner of the KWS.

Functions indicated for the Manufacturer, the Installer, the User, and the Maintenance Technician may be performed by a single Person, if he/she has the needed competence and undertakes the resulting responsibilities. Each Person must be aware of the instructions contained in the Manual, depending on the activity they carry out.

For example, if a Manufacturer is also the Installer, and/or Maintenance Technician, he must also know and follow the instructions specifically addressed to those Persons.

1.3 Symbols



This symbol identifies the parts of text in the Manual that must be read with special attention.



This symbol identifies the parts of text in the Manual containing warnings, information and/or instructions that are particularly relevant with regards to safety; failure in understanding them or in complying with them may cause hazards for People and/or property.

1.4 Technical Data Sheet

The KWS Technical Data Sheet:

- Describes the configuration of the TWS and the RWS
- Specifies the relation between the commands sent by the TWS and those available in the RWS.

The Technical Data Sheet must be filled in, checked and signed by the Installer, who is responsible for correct wiring.

A Technical Data Sheet must always be kept together with this Manual: if you need to use the Technical Data Sheet for administrative purposes (tests, check, etc.), make a copy of it.



The connections of the TWS and the RWS must comply with the directions provided in the Technical Data Sheet.

1.5 To whom the instructions are addressed

The Operation and Maintenance Instruction Manual is addressed to Manufacturers, design engineers, Installers, assemblers, mechanics, electricians, drivers, workers, people responsible for productive activities, Maintenance Technicians and to all the people who, in any capacity and for any reason, work with the Autec KWS or with the Machine where it is installed.

This Manual must be read carefully, understood and implemented by:

- The Owner and/or the Person responsible for the Machine and/or for the Autec KWS and/or for their operation
- The Machine Manufacturer, who decides to equip it with a KWS
- The KWS Installer or the Person who assembles it on a Machine, device, Machinery system, etc., and/or who has the responsibility for that operation
- The Person responsible for safety in the workplace where the KWS is used
- Those who, in any capacity, work with the KWS and/or with the Machine, system, device and/or Machinery system where the Autec KWS is installed, or that is controlled by it.



The instructions concerning the installation and maintenance of the KWS are addressed to qualified Personnel; their implementation requires qualified professional expertise: none of the operation for which qualified Personnel is required can be carried out by Persons or companies that do not have the required specific professional expertise.

1.6 Instruction storage

The Instruction Manual must be stored and made available to all its addressees, Users and technicians, for the whole life time of the KWS, in any moment it may need to be consulted.

The Manual must not be changed, modified or damaged.

If this Manual is damaged, a written request of replacement shall be sent to Autec; replacement is at the applicant's expense.

When asking for it, the KWS serial number must be provided.

1.7 Intellectual property

The Manual, its structure and contents, the images and photos, the drawings, the instructions and all intellectual property rights included in the Manual are and remain exclusive property of Autec Srl.

They cannot be reproduced and/or disseminated in any form or by any means (including the internet and photocopying) without authorisation and written consent by Autec.

2 Brief product presentation

2.1 KWS

The object of this Manual is the KWS (Kit Wireless System), a wireless device whose purpose is to transfer information or commands from a place to another within the same Machine or from a Machine to another one. A KWS consists of one TWS (Transmitter Wireless Sub-system) and one RWS (Receiver Wireless Sub-system). Their features are described in the related chapters in this Manual and in the Technical Data Sheet.

The TWS can be installed in those parts of the machine and/or in working areas where at least one of the following situations occurs:

- information to be transferred is generated
- commands are activated by actuators.

The RWS is installed where such commands or information need to be available and/or executed.

2.2 Identifying the KWS

A serial number (S/N) univocally identifies each KWS.

The serial number is on the KWS identification plate on the TWS and the RWS.

This is the only reference to be used for maintenance operations and for any other situation when you need to precisely identify the KWS.

The serial number must be mentioned in any communication with Autec, its dealers, Installers, Maintenance technicians of the KWS and with Persons who, in any capacity, need information, spare parts or technical data regarding the KWS.



Plates must not be removed from their position: removal immediately voids the warranty.

If the plates are altered or damaged, contact Autec.



The Machine Manufacturer, the Installer, the Maintenance Technician and the People in charge for the usage of the Machine and of the working place are responsible for making sure that the KWS identification plate is a sufficient means to explain the correspondence between TWS and RWS. If that were the case, it is necessary to provide additional, more visible identification.

2.3 Contacts and useful addresses

KWSs are manufactured by Autec Srl – Via Pomaroli, 65 - 36030 Caldogno (VI) - Italy.

You can find contacts for Autec, its distributors, dealers and authorized service centres on the website www.autecsafety.com.

2.4 Warranty


General warranty conditions are indicated both in the relevant sheet provided together with this documentation, and in the specific page on the website www.autecsafety.com.

2.5 Technical assistance and spare parts

If you need technical services and/or spare parts, please refer to contacts provided in the website www.autecsafety.com.

When asking for technical service to Autec, its distributors, dealers and Authorized Service Centres, the KWS serial number must be provided; you can find it on the identification plate on the TWS and/or the RWS.

3 General safety warnings

	<p>All the warnings and instructions provided in this chapter are safety-relevant.</p> <p>Failure to follow the instructions contained in the Manual provided by Autec, as well as all applicable safety-related legislations, even local ones, regulations and standards may generate serious damage to people and property.</p> <p>It is the responsibility of the Machine Manufacturer and/or designer, the Installer, the Maintenance Technician and the People responsible for the use of the Machine and for the working place to ensure that the installation, maintenance and use of the Autec KWS and all its components are carried out solely and completely in compliance with the instructions provided by Autec and with all the applicable safety-related standards and regulations in force in the countries where the Machine and the KWS are used.</p> <p>The Machine Manufacturer takes on the responsibility for the installation and use of the KWS on any application.</p>
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The Machine Manufacturer or those who want to use or install a Autec KWS on a Machine must first:

- Assess whether the Machine where the KWS is to be installed can be used with a KWS safely and effectively.
- Carry out an extensive and thorough risk assessment (see paragraph 3.1), also considering:
 - the Machine's manufacturing, functional and performing features
 - the Machine usage
 - the place and setting where the Machine will be used
 - the facility where the Machine will be or is installed
 - the interaction amongst the Machine, other equipment and personnel
 - its actual and potential different operating conditions
 - the conditions that may arise due to the installation of a KWS and the characteristics and limitation of the Autec KWS

For this purpose, by way of example and by no way of limitation, refer to standards ISO 12100 and ISO 14121, that prescribe the conditions for a correct risk assessment, which includes risk analysis and the adoption of the necessary protection and safeguarding actions.

Without limitation on the Laws, Regulations and Standards it is forbidden to install a KWS if the Manufacturer or those who want to install a KWS on a Machine are not able to or do not:

- Carry out an appropriate and comprehensive risk assessment in relation to the safety of the Machine, concerning the installation of the KWS.
- Ensure the required professional experience and/or technical competence to carry out the risk assessment correctly.
- Ensure the correct installation of the KWS in accordance with this Manual and all applicable Laws, Regulations and Standards, even local.
- Implement all safety conditions, so that the Machine equipped with the KWS can be used without generating dangerous situations.
- Adopt the appropriate technical solutions and informative actions to create the conditions for the Maintenance Technician to safely operate the Machine equipped with the KWS.
- Implement all necessary and appropriate actions and procedures to remove or reduce risks that may originate from the use of the Machine equipped with the KWS.



ONLY IF THE COMPREHENSIVE RISK ASSESSMENT SUPPORTS THE INSTALLATION OF THE AUTEC KWS AS APPROPRIATE, EFFECTIVE AND SAFE TO OPERATE THE MACHINE, AND THE INSTALLATION OF THE AUTEC KWS ON THE MACHINE IS PERMITTED BY AND IS IN COMPLIANCE WITH APPLICABLE LAWS, REGULATIONS AND STANDARDS, EVEN LOCAL, AND WITH THIS MANUAL, MAY THE BE INSTALLED ON SUCH MACHINE.

THE MACHINE MANUFACTURER OR ALL THOSE WHO DECIDE TO INSTALL AN AUTEC KWS ON A MACHINE IS HELD COMPLETELY RESPONSIBLE FOR:

- **THE RISK ASSESSMENT**
- **THE DETERMINATION TO USE THE AUTEC KWS ON THE MACHINE**
- **TAKING ALL ACTIONS NECESSARY OR ADVISABLE TO REDUCE OR REMOVE RISKS OCCASIONED BY THE MACHINE**
- **THE OBSERVANCE OF STANDARDS AND REGULATIONS AIMING AT PRESERVING SAFETY.**



AUTEC IS NOT RESPONSIBLE FOR AND SHALL NOT BE HELD LIABLE FOR THE COMPATIBILITY OF THE KWS WITH THE MACHINE OR DESIRED APPLICATION, EVEN IF IT IS AMONG THE PERMITTED APPLICATIONS, OR FOR ANY ISSUE RELATED TO THE SUITABILITY OF THE MACHINE AND ITS CONTROL SYSTEMS TO BE CONTROLLED BY THE KWS.

SIMILARLY, AUTEC IS NOT RESPONSIBLE AND SHALL NOT BE HELD LIABLE FOR THE RISK ASSESSMENT THAT NEEDS TO BE CARRIED OUT WHEN AN AUTEC KWS IS TAKEN INTO ACCOUNT, BOTH WITH REGARDS TO THE MACHINE AND THE STRUCTURE WHERE THE MACHINE IS OR WILL BE USED, AND TO THE ENVIRONMENTAL AND/OR OPERATIONAL CONDITIONS WHERE THE MACHINE IS OR WILL BE USED.

Without limitation on the foregoing, Autec is not responsible for and shall not be held liable for:

- Installation that is faulty or in any way not in conformity with this Manual and any other instructions provided by Autec, and with all applicable Laws, Regulations and Standards, even local
- Installation on Machines, appliances, devices, equipment and/or machinery systems on which the use of a KWS is not allowed by its Manufacturer or under applicable Laws, Regulations and Standards, even local, or on which the installation and/or the use of a KWS may generate safety issues or other risk situations that cannot be adequately removed and/or reduced, in conformity with applicable Laws, Regulations and Standards, even local
- Installation of the KWS in facilities or environments, or in weather and/or climate conditions, in which the use of the KWS is not permitted nor advisable under applicable Laws, Regulations and Standards, even local, not permitted according to the instructions contained in this Manual, or that may pose the risk of damage and/or incorrect operation of the KWS (by way of example: temperature exceeding the limits indicated in paragraph 6.2, explosion-risk situations, risk of contact with liquids or fluids)
- Inadequate or missing maintenance of the KWS, referring to both routine and special maintenance
- Damage to and/or deterioration of any component or feature of the KWS
- Failure to put the Autec KWS out of service if any damage or malfunction of the KWS or any component thereof occurs
- Use of parts or components in the KWS that are not manufactured by Autec or supplied by Autec
- Service for the Autec KWS carried out by anyone other than Autec or than one of its authorized service providers.


3.1 Risk assessment for Machines where a KWS is installed

The Manufacturer of the Machine on which the KWS is to be installed must carry out a full and proper risk assessment to determine whether the installation of the Autec KWS is appropriate for the safe and effective operation of the Machine and for the purposes intended, also taking into account the reasonably foreseeable misuse, so that the installation and maintenance of the Autec KWS, and of all its components, are done solely and completely in accordance with this Manual and with all local applicable laws, safety rules and standards (all of the foregoing referred to herein as "Laws, Regulations and Standards").

When carrying out the risk assessment to determine whether the KWS may be installed on a Machine, the Manufacturer and/or Installer of the KWS must comply with all Laws, Regulations and Standards, even local, regarding the safety of the Machine and the installation. In addition, they must follow these warnings:

- Some Machines cannot be equipped with a KWS, as stated in paragraph 10.1.
- The radio link between TWS and RWS may get interrupted (see paragraph 4).
- All warnings related to the installation and maintenance provided by Autec must be taken into account (see chapters 10.3 and 11.1).
- A delay occurs between the moment data and/or a TWS input command is acquired and the moment it is available in the RWS' outputs (see paragraph 3.2).

3.2 Delay in data/command transfer time between TWS and RWS

	<p>Under normal conditions, the delay between the moment data and/or a TWS input command is acquired and the moment it is available in the RWS' outputs is equal to the "Output response time when their corresponding inputs are activated or deactivated", indicated in the Technical Data (see paragraph 6.1). With poor radio link (by way of example: EM interference, exceeded working range) this delay may protract up to the "Function response time AUTOMATIC OFF" indicated in the Technical Data (see paragraph 6.1).</p> <p>The Manufacturer, the Installer, the Owner, and the Maintenance Technician, must make sure that these delays never lead to a dangerous situation in the specific uses.</p>
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4 Radio link

4.1 Description of radio link

The TWS communicates with the RWS through a radio link. Such link must be continuous to promote safety in the use of the Machine. Every time this link is incorrect or interrupted, the RWS deactivates all of its outputs.



Incorrect wiring of the RWS may bypass the protection functions and/or may prevent the Machine stop (see paragraph 10.5).

The TWSs and RWSs encode their messages through an address that is unique (produced by Auteonly once and non repeatable for other KWSs) and univocal (specific for each KWS and associated to it).

Each TWS and RWS can only decode messages coming from TWS and RWS with the same address.

This prevents messages from other radio equipment from activating any KWS function.

The radio link may get interrupted in the following cases:

- Stop (see paragraphs 4.4 and 5)
- Automatic switch off (see paragraphs 4.4 and 5)
- Missing power supply in the TWS or RWS
- Working range exceeded (see paragraph 7)
- Presence of metal obstructions.



WARNING: The operating working range may be significantly and unpredictably reduced compared to the value indicated in the technical data (see paragraph 7) when special conditions occur in the working environment (by way of example: temporary presence of electromagnetic interference and/or metal obstructions).

WARNING: The operating working range may be extended up to ten times compared to the value indicated in the technical data (see paragraph 7) when there are no interference elements in the working environment (by way of example: no electromagnetic interference and/or metal obstacles).

When a radio link is interrupted:

- All outputs of the RWS are disabled

Depending on the application, until the KWS is started up again, it is no more possible to:

- Transfer information
- Activate commands

4.2 Interruption of the radio link

When the radio link is incorrect or interrupted, the AUTOMATIC OFF function activates (refer to paragraph 4.4).

The Green Status LED on the TWS signals this interruption by switching from green slow blinking (one blink every two seconds) to one of the following statuses (see chapter 8.5):

- fast blink;
- on;

4.3 START input

The START input is used to start the KWS (see paragraph 6.4)

4.4 AUTOMATIC OFF function

The KWS has a function called AUTOMATIC OFF.

The AUTOMATIC OFF function brings the KWS to a safe state, that does not allow the transfer of information and commands.

This function is activated automatically:

- By the RWS, when it does not receive correct messages from the TWS within a certain time frame (see paragraph 4.1).
- When a KWS malfunction is detected.

Such events will cause the opening of the SF-Function relay contacts in the RWS (see paragraph 5).

5 SF-Function function

The SF-Function function is activated in the TWS through the IN-SF1 and IN-SF2 inputs. The function reaction when a certain event occurs (for example when a protection door or shelter opens, when a sensor such as light array, laser scanner, is triggered ...) causes the opening of the SF-Function relay contacts in the RWS.

The SF-Function function makes it possible to obtain:

- a machine stop function in compliance with the IEC 60204-1, if and only if to terminals IN-SF1 and IN-SF2 in the TWS you connect position sensors with direct opening action (see IEC 60947-5-1, Annex K) or ensuring comparable reliability (IEC 60204-1);
- an emergency stop function if both (or all) the following conditions are fulfilled:
 - the KWS is set in monitored start up mode
 - an emergency stop device is connected to terminals IN-SF1 and IN-SF2

The SF-Function function can meet the requirements up to Cat3, PLd according to the EN ISO 13849-1 as a stop function or as an emergency stop function.

This is only possible if the given specific conditions for each function are met.



The fulfilment of requirements for the indicated PL depends on the amount of sub-systems involved in the stop function, as stated in the EN ISO 13849-1.

The installer or the machine manufacturer is in any case responsible for carrying out wiring in such a way as to obtain a stop or an emergency stop.

6 KWS features

6.1 KWS Technical Data

Performance of the AUTOMATIC OFF function	up to SIL 2 (EN IEC 62061) up to PL d, cat.3 (EN ISO 13849-1)
Performance of the SF-Function function	up to cat.3 (EN ISO 13849-1, see paragraph 5)
AUTOMATIC OFF function response time	0.5s
SF-Function function response time	
Command response time (typical)	140ms

The technical data of the TWS and the RWS are given in the specific parts of the Manual and in their Technical Data Sheets.

6.2 Operating ambient conditions

Environmental working conditions are given in the following table.

	Temperature	Relative Humidity (non-condensing)	Air pressure	Maximum altitude (a.s.l.)
TWS usage	from -20 to +70°C (from -4 to +158°F)	max 95% at 55°C (+131°F)	from 70 to 106kPa	2000m
RWS usage	from -20 to +70°C (from -4 to +158°F)	max 95% at 55°C (+131°F)	from 70 to 106kPa	2000m

6.3 KWS storage before installation or after removal

KWSs must always be transported and stored inside their packaging until they are installed on the Machine.

The KWS and all its components are to be shipped and maintained according to the following environmental parameters and conditions:

	Temperature	Relative Humidity	Air pressure
Transportation	from -40 to +70°C (from -40 to +158°F)	max 95% at 55°C (+131°F)	from 70 to 106kPa
Storage	from -40 to +70°C (from -40 to +158°F)	max 95% at 55°C (+131°F)	from 70 to 106kPa

6.4 Start up mode

The KWS can be started in different modes depending on its setting and on the corresponding wiring (see paragraph 10.5), as well as on the Machine risk assessment.

Before enabling the START input, and regardless of the start up mode in the TWS, simultaneously activate the inputs (<350ms) connected to terminals IN-SF1 and IN-SF2 of the SF-Function function.

The simultaneous activation of inputs may also be ensured by appropriate wiring (see paragraph 10.5).

The KWS start up mode depends on the status of a DIP Shunt (DIP 1 of DIP Shunt S2).

- When DIP 1 of DIP Shunt S2 is intact (to obtain a closed circuit), the start up mode is automatic or manual; in this case, LED DS2 of diagnostic LEDs is off (see paragraph 8.5.3).
- When DIP 1 of DIP Shunt S2 is broken (to obtain an open circuit), the start up mode is monitored; in this case, LED DS2 of diagnostic LEDs is on (see paragraph 8.5.3).

6.4.1 Monitored start up mode

To set the monitored start up mode, you need to:

- switch off the TWS;
- switch off the RWS;
- break DIP 1 of DIP Shunt S2 in the TWS

To break DIP 1 of DIP Shunt S2, use a 1.5mm (0.059in) wide slot screwdriver to press the contact until it breaks.



Make sure that LED DS2 of diagnostic LEDs turns on when the TWS switches on (see paragraph 8.5.3).

When the KWS is in monitored start up mode, it is started by acting on the START pushbutton connected to the START input. The monitored start up monitors the signal switch of the START pushbutton. This way, it is not possible to tamper with the operational command of the START pushbutton.



Pay special attention when setting the DIP shunt, as it cannot be restored.



If the actuator corresponding to the START is activated for more than 10 seconds, the KWS will not start when the actuator is released.




This start up mode is permitted for stop and emergency stop devices.

The risk assessment determines if you need the monitored start up mode.


6.4.2 Automatic start up mode

When using the automatic start up mode, the KWS is started without voluntary consent. Connect the TWS power supply to the START input. This way, when the TWS is powered, the KWS system starts up automatically.

	<p>This start up mode is not permitted for emergency stop devices.</p> <p>Protection devices for dangerous restricted zones (e.g. position switch, light array pressure-sensitive safety mat) may operate with automatic start up if danger is not generated from that.</p> <p>The Machine Manufacturer takes on the responsibility for the installation and use of the KWS on any application.</p>
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6.4.3 Manual start up mode

In manual start up mode, the voluntary consent to KWS start occurs when the START pushbutton in the TWS is activated.

	<p>The manual start up mode does not monitor if the START input works correctly: if the input corresponding to the START is damaged (always closed/active), start up is automatic.</p> <p>For this reason, this start up mode is not permitted for stop and emergency stop devices.</p> <p>When using the manual start up mode, a device that switches off the KWS, and therefore stops the Machine, is required.</p>
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7 Conformity and frequencies

KWSs can work in the 863-870MHz frequency band.

	<p>The KWS working frequency is defined by market-specific laws and standards. In order for the KWS to be compliant and therefore to be used, these laws and standards must be respected: if they are not, the KWS cannot and must not be used.</p> <p>Autec cannot be held responsible if the KWS is set at frequencies that are forbidden in the country of use.</p>
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Addressees of instructions must:

- Make sure that the KWS works within the frequency band permitted in the country where it is used.
- Make sure that the KWS works correctly, in compliance with the applicable standards in the relevant country.
- Not modify the KWS conformity, by performing modifications or technical operations that would change its operation.

During training on or while using an Autec KWS, local provisions imposing the conservation of product conformity with local standards must be respected, as well as specific standards related to safety in the use of a KWS or electrical devices, both in the working environment or outside of it.

7.1 863-870MHz frequency band

7.1.1 Frequency band characteristics

The radio link between the Autec TWS and the RWS is established at one of the frequencies permitted by the European standards in force when the system is put on the market.

Frequencies used	128
RF power	<25mW ERP
Channel spacing	50kHz
(Typical) working range	100m (330ft)

TWS and RWS communicate with one another in dynamic mode, that is:

- They use a working frequency in the 863-870MHz band
- They verify that the frequency is free before using it
- They continuously change the working frequency in order to guarantee the radio connection even in the presence of interference.

7.1.2 EC conformity

According to the regulations in force in the European Union, one of the requirements for a KWS to be compliant with the EC conformity is to work at one of the permitted frequencies. If it does not, the KWS cannot be considered compliant.

Each KWS operating in the 863-870MHz frequency band complies with the following Directives: RED Directive (2014/53/EU, Annex II), all relevant provisions of the Machinery Directive (2006/42/EC), RoHS Directive (2011/65/EU).

Each KWS also complies with the harmonised standards listed in the EU Declaration of Conformity, that are in force and applicable when the KWS is put on the market.

The EU Declaration of Conformity of the Autec KWS is provided in English as an attachment to the KWS itself. Contact Autec if you need this declaration in one of the other languages of the European Union.



7.1.3 UK conformity

According to the regulations in force in the United Kingdom, one of the requirements for a KWS to be compliant with the UKCA conformity is to work at one of the permitted frequencies. If it does not, the KWS cannot be considered compliant.

Each KWS operating in the 863-870MHz frequency band complies with the following Directives: 2017 Radio Equipment Regulations, all the relevant provisions of the 2008 Supply of Machinery (Safety) Regulations, 2012 Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations.

Each KWS also complies with the standards listed in the UK Declaration of Conformity, that are in force and applicable when the KWS is put on the market.

The UK Declaration of Conformity of the Autec KWS comes with the KWS itself.



7.1.4 Countries of usage

KWSs working in the 863-870MHz frequency band can be used within the EU (European Union) and the EFTA (European Free Trade Association).

Refer to the technical data plate of the TWSSs and RWSs to check in which markets the KWSs can be used.

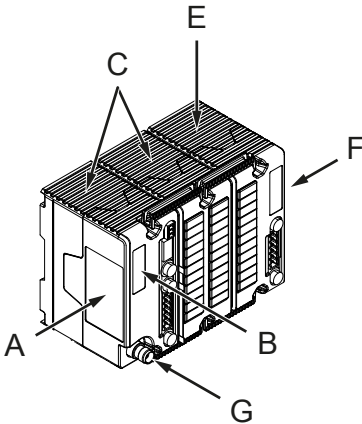
8 TWS

8.1 DescriptionTWS

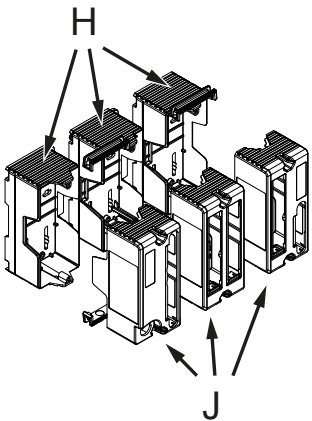
The TWS consists of at least two modules:

- CPU MODULE (see paragraph 8.1.1)
- POWER SUPPLY MODULE (see paragraph 8.1.3)

Up to two EXPANSION MODULES can be present between the POWER SUPPLY MODULE and the CPU MODULE (see paragraph 8.1.2).



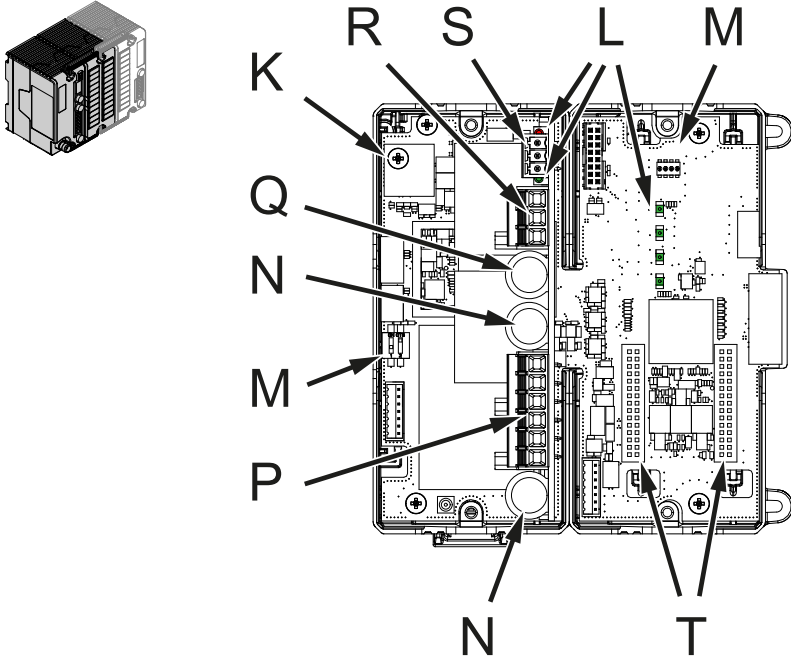
A	Technical data plate of CPU MODULE
B	Identification plate
C	CPU MODULE
E	POWER SUPPLY MODULE
F	Technical data plate of POWER SUPPLY MODULE
G	TNC connector for external antenna kit



H	Lower housing
J	Upper housing

8.1.1 CPU MODULE

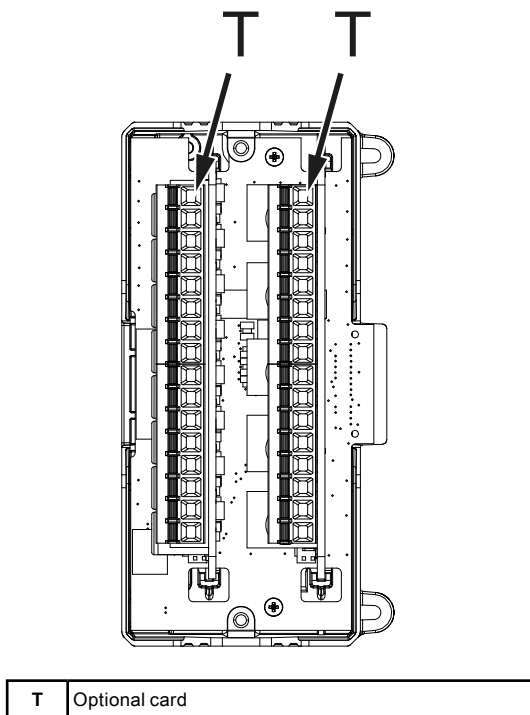
The CPU MODULE contains the radio module and the address key. This module also contains the SF-Function and START inputs of the TWS.



K	Address key
L	Internal light signals
M	DIP switches
N	Protection fuses of the SF-Function inputs
P	SF-Function inputs
Q	Protection fuse of START input
R	START input
S	Connector for external light signals
T	Connector for optional card

8.1.2 EXPANSION MODULE

The EXPANSION MODULE may contain up to two optional cards, whose features are indicated in the Technical Data Sheet.

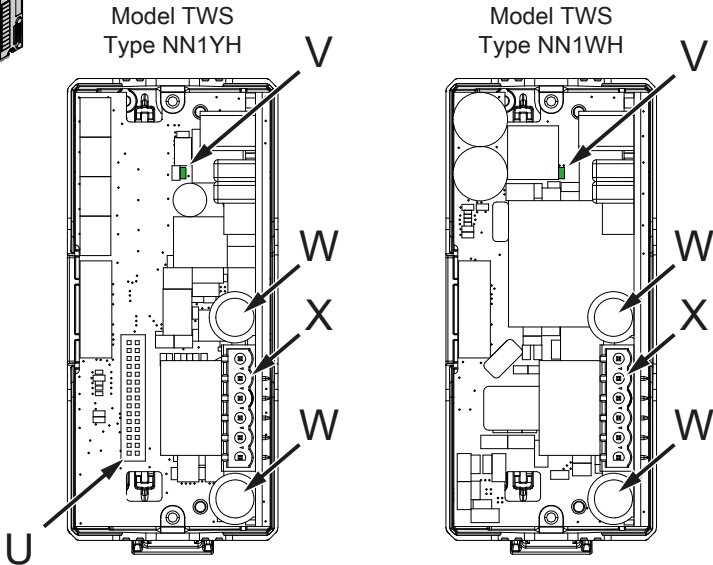
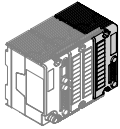


8.1.3 POWER SUPPLY MODULE

The POWER SUPPLY MODULE provides power supply to the entire TWS

The Model TWS Type NN1YH POWER SUPPLY MODULE may also contain an optional card, whose features are indicated in the Technical Data Sheet.

The Model TWS Type NN1WH POWER SUPPLY MODULE only contains the power supply unit.



U	Connector for optional card
V	Internal light signal
W	Power supply protection fuses
X	Connector for power supply

8.2 TWS plates

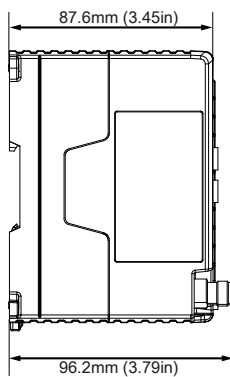
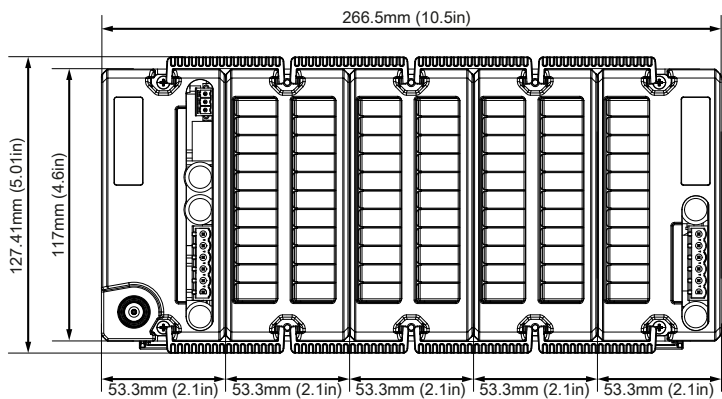
Plate	Position	Content
KWS identification plate	Cover of CPU MODULE	KWS serial number (S/N), QR code and manufacturing year.
Technical data plate of CPU MODULE	Cover of CPU MODULE	MODEL, TYPE and main technical data of CPU MODULE.
Technical data plate of POWER SUPPLY MODULE	Cover of POWER SUPPLY MODULE	MODEL, TYPE and main technical data of POWER SUPPLY MODULE, marking and any KWS marks.

8.3 TWS technical data

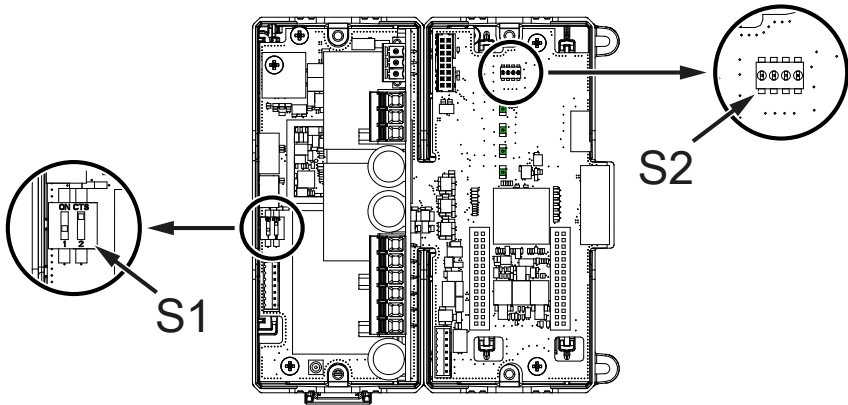
Power supply voltage	24-230V \sim (1.2A)
(Model: TWS, Type: NN1WH)	
Power supply protection fuse	Fuse 2A 250V (5x20mm T)
(Model: TWS, Type: NN1WH)	
Power supply voltage	24V \sim (2A) / 12-24V \equiv (4A)
(Model: TWS, Type: NN1YH)	
Power supply protection fuse	Fuse 4A 250V (5x20mm T)
(Model: TWS, Type: NN1YH)	
Antenna	dedicated
Voltage of SF-Function inputs	24-230V \sim / 12-24V \equiv
Protection fuses of SF-Function inputs	32mA 250V (5x20mm T)
Voltage of START input	24-230V \sim / 12-24V \equiv
Protection fuse of START input	32mA 250V (5x20mm T)
Upper housing material	polycarbonate
Lower housing material	PA6 (30% fg)
Protection degree	IP20 (NEMA 1)
Weight of CPU MODULE	315g (0.7lb)
Weight of EXPANSION MODULE	max. 240g (0.53lb)
Weight of POWER SUPPLY MODULE	max. 270g (0.6lb)
Over-voltage category	II
Maximum altitude (a.s.l.)	2000m
Continuous vibration	0.35mm, 5g (10-150Hz)
Random vibration	3m ² /s ³ (10-200Hz), 1m ² /s ³ (200-500Hz)
Shock	half sine, 11ms, 30g



Refer to Technical Data Sheet for input voltage range in the optional cards.



8.4 DIP switchTWS



8.4.1 DIP switch - S1

DIP 1 is used to set the frequency band.

DIP 2 shall always be set in the OFF position.



The normal position of DIP 2 is OFF. This position must not be modified.

8.4.2 DIP shunt - S2


DIP 1 is used to set the KWS start up mode (see chapter 6.4)



DIPs 2, 3, 4 must remain intact. Such state must not be modified.

8.5 TWS internal light signals

The meaning of light signals illumination is described in the following paragraphs; possible measures to take are provided in chapter 12.1.

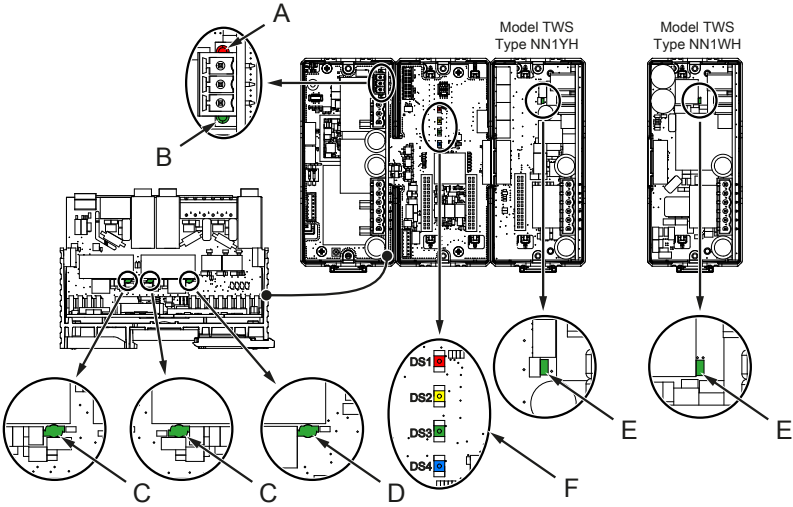

WARNING

It may be necessary to open the live electrical panel to check the light signals: this operation entails electrical hazards.

It is therefore mandatory that light signals are checked by qualified staff trained for live-line working.



Optional cards' light signals are described in the corresponding manuals.



A	Red Status LED
B	Green Status LED
C	Activation LED of SF-Function inputs
D	Activation LED of START input
E	POWER LED
F	Diagnostic LEDs


8.5.1 POWER LED

The POWER LED signals the TWS status.

Signals	Meaning
The POWER LED is off.	The TWS is not powered.
The POWER LED is on.	The TWS is powered.

8.5.2 Red Status LED and Green Status LED

The TWS always has a Green Status LED [B] and a Red Status LED [A] that provide information about the KWS.

	The meaning of the Green Status LED and Red Status LED signals cannot be modified.
---	--

Signals	Meaning
The Green Status LED is lit with a steady light.	The TWS and the RWS do not communicate with one another.
The Green Status LED blinks fast.	The TWS and the RWS do not communicate with one another. The KWS is not started.
The Green Status LED blinks once every second.	The KWS is started.
The Red Status LED blinks twice per second when the TWS starts.	At least one of the inputs monitored at start-up is active (see Technical Data Sheet).
The Red Status LED is steady on for two seconds when the TWS starts.	The TWS does not work properly.
The Green Status LED and the Red Status LED blink three times per second when the TWS starts.	The ID internal tx memory is damaged.
The Green Status LED is steady on and the Red Status LED blinks twice per second when the TWS starts.	The START input has been activated for more than 10 seconds.
The Green Status LED and the Red Status LED are off when the TWS starts.	The SF-Function inputs or the START input are not active.
	The SF-Function inputs have not been activated simultaneously (only one of the two SF-Function LEDs is not active).

8.5.3 Diagnostic LEDs

Diagnostic LED DS2 indicates the KWS start up mode.

Signals	Meaning
Yellow LED DS2 is off.	KWS in automatic or manual start up mode.
Yellow LED DS2 is on.	KWS in monitored start up mode.

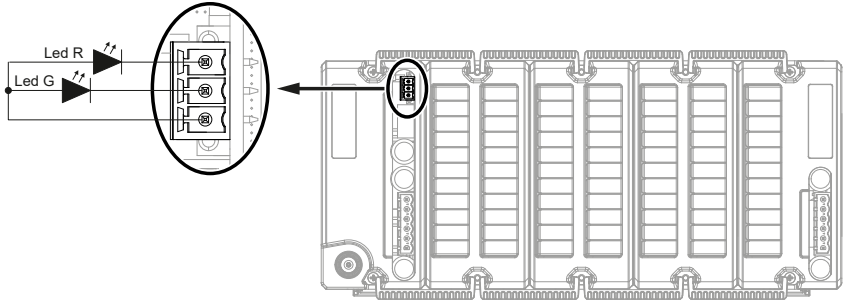
8.5.4 Activation LEDs of SF-Function and START inputs

Signals	Meaning
Activation LEDs of SF-Function inputs are steady on.	SF-Function inputs are active.
Activation LED of START input is steady on.	START input is active.

8.6 TWS external light signals

The TWS has a connector for the two external light signals (LEDs).

The external light signals always provide the same information as the Green Status LED [B] and the Red Status LED [A], given in chapter 8.5.



8.7 Voluntary TWSswitch off

The voluntary TWSswitch off occurs when power supply is disconnected.



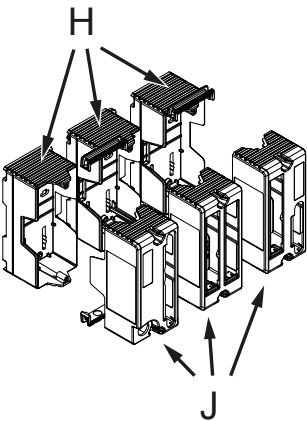
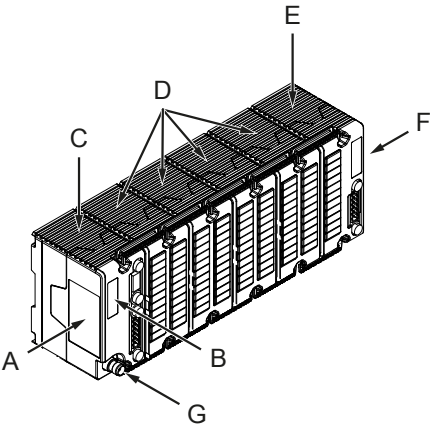
Switch off the KWS when it is not in use.

9 RWS

9.1 RWS description

The RWS consists of at least two modules:

- CPU MODULE (see paragraph 8.1.1)
- POWER SUPPLY MODULE (see paragraph 8.1.3)
- Up to four EXPANSION MODULES can be present between the POWER SUPPLY MODULE and the CPU MODULE (see paragraph 8.1.2).

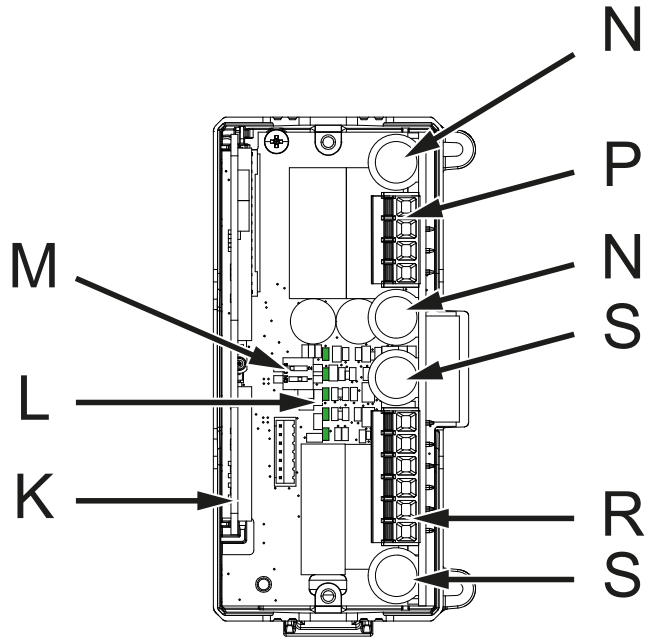
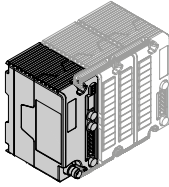


A	Technical data plate of CPU MODULE
B	Identification plate
C	CPU MODULE
D	EXPANSION MODULE
E	POWER SUPPLY MODULE
F	Technical data plate of POWER SUPPLY MODULE

H	Lower housing
J	Upper housing

9.1.1 CPU MODULE

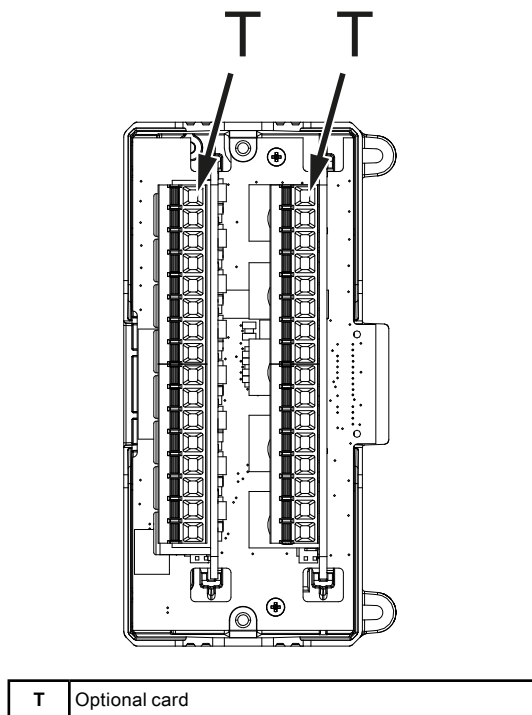
The CPU MODULE contains the radio module and the address key. This module also contains the SF-Function and START outputs.



K	Radio module and address key
L	Internal light signals
M	DIP switches
N	Protection fuses of SF-Function contacts
P	SF-Function outputs
R	START output
S	Not used

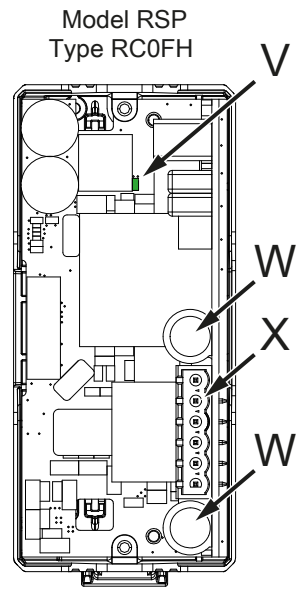
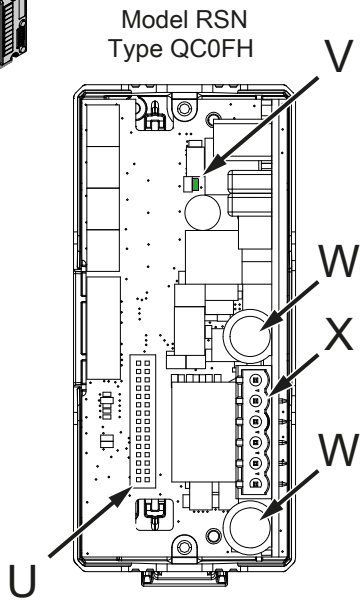
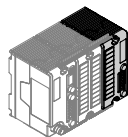
9.1.2 EXPANSION MODULE

The EXPANSION MODULE may contain up to two optional cards, whose features are indicated in the Technical Data Sheet.



9.1.3 POWER SUPPLY MODULE

The POWER SUPPLY MODULE provides power supply to the entire RWS
 The Model RSP Type RC0FH POWER SUPPLY MODULE may also contain an optional card, whose features are indicated in the Technical Data Sheet.
 The Model RSN Type QC0FH POWER SUPPLY MODULE only contains the power supply unit.



U	Connector for optional card
V	Internal light signal
W	Power supply protection fuses
X	Connector for power supply

9.2 RWS plates

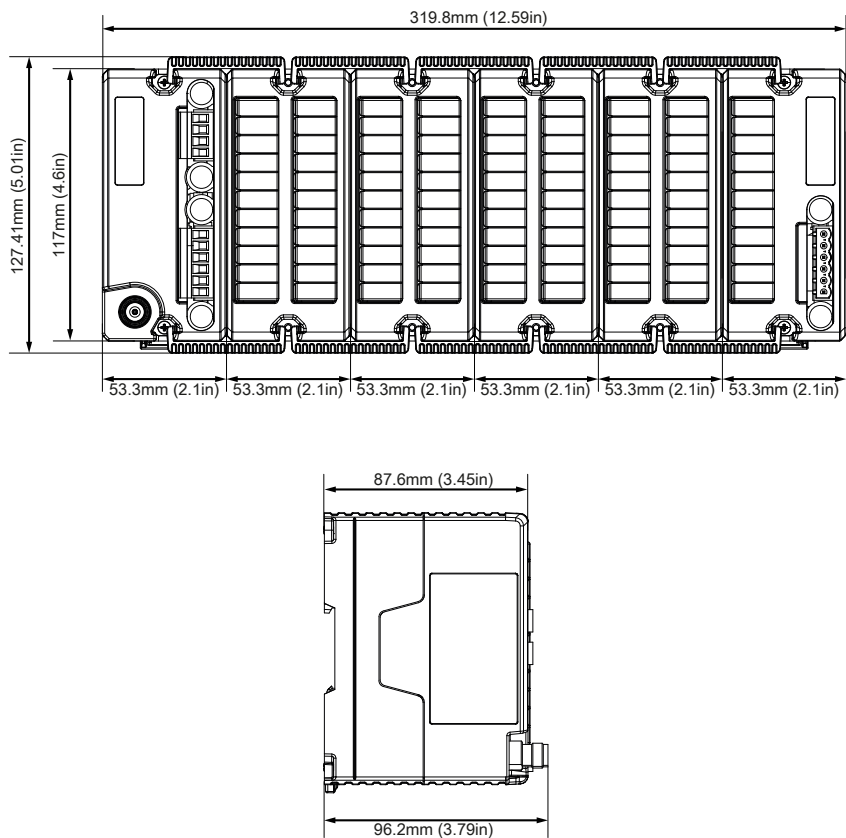
Plate	Position	Content
KWS identification plate	Cover of CPU MODULE	KWS serial number (S/N), QR code and manufacturing year.
Technical data plate of CPU MODULE	Cover of CPU MODULE	MODEL, TYPE and main technical data of CPU MODULE.
Technical data plate of POWER SUPPLY MODULE	Cover of POWER SUPPLY MODULE	MODEL, TYPE and main technical data of POWER SUPPLY MODULE, marking and any KWS marks.

9.3 RWS technical data

Power supply voltage	24-230V \sim (1.2A)
(Model: RWS, Type: RC0FH)	
Power supply protection fuse	Fuse 2A 250V (5x20mm T)
(Model: RWS, Type: RC0FH)	
Power supply voltage	24V \sim (2A) / 12-24V \equiv (4A)
(Model: RWS, Type: QC0FH)	
Power supply protection fuse	Fuse 4A 250V (5x20mm T)
(Model: RWS, Type: QC0FH)	
Antenna	dedicated
Rated current of SF-Function contacts	4A (250V \sim)
	4A (30V \equiv)
Protection fuses of SF-Function contacts	4A 250V (5x20mm T)
START contact rated current	6A (250V \sim)
	6A (30V \equiv)
Upper housing material	polycarbonate
Lower housing material	PA6 (30% fg)
Protection degree	IP20 (NEMA 1)
Weight of CPU MODULE	315g (0.7lb)
Weight of EXPANSION MODULE	max. 240g (0.53lb)
Weight of POWER SUPPLY MODULE	max. 270g (0.6lb)
Over-voltage category	II
Maximum altitude (a.s.l.)	2000m
Continuous vibration	0.35mm, 5g (10-150Hz)
Random vibration	3m ² /s ³ (10-200Hz), 1m ² /s ³ (200-500Hz)
Shock	half sine, 11ms, 30g



Refer to Technical Data Sheet for voltage and current rating of command outputs in the optional cards.



9.4 DIP switches in the RWS

DIP 1 is used to set the frequency band.

DIP 2 shall always be set in the OFF position.



The normal position of DIP 2 is OFF. This position must not be modified.

9.5 RWS light signals

The meaning of light signals illumination is described in the following paragraphs; possible measures to take are provided in chapter 12.2.

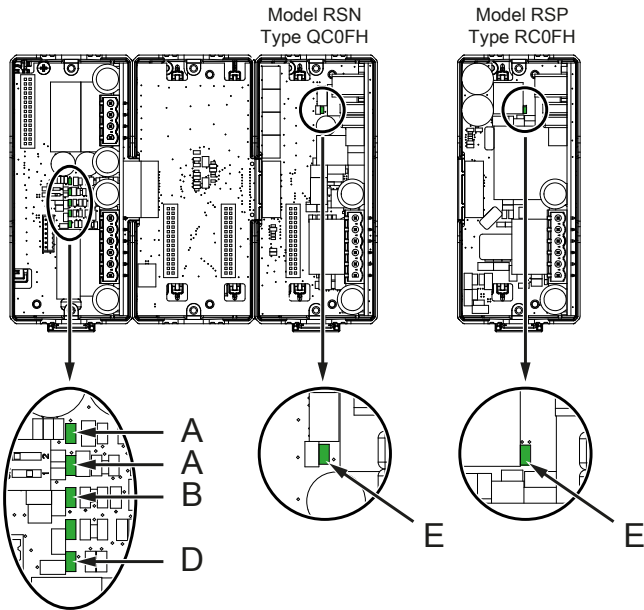


It may be necessary to open the live electrical panel to check the light signals: this operation entails electrical hazards.

It is therefore mandatory that light signals are checked by qualified staff trained for live-line working.



Optional cards' light signals are described in the corresponding manuals.



A	Activation LEDs of SF-Function relays
B	ENABLE LED
D	Activation LED of START relay
E	POWER LED

9.5.1 POWER LED

The POWER LED signals the RWS status.

Signals	Meaning
The POWER LED is off.	The RWS is not powered.
The POWER LED is on.	The RWS is powered.

9.5.2 ENABLE LED

The ENABLE LED indicates the status of the radio link.

Signals	Meaning
The ENABLE LED blinks once every 5 seconds.	The RWS and the TWS do not communicate with one another.
The ENABLE LED blinks fast.	The RWS is ready to receive commands sent by the TWS.

9.5.3 Activation LEDs of SF-Function and START relays

Signals	Meaning
The activation LEDs of SF-Function relays are steady on.	SF-Function relays are active.
START relay activation LED is steady on.	START relay is active.

10 Installation

10.1 Applications

An Autec KWS can be used for several applications (monitoring, measurement, signalling, information transfer): the Manufacturer must establish if the KWS is suitable for each different application, especially with regards to safety.



An Autec KWS cannot be installed on Machines where it is used for applications or functions not permitted according to this Manual and under the applicable Laws, Regulations and Standards, even local. THE INSTALLATION OF AN AUTEC KWS ON OTHER MACHINES OR FOR OTHER FUNCTIONS MAY GENERATE SERIOUS INJURY OR DEATH OR PROPERTY DAMAGE.

Autec is not and cannot be held responsible if the KWS is used in unsafe or poor safety conditions.



In addition to the above, a KWS cannot be installed:

- On Machines that are intended for the use in environments requiring explosion-proof features or in any KWS usage situation that may pose the risk of explosion
- On Machines for moving, raising and transporting people, if the Machine's characteristics and their related risks and/or the risks related to the use of a KWS do not make it possible for the Machine Manufacturer to ensure that all safety requirements are met. Such requirements must be taken into account when designing and manufacturing the Machine, also bearing in mind that a KWS will be used. The Machine Manufacturer may allow the installation and use of the KWS on such applications under their own responsibility
- On Machines that create or can create dangerous situations if they stop due to the loss of radio link
- On Machines that do not allow a risk-free installation of a KWS, due to their functions or features and/or to the risks related to their use
- On any kind of lifting accessory (by way of example: magnets, grippers, suction cups) whenever the loss of radio link or the deactivation of commands may cause the release of the load, resulting in the risk of damage to People and/or property. The Machine Manufacturer may allow the installation and use of the KWS for such applications under their own responsibility
- If the applicable safety-related laws in the country where the Machine is used, regulations and standards (even local ones), even concerning safety in the workplace, do not allow the use of KWSs to control the Machines.

INSTALLING AN AUTEC KWS ON ABOVE-MENTIONED MACHINES AND SITUATIONS MAY GENERATE SERIOUS INJURY OR DEATH OR PROPERTY DAMAGE.

10.2 Staff training: installation and maintenance

All installation and maintenance operations relating to the Autec KWS must be carried out ONLY by qualified technicians. Without limitation on the foregoing, such technicians must be trained and qualified with respect to:

- The activity to perform
- Warnings resulting from the risk assessment, concerning the KWS installation and/or maintenance
- All applicable Laws, Regulations and Standards, even local, including also safety rules
- Operations and requirements of the Machine on which the KWS is to be installed
- Warnings and instructions contained in the Manual of the KWS and of the Machine equipped with KWS
- Directions by the Machine Manufacturer and by the Person in charge for safety in the work-place where the system "Machine+KWS" is used.


General instructions for installation and maintenance are provided in chapter 10 and in chapter 11 respectively.

10.3 Warnings for the Installer


The Installer must:

- Observe and comply with all instructions and warnings provided by the Machine Manufacturer.
- Observe and comply with all instructions and warnings provided by the Person responsible for the Machine commissioning or making the Machine available for work.
- Observe and comply with all instructions and warnings provided in the KWS Manual.
- Observe and comply with all applicable Laws, Regulations and Standards, even local.
- Operate with the Autec KWS in compliance with this Manual and all its parts, and with all warnings and instructions provided by Autec.
- Immediately inform their supervisors and/or the people in charge for the working place and/or for the Machine about any possible failure, damage, loosening, anomalous wear, detachment and/or any other anomaly that may cause malfunction to the KWS and/or to the Machine, or that may cause damage to people and/or property.

10.3.1 General warnings for installation

 WARNING	<p>Always follow the instructions provided in the Technical Data Sheet and respect values given in the technical data to carry out correct installation.</p> <p>ONLY QUALIFIED PERSONNEL MAY INSTALL THE AUTEK KWS. SUCH PERSONNEL MUST HAVE MASTERED THE TECHNICAL KNOWLEDGE REQUIRED TO CARRY OUT THESE PROCEDURES CORRECTLY AND SAFELY AND BE QUALIFIED ACCORDING TO THE APPLICABLE LAWS AND REGULATIONS AND HAVE ALL NECESSARY CERTIFICATIONS.</p> <p>FAILURE TO INSTALL THE AUTEK KWS MAY RESULT IN PERSONAL INJURY OR DEATH, OR PROPERTY DAMAGE.</p>
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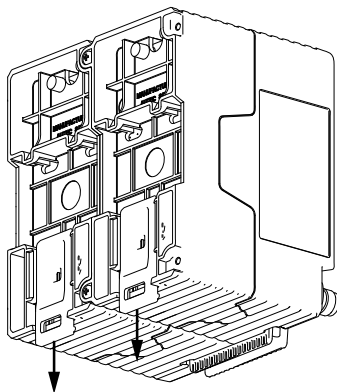
10.3.2 Position and mounting

 WARNING	<p>Install both the TWS and the RWS only inside an electrical panel.</p> <p>The electrical panels where the KWS is installed must ensure a protection degree higher than or equal to IP54 (IP65 is recommended if the panel is outdoors).</p> <p>Position both the TWS and the RWS so as to avoid accidental damage.</p> <p>Position both the TWS and the RWS so that they can be reached easily if needed.</p> <p>A 10cm (4in) minimum clearance is needed between the TWS/RWS' connectors and the closest surface, so that the antenna cable and the TWS/RWS' wiring are not crushed/damaged.</p> <p>Install both the TWS and the RWS far from any device that can generate electromagnetic fields and/or heat (by way of example: transformers).</p> <p>Never perforate the TWS nor the RWS.</p> <p>Vibrations may jeopardize the KWS performance: in this case, it is recommended to mount appropriate vibration dampers onto the electrical panel.</p>
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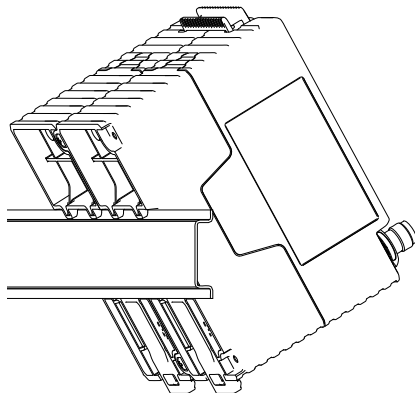
10.3.3 DIN rail mounting

Inside an electrical panel, the KWS must be installed exclusively on a DIN rail EN 60715. Perform the following procedure to install the KWS:

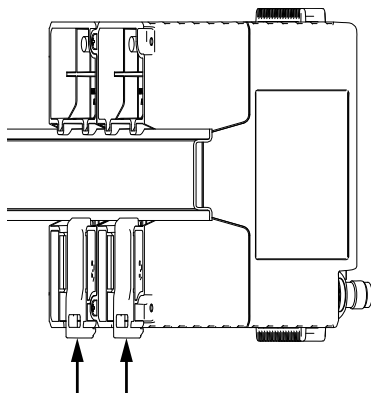
1. Move the clips at the bottom of the TWS and/or the RWS downwards.



2. Clip the upper part of the TWS and/or the RWS to the DIN rail.

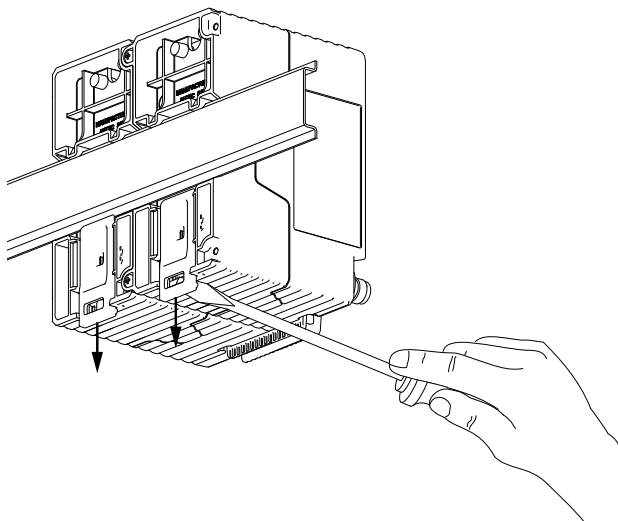


3. Hook the TWS and/or the RWS to the DIN rail and move the clips at the bottom of the TWS and/or RWS upwards to fasten it to the rail.



10.3.4 DIN rail disassembling

Use a screwdriver to move the clips at the bottom of the TWS and/or RWS downwards, until the TWS and/or RWS unhooks from the DIN rail.



10.3.5 Positioning the antenna



The antenna must be mounted outside the electrical panel, in a vertical position, and possibly be placed towards the antenna of the other TWS and/or RWS of the KWS.

Always use the antenna with its extension kit.

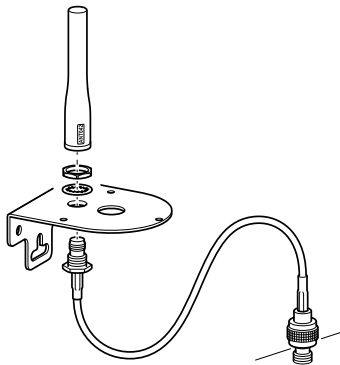
If possible, avoid installing a KWS near antennas of other radio equipment. If this were necessary, pay particular attention in placing the antenna in a favourable place. In this case the different antennas need in fact to be installed in such a way that all systems work correctly (position, direction and distance between the antennas shall be assessed depending on the application and on the working environment).

Install the antenna at least 50cm (20in) far from metal objects in the surroundings, in a free area of the Machine; protections, panels, parts, surfaces or anything else should not be present, so that shields, structures or materials do not obstruct the radio link.

If this warning is disregarded, the typical working range of the KWS may be reduced.

10.3.6 Antenna assembly

It is necessary to install an antenna for the TWS and an antenna for the RWS.



The antenna must only be assembled by qualified technicians.

10.4 Wiring: general instructions and warnings

Wiring is understood as the electrical cable connections between the KWS and the Machine.



ALL ELECTRICAL CONNECTIONS MUST BE PERFORMED AND MADE IN COMPLIANCE WITH THE NATIONAL ELECTRIC CODE AND ALL APPLICABLE LAWS, REGULATIONS AND STANDARDS, EVEN LOCAL. IF INSTRUCTIONS PROVIDED BY AUTEC ARE INCONSISTENT WITH SUCH APPLICABLE LAWS, REGULATIONS OR STANDARDS, DO NOT INSTALL THE AUTEC KWS WITHOUT PRIOR CONSULTATION WITH AUTEC. AUTEC IS NOT RESPONSIBLE FOR AND SHALL NOT BE HELD LIABLE FOR ANY MALFUNCTIONS OR ACCIDENTS THAT MAY OCCUR DUE TO ANY IMPROPER INSTALLATION OR INCONSISTENCY BETWEEN ITS INSTRUCTIONS AND SUCH LAWS, REGULATIONS OR STANDARDS.

FAILURE TO INSTALL THE AUTEC KWS MAY RESULT IN PERSONAL INJURY OR DEATH, OR PROPERTY DAMAGE.

The power supply of the TWS and the RWS must be connected using an omnipolar switch with a switch-contact gap of at least 3mm (0.1in), that allows power supply disconnection during installation, wiring and/or maintenance operations.

The power supply of the TWS and the RWS must be protected against short circuit by means of an external device (by way of example: fuse, thermal magnetic circuit breaker). Such device must be able to interrupt the maximum fault current (including the short circuit current) allowed in the circuit.



TWSs and/or RWSs powered with AC and exposed to transient overvoltages exceeding those of overvoltage category II require additional protections that must be provided on the outside of the TWS and/or RWS.



Group the wiring away from the connector and from the cable of the external antenna, in order to avoid interference and hazards related to electrical safety.

The connection of the grounding terminal that protects both the TWS and the RWS must be connected to the grounding conductor that protects the system where the system is installed.

Keep wiring cables at hazardous voltage (sources of class 3 electrical energy (ES3)) physically separated from those at extra low voltage (sources of class 1 electrical energy (ES1)). Refer to standards IEC 62368-1 and IEC 60204-32 for their voltage values.

The voltage connected to inputs of the TWS must ensure the expected minimum value for power, voltage and current (see paragraph 8.3).

The relay outputs of the RWS are designed to control high current loads. Contacts of those outputs are protected by means of over-voltage suppressors (varistors), to ensure the maximum lifetime of relays in most applications.

Suppressors connected in parallel with contacts of the output relays (of the RWS) may conflict with the connection to a high-impedance load (by way of example: some PLCs); please contact Autec to carry out the installation correctly.

The loads connected to the relay outputs of the RWS must ensure the minimum power, voltage and current value that the contacts can switch (see paragraph 9.3). Connect an additional load to the outputs if necessary.

If an RWS' output is connected to inductive loads (by way of example: solenoid valves, relays), it is recommended to connect with reversed polarity an appropriate circuit to the driven load, to further reduce the effects of demagnetisation currents. By way of example: RC, TVS for AC load, or RC, TVS, diode for DC load.



Pay special attention to the currents and voltages in the SF-Function outputs: they shall not exceed the maximum permitted values (see rated current of SF-Function contacts in paragraph 9.3).

The SF-Function outputs in the RWS are wired with two contacts connected in series through a wire jumper (Autec standard wiring). If the application needs a circuit with two separate contacts (four wires), this bridge can be removed. In any case, the Installer is responsible for wiring in such a way as to ensure the required safety level.

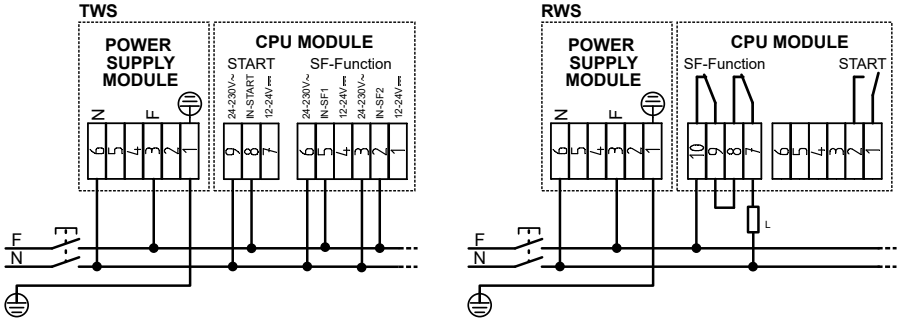
10.5 Wiring examples

Here are some examples of KWS wiring.

10.5.1 AC Automatic start up

Example of Automatic Start Up with AC power supply.

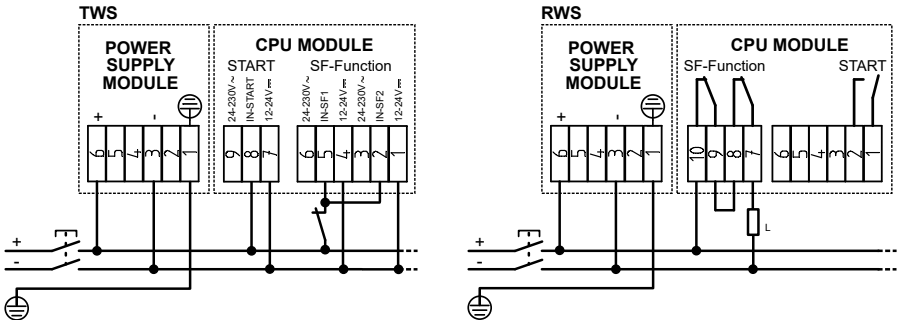
The TWS does not have START and SF-Functionvoluntary monitoring.



10.5.2 DC Automatic start up

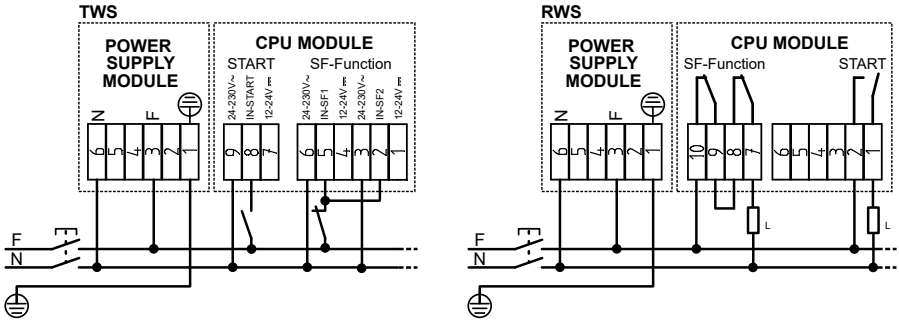
Example of Automatic Start Up with DC power supply.

The TWS does not have START monitoring and has a voluntary SF-Function command.



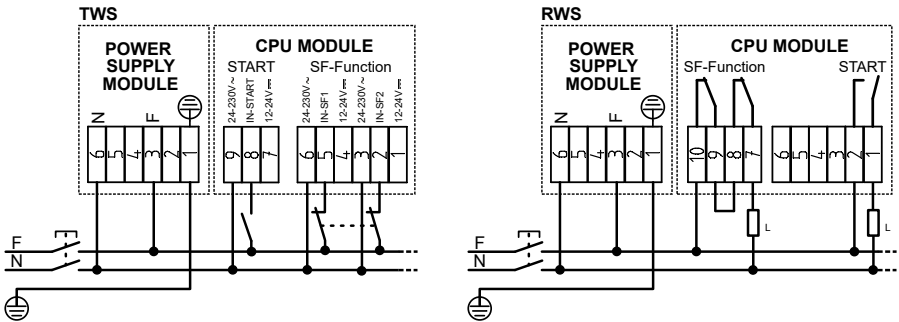
10.5.3 AC Manual start up

Example of Manual Start Up with AC power supply.
The TWS has START and SF-Function voluntary commands.



10.5.4 AC Monitored start up

Example of Monitored Start Up with AC power supply.
The TWS has the START voluntary command at release, and two SF-Function voluntary contacts activated simultaneously (see chapter 6.4).



11 Maintenance

11.1 Warnings for the Maintenance Technicians


The Maintenance Technician must:

- Observe and comply with all instructions and warnings provided by the Machine Manufacturer.
- Observe and comply with all instructions and warnings provided by the Installer.
- Observe and comply with all instructions and warnings provided by the Person responsible for the Machine commissioning or making the Machine available for work.
- Observe and comply with all instructions and warnings provided in the KWS Manual.
- Observe and comply with all applicable Laws, Regulations and Standards, even local.
- Operate the Autec KWS only in accordance with this Manual and all its parts, with all warnings and instructions provided by Autec, and with all applicable Laws, Regulations and Standards, even local.
- Immediately inform their supervisors and/or the people in charge for the working place and/or for the Machine about any possible failure, damage, loosening, anomalous wear, detachment and/or any other anomaly that may cause malfunction to the KWS and/or to the Machine, or that may cause damage to people and/or property.



ADDITIONAL WARNINGS AND INSTRUCTIONS THAT ARE CONTAINED IN THE OTHER PARTS OF THIS MANUAL MUST BE FOLLOWED.

All fine-tuning, checking and maintenance actions carried out on the KWS shall be verified and recorded by the Person in charge of carrying out maintenance on the Machine.

 WARNING	<p>Before any maintenance operation, disconnect power supply from both the TWS and the RWS.</p> <p>Check that the KWS works properly after any maintenance operation.</p> <p>In case of malfunction, disconnect power supply from both the TWS and the RWS. This way, the KWS and the application where it is installed are disabled: both must not be used until the problem has been solved by implementing the necessary technical operations.</p>
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11.2 Routine maintenance

Routine maintenance consists of operations needed to preserve the KWS normal usage conditions, thus implementing fine-tuning, checks, planned replacement actions that necessarily arise from the normal use of the product.

All given instructions must be followed correctly at each commissioning, that is:

- Whenever the KWS and/or the Machine is installed or assembled
- Whenever the Machine location/placing changes
- After special maintenance.

Routine maintenance carried out as described in this Manual is fundamental to use the KWS safely.

Special applications may require more specific routine maintenance actions to be carried out at different periods (by way of example: if the environment temperature is very high or very low (see limits provided in paragraph 6.3), or in case of heavy application, or very frequent usage, some maintenance actions may be required more frequently).



When carrying out maintenance on the Machine, always disconnect power supply from both the TWS and the RWS. If the Machine needs maintenance (by way of example: welding) also disconnect all their electrical connections.

11.2.1 Three-month routine maintenance

At least every three months:


- Check the correct correspondence between the commands that are sent and the manoeuvres that are carried out by the Machine.
- Make sure that all relay contacts of the RWS work properly.
- Start up the TWS and check in the RWS that the contacts of the SF-Function relays close.
- Make sure that the plates on the TWS and on the RWS are readable and not damaged. If they are altered or damaged, please contact Autec.
- Make sure that the TWS and the RWS are intact in all their parts.
- Check that the wiring of the TWS and the RWS is intact and connected.



Before testing the SF-Function relays, make sure that no dangerous situations may arise due to the closing of the SF-Function relay contacts of the RWS.

11.3 Special maintenance


Special maintenance consists in the replacement of the TWS or the RWS due to KWS failure, damage or malfunction, and it is carried out with the aim of restoring the original usage and working conditions.

 WARNING	<p>Special maintenance may be performed only by qualified Maintenance Technicians, that is to say, by skilled technical personnel with specific competence and knowledge of the Autec KWS, belonging to Autec's service network, or explicitly authorised by Autec.</p> <p>When carrying out special maintenance operations this Manual, undamaged in all its parts, must be available.</p> <p>Only Autec TWSs and RWSs provided by Autec can be used for replacement.</p>
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When seeking assistance from Autec or its authorized distributors or service centres, the following must be provided:

- KWS serial number (S/N)
- Purchase date
- Description of the problem found
- Address and telephone number of the place where the KWS is being used (with the name of the Person to contact)
- Local KWS supplier.

11.3.1 Relays


 WARNING	<p>Relays are electromechanical components that wear out with use.</p> <p>It is possible to evaluate a relay's electrical endurance, expressed as its number of cycles (one cycle = one activation and de-activation), depending on the applied load and on its usage current. When such number of cycles is reached, it is recommended to replace the RWS</p> <p>This replacement must be carried out by the Maintenance Technician and prevents possible failure and dangerous situations (by way of example: deactivation of a command associated to a TWS input).</p> <p>For AC loads, the relay's electrical endurance varies from a minimum of 10^4 cycles (at the maximum current and voltage indicated in the Technical Data Sheet) to a maximum of 10^6 cycles (at 10% of the maximum current indicated in the Technical Data Sheet).</p> <p>For DC loads, the relay's guaranteed electrical endurance is equal to 10^4 cycles (at the maximum current and voltage indicated in the Technical Data Sheet).</p>
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12 Troubleshooting

12.1 Malfunctions signalled by the TWS

The table below lists malfunctions that are signalled by LEDs on the TWS and the solutions to those malfunctions.

If the problem persists after attempting the suggested solution, contact the support service of the Machine Manufacturer or those who installed the TWS on the Machine.

	<p>It may be necessary to open the live electrical panel to look for malfunctions: this operation entails electrical hazards.</p> <p>It is therefore mandatory that malfunction is searched for by staff skilled and trained for live-line working.</p>
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Signals	Possible reasons	Solutions
The POWER LED is off.	Wrong or no power supply.	Make sure that power supply wires are connected correctly and that the value of the supply voltage is within the limits specified in the technical data.
		Check the power supply protection fuse and, if needed, replace it.
The Green Status LED is lit with a steady light.	The TWS and the RWS do not communicate with one another.	Make sure that the RWS is powered.
		Check the connections and the antennas' cables in the TWS and the RWS.
		Check correct positioning of the antennas. See chapter 10.3.5.
The Green Status LED blinks fast.	Temporary loss of radio link.	Start the TWS.
The Green Status LED blinks once every second.	The TWS and the RWS might not be working correctly.	Make sure that the input wires are connected correctly and that the voltage value is within the limits specified in the technical data.
		Make sure that the inputs are wired correctly (wiring must be "intact", connectors must be plugged in, and no disconnected wires are present)

Signals	Possible reasons	Solutions
The Green Status LED blinks once every second.	The TWS and the RWS might not be working correctly.	Make sure that commands sent activate the corresponding outputs.
		Check the protection fuses of command inputs and replace them if needed.
The Red Status LED blinks twice per second when the TWS starts.	At least one of the inputs monitored at start-up is active (see Technical Data Sheet).	Deactivate the inputs related to commands monitored during start up.
The Red Status LED is steady on for two seconds when the TWS starts.	The TWS does not work properly.	Contact the support service of the Machine Manufacturer or those who installed the KWS on the Machine.
The Green Status LED and the Red Status LED blink three times per second when the TWS starts.	The ID internal tx memory is damaged.	
The Green Status LED is steady on and the Red Status LED blinks twice per second when the TWS starts.	The START input is active with monitored start up.	Check that the START command works properly.
The Green Status LED and the Red Status LED are off when the TWS starts.	The SF-Function inputs or the START input are not active.	Activate the SF-Function inputs and the START input.
		Make sure that the input wires are connected correctly and that the voltage value is within the limits specified in the technical data.
		Make sure that the inputs are wired correctly (wiring must be "intact", connectors must be plugged in, and no disconnected wires are present)
		Make sure that the commands sent activate the corresponding LEDs.
		Check the inputs' protection fuses and replace them if needed.
	The SF-Function inputs have not been activated simultaneously (only one of the two SF-Function LEDs is active).	Deactivate and re-activate the SF-Function inputs simultaneously.

12.2 Malfunctions signalled by the RWS

The table below lists malfunctions that are signalled by LEDs on the RWS and the solutions to those malfunctions.

If the problem persists after attempting the suggested solution, contact the support service of the Machine Manufacturer or those who installed the KWS on the Machine.

	<p>It may be necessary to open the live electrical panel to look for malfunctions: this operation entails electrical hazards.</p> <p>It is therefore mandatory that malfunction is searched for by staff skilled and trained for live-line working.</p>
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Signals	Possible reasons	Solutions
The POWER LED is off.	Wrong or no power supply.	<p>Make sure that power supply wires are connected correctly and that the value of the supply voltage is within the limits specified in the technical data.</p> <p>Check the power supply protection fuse and, if needed, replace it.</p>
The ENABLE LED blinks once every 5 seconds.	The TWS and the RWS do not communicate with one another.	<p>Start the TWS.</p> <p>Make sure that there are no obstacles that might jeopardize the radio link between TWS and RWS (see chapter 10.3.2)</p>
The ENABLE LED blinks fast.	The RWS does not activate the outputs of the commands sent.	<p>Make sure that the outputs are wired correctly (wiring must be "intact", connectors must be plugged in, and no disconnected wires are present)</p> <p>Make sure that commands sent activate the corresponding outputs.</p> <p>Check the protection fuses of the SF-Function contacts and replace them if needed.</p>

13 Decommissioning and disposal

13.1 Decommissioning

If you want to remove the TWS and/or the RWS from the Machine:

- Make sure that the TWS and/or the RWS and the Machine are not powered.
- Remove all electrical connections between the TWS and/or the RWS and the Machine.

If the KWS must be stored after its dismantling, follow the instructions in chapter 6.3.

If the KWS must be decommissioned after its dismantling, follow the instructions in paragraph 13.2.

13.2 Disposal

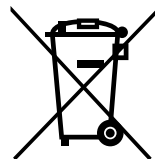
When disposing of a KWS, its components must be managed as separate waste. When disposing of the different Stations of the KWS, please comply with the provisions and/or the regulations in force in the country where it is used.

13.2.1 Waste disposal in the European Union: Directive 2012/19/EU

In the European Union, all electrical and electronic equipment (EEE), such as KWSs, must be properly handled to reduce their environmental impact and to protect people's health. Different collection and recycling schemes for such equipment are hence established across the European Union.

The symbol consisting of a crossed-out wheeled bin indicates that such EEE must be disposed of in conformity with Directive 2012/19/EU.

The symbol of the crossed-out bin on the KWS indicates that the product at the end of its life must be collected separately from other waste. The separate collection of the KWS at the end of its life is planned and handled by the manufacturer.



Users who want to dispose of the KWS must therefore contact its manufacturer to receive information about the separate collection scheme of the product adopted at the end of its life. As an alternative, it is possible to bring any equipment with no dimension more than 25 cm to retail shops with sales areas relating to EEE of at least 400 m², free of charge and with no obligation to buy any new equivalent equipment.

Appropriate separate collection and the subsequent shipping of the dismantled KWS to environmentally friendly recycling, handling and disposal contributes to avoid possible negative effects on the environment and on health, and fosters the re-use and/or recycling of the materials that compose the KWS.



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