Guide to the choice.

From products to service: the tightening process according to Fiam

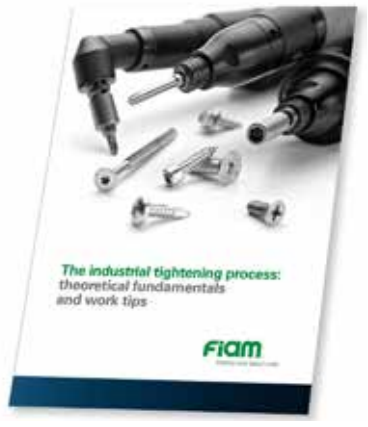
Industrial screwdrivers: air, electric, cumputerised

Fiam®
PEOPLE AND SOLUTIONS

TIGHTENING. THE TENET OF A MOVING FUTURE.

Tightening is not a simple action.
It is a fundamental part of any industrial process, and many factors should be carefully considered: screw, joint and screwdriver. The overall quality of the tightening process is therefore closely linked to the right choice of the most suitable type of screw for the application, of the material which makes up the components of the joint and of the air or electric screwdriver.

For this reason we realized this Guide, a vademecum to make the right choice easier.



For further information regarding the themes of the next pages, it is available the book *'The industrial tightening process: theoretical fundamentals and work tips'*.

The screws

Nowadays, specific screws are available depending on the kind of materials and the various applications; this offers quicker, safer and less expensive assembly work.
Choosing the right screw is very important: **the speed of screw inserting depends on thread geometry and screw pitch, while the head's imprint influences the applied torque.**

THE MAIN SCREWS ON SALE ARE:

METRIC
Generally used with nuts and threaded holes.

SELF-THREADING
These form the thread and tighten at the same time. The thread is created by deformation of the material, making this kind of screw particularly suitable for plastic, wood and other lightweight materials.

SELF-TAPPING
These are metric screws with special grooves on their threaded shanks which allow the shavings created during tightening to be removed.

THREE-LOBE
These are metric screws that tap through the special lobe shape of the shank, thereby deforming the material rather than removing it.

SELF-DRILLING
These are self-threading screws with a special "drill" tip that makes the hole during drilling.

THE TYPE OF IMPRINT MAY BE...

SLOTTED
Mainly used in the wood, eye-glasses, electronics sectors, etc; low priced and often of poor quality.

CROSS-SLOTTED (PHILIPS-POZIDRIVE)
Used on plastic, sheet metal and wood; the cross-slot improves the connection between screw and screwdriver.

TORX
This transmits higher torque levels with lower axial thrust. The imprint offers a larger surface contact and effective connection with minimum clearance.

HEX SOCKET SCREW (Allen screw)
Normally with metric pitch, it can be used in small spaces.

HEX HEAD
Used in many sectors, both in the metric and in the self-threading and self-drilling versions etc. Particularly effective for high tightening torque levels.

THE SCREWS CAN BE FITTED WITH:

BUILT-IN FLAT WASHER
This improves the quality of tightening and makes tightening cycle times quicker.

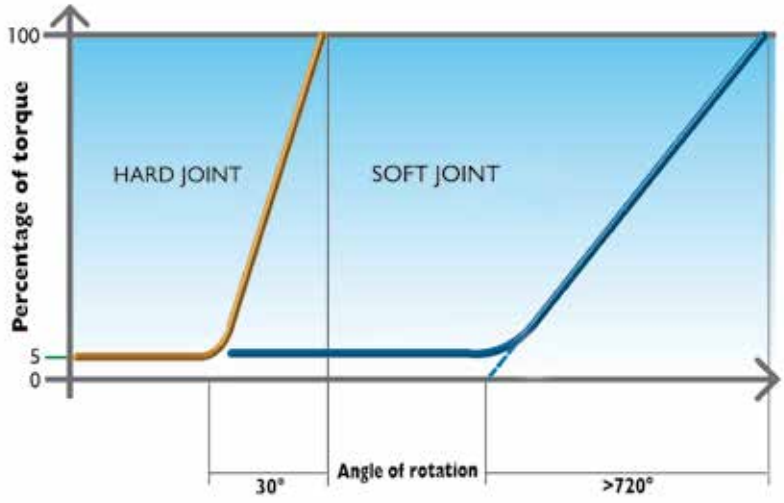
KNURLED WASHER UNDER THE HEAD
Fixed or mobile, it reduces the chances of the screw from accidentally loosening.

The joint

Steel, aluminium, plastic and wood, etc. create different joints and therefore they can support different tightening forces.
It's important to know what material the joint is made of when choosing the screw and the screwdriver.

Joints can be hard or soft.

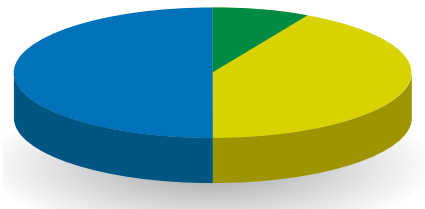
- **The joint is soft** when tightening torque is reached with a rotation of at least 720° (about 2 rotations);
- **The joint is hard** when tightening torque is reached with a maximum rotation of 30°.



The tightening force of the screw

The tightening force is obtained by applying a torque to the screw and allows two elements to be kept firmly together.

Only about 10% of the torque is transformed into tightening force, the remaining 90% is dissipated in various types of frictions.
Frictions make the tightening force applied to the screw (and therefore to the effective hold of the joint) extremely variable. As a result, the values of tightening torque to apply to the screw, shown in the table here beside, are purely indicative.

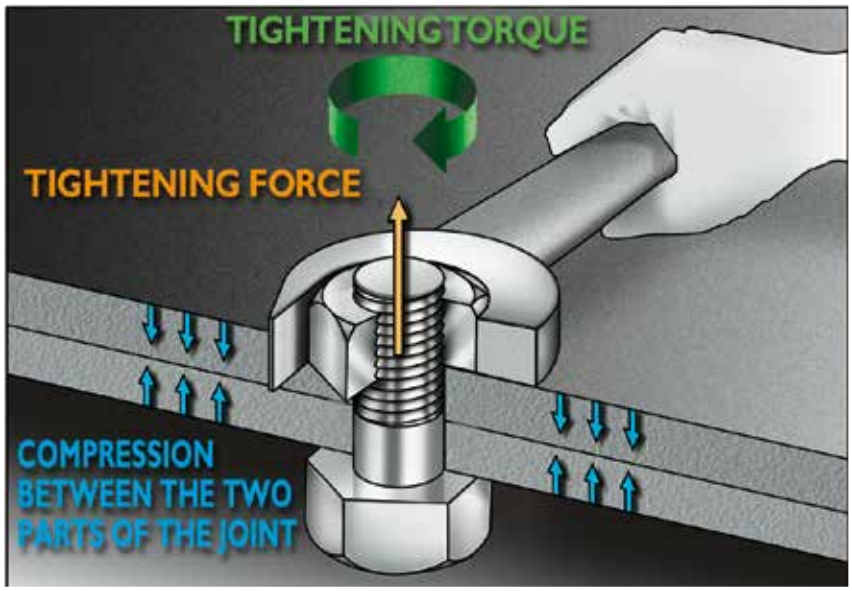


How the torque applied to the joint is distributed.

10% is transformed into tightening force which guarantees the hold or the tightening of the joint;

about 50% of the torque is dissipated to overcome the frictions of the under head of the screw;

40% is dissipated to overcome the frictions between the threads.



The torque applied transforms into tightening force in the screw

Electronic instruments such as digital torque readers and analysers, static and dynamic transducers, dynamometric wrenches and screwdrivers are used to measure, check, visualise, print and process tightening force values (see Fiam catalogues 'Accessories for the measurement of tightening torque').

These instruments permit to:

- **Ensure the required quality standards are respected**
- **Certify correct assembly**
- **Guarantee higher finished product quality**
- **Reduce the risks of "product responsibility".**

And they have also become of fundamental importance when each single tightening operation must be certified, especially when working according to ISO 9000 standards.

Example of static measurement with digital dynamometric wrench

The table shows approximate recommended torque values (in Nm) for wide pitch metric screws featuring various degrees of resistance (ref. EN ISO 898-1).

As regards self-threading screws, self-locking nuts, stainless steel screws, etc., due to the considerable complexity of the variables that affect torque levels (type of material, frictions...) the correct torque value to apply should be analysed case by case.

SCREW STRENGTH CLASS (DIN)								
PITCH AND SCREW Ø	NORMAL SCREWS					HIGH STRENGTH SCREWS		
mm	3,6	4,6	4,8	5,8	6,8	8,8	10,9	12,9
M 1	0,0107	0,0143	0,0190	0,0239	0,0287	0,0382	0,0539	0,0646
M 1,2	0,0206	0,0273	0,0364	0,0456	0,0547	0,0732	0,103	0,123
M 1,4	0,033	0,044	0,059	0,074	0,088	0,118	0,166	0,199
M 1,6	0,048	0,064	0,085	0,106	0,128	0,170	0,238	0,288
M 1,8	0,075	0,099	0,132	0,166	0,2	0,265	0,373	0,45
M 2	0,099	0,132	0,176	0,220	0,264	0,35	0,50	0,595
M 2,5	0,203	0,27	0,36	0,444	0,540	0,72	1,02	1,21
M 3	0,351	0,467	0,62	0,78	0,935	1,24	1,75	2,10
M 4	0,802	1,070	1,4	1,78	2,14	2,9	4,0	4,8
M 5	1,57	2,10	2,8	3,50	4,21	5,5	8	9,4
M 6	2,71	3,61	4,8	6,02	7,22	9,7	13,6	16,2
M 8	6,57	8,70	11,6	14,6	17,5	23	33	39
M 10	13	17,5	23	29	35	47	65	78
M 12	22,6	30	40	50	60	80	113	135
M 14	36	48	65	79	95	130	180	215
M 16	55	73	98	122	147	196	275	330
M 18	75	101	135	168	202	270	380	450
M 20	107	143	190	238	286	385	540	635
M 22	145	190	255	320	385	510	715	855
M 24	185	245	325	410	490	650	910	1100
M 27	275	365	480	605	725	960	1345	1615
M 30	370	495	650	820	990	1300	1830	2200
M 33	500	670	885	1110	1340	1770	2480	2980
M 36	645	860	1130	1430	1720	2260	3170	3810

INDICATIVE TIGHTENING TORQUE (Nm) FOR SELF-THREADING SCREWS								
Ø SCREW (mm)	2,2	2,9	3,5	3,9	4,2	4,8	5,5	6,3
RECOMMENDED TORQUE (Nm)	0,3	1	1,8	2,5	3	4,2	6,7	9

TIGHTENING TORQUE CONTROL. THE PRINCIPLE THAT MAKES THE DIFFERENCE.

In order to choose the best screwdriver, it is important to know the principles lying behind each family of screwdrivers, that is, the tightening torque control system.

Generally speaking, the following considerations also apply to air nutrunner motors: for these products please contact the Fiam Technical Consultancy Service or refer to the specific guide to the choice on the corresponding Fiam catalogues.

AIR SCREWDRIVERS AND NUTRUNNERS WITH CLUTCH

The clutch is a mechanical torque control device and can be of various types.

Immediate and automatic air shut-off clutch

When the pre-set torque value is reached, the clutch automatically stops the air feed and the air motor. It guarantees **high torque repeatability and generates minimum reaction on the hand of the operator**.
The sophisticated design concept and machining precision of the clutch guarantee quality tightening regardless of the action of the operator and the variable softness of the joint.

Immediate and automatic air shut-off clutch and pneumatic pick-up signal (ported)

Besides the characteristics of the automatic shut-off clutch, the screwdrivers are equipped with two pneumatic signals (tool start and clutch shut-off). This signal is converted into electric signal and it reports if the clutch shuts-off (yes/no) during the time set in the program. These 'poka yoke' solutions allow the monitoring of the tightening process in **real time and to discriminate the screws that have been tightened incorrectly with consequent quality improvement of the assembled product.**

Immediate and automatic air shut-off clutch and torque transducer

Besides the characteristics of the automatic shut-off clutch, the built-in torque transducer of the screwdriver (and connected to an electronic reader) constantly **monitors the functionality of the tool and the applied torque**.

Slip clutch

When the pre-set torque is reached, two ratchets begin to slip. The clutch does not stop the air motor and therefore **it is up to the operator to decide when to stop the tightening process**. It is certainly one of the most versatile clutches and most popular in the past, as the skill and experience of the operator determine the applied torque depending on the situation and the type of joint. However, the slip clutch generates high levels of noise and vibrations which makes it unsuitable from the ergonomic point of view. Moreover the premature wear of the ratchets does not guarantee torque repeatability over time.

DIRECT DRIVE - WITHOUT CLUTCH (OR STALL TYPE)

This is the simplest tightening solution: the air motor is directly connected by means of adapters to the accessory (bit, socket, etc.) working on the screw. The torque applied can be adjusted by regulating the air feed pressure. It is a **low-priced alternative compared with the slip clutch** with the advantage that it does not generate vibrations. It is also very versatile as it can tighten screws with different diameters on different joints.

PULSE AIR WRENCHES

Mechanic impact air wrenches

Mechanic impact air wrenches are not currently used much at industrial level due to their elevated noise and vibration levels.
They are particularly suited to many fields - from building and road construction to shipbuilding, railway construction, chemical plants, structural work, farm machinery and earthmoving equipment. They can be used to easily and quickly tighten and unscrew large screws, nuts and bolts, even badly rusted ones.

Hydraulic pulse air wrenches

Hydraulic pulse air wrenches are a satisfactory solution to tighten at medium-to-high torque levels: the hydraulic unit generates torque pulses with elevated frequencies, **allowing rapid tightening with modest torque reaction on the hand**.

Hydraulic pulse air wrenches with automatic air shut-off

In addition to the advantages offered by the range described above, the hydraulic pulse air wrenches with automatic air shut-off offer, accurate tightenings both with soft and hard joints regardless of the action of the operator.

ELECTRIC SCREWDRIVERS

Electric screwdrivers with and without brushes with automatic electric feed shut-off

These screwdrivers have a clutch with automatic electric feed shutoff, which provides similar performance to the air screwdrivers with clutch.
They can be fed through cable or battery.

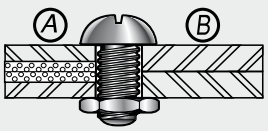
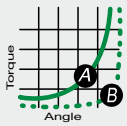
Brushless electric screwdrivers with computerized control (with computerized electric feed shut-off)

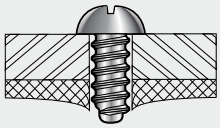
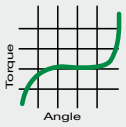
A feed and control unit, teamed with the impressive flexibility, the wide field of use and controllability of the brushless electric motor, permit to set very effective tightening strategies, **high flexibility in the assembly process, easy integration into production lines, traceability of all data of the assemblies** both in the case of electric screwdrivers used manually and in the case of electric nutrunner motors integrated on complex assembly systems (such as multispindle tightening units or robot manipulators).
The control of the tightening process is guaranteed by the presence of the built-in resolver/encoder that guarantee an elevated resolution in the angle measurement and therefore it assures an excellent tightening process control.
There are two types of brushless electric motors:

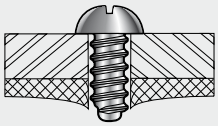
- **CURRENT CONTROL:** The torque parameters are achieved by measuring the current absorbed by the brushless motor; the angle parameters are achieved by appropriate sensors.
- **TORQUE AND ANGLE CONTROL:** Equipped with an electronic transducer to read the torque applied to the screw; while the angle is read directly by appropriate sensors.

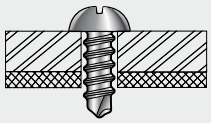
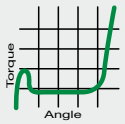
Types of joint and choice of torque control system

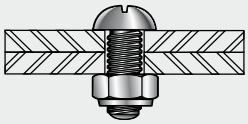
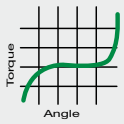
A list of examples of joints follows together with the most suitable torque control system for most applications. The wide variety of assembly solutions leads us to recommend an adequate “on-site” assessment in cooperation with the Fiam Technical Consultancy Service.

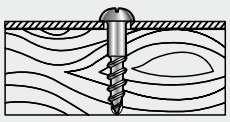
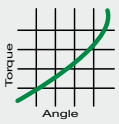
SOFT JOINT (A) AND HARD JOINT (B) / METAL SCREW (CLASS 8,8)		RECOMMENDED TORQUE CONTROL SYSTEM							
		1	2	3	4	5	6	7	8
The initial torque required is very low and grows gradually (soft joint A) or rapidly (hard joint B) when the screw head begins to slip on the joint.	 	■■■	■■■	■	■	■	■■	■■■	■■■

SHEET METAL JOINT / SELF-THREADING SCREW		RECOMMENDED TORQUE CONTROL SYSTEM							
		1	2	3	4	5	6	7	8
The initial torque for forming the thread is lower than the final tightening torque.	 	■■■	■■■	■■	■	■	■■	■■■	■■

ENAMELLED SHEET METAL JOINT / SELF-THREADING SCREW		RECOMMENDED TORQUE CONTROL SYSTEM							
		1	2	3	4	5	6	7	8
The initial torque for forming the thread is higher than the final tightening torque.	 	■	■	■■	■			■	■■■

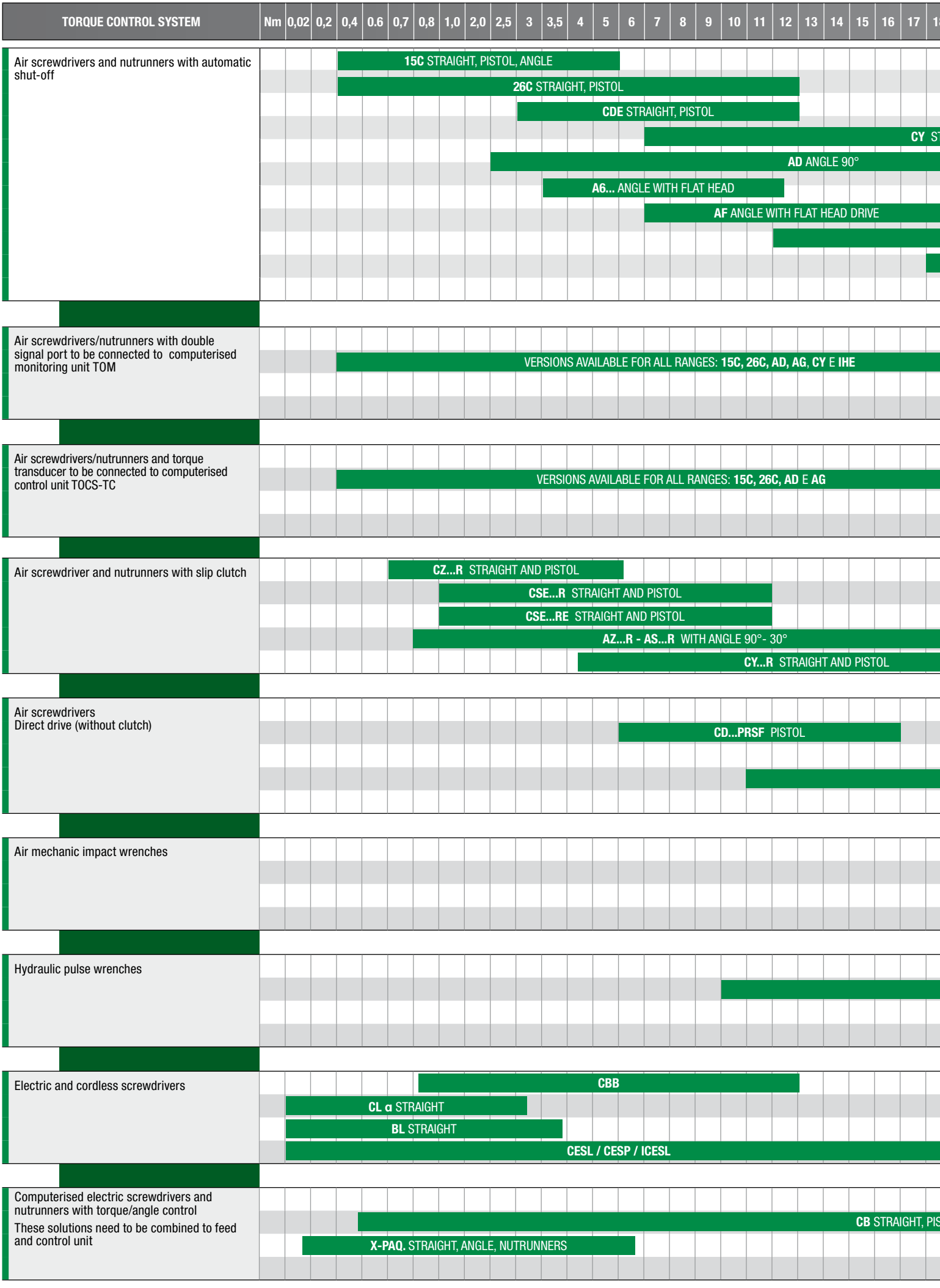
SHEET METAL JOINT / SELF-DRILLING SCREW		RECOMMENDED TORQUE CONTROL SYSTEM							
		1	2	3	4	5	6	7	8
The initial torque for making the hole and forming the thread tends to increase rapidly when the screw head slips on the joint.	 	■■■	■■■	■	■	■	■	■■■	■

JOINT WITH SELF-LOCKING NUT		RECOMMENDED TORQUE CONTROL SYSTEM							
		1	2	3	4	5	6	7	8
The initial torque required to overcome the friction generated by the plastic insert in the nut tends to increase rapidly when the screw head slips on the joint.	 	■■■	■■■	■	■	■	■■	■■	■■■

JOINT FOR WOOD/PLASTIC SCREW		RECOMMENDED TORQUE CONTROL SYSTEM							
		1	2	3	4	5	6	7	8
The torque level increases gradually and constantly until the final peak when the screw slips on the joint.	 	■■■	■■■	■■	■■			■■■	■

KEY	■■■ Recommended ■■ Acceptable ■ Slightly recommended

TYPE OF TORQUE CONTROL SYSTEM					
1	Immediate and automatic air shut-off / Automatic air shut-off and pneumatic pick-up signal	3	Slip clutch	6	Hydraulic pulse and hydraulic pulse with automatic air shut-off
		4	Direct drive without clutch (or stall drive)	7	Automatic shut-off of the electric feed
2	Immediate and automatic air shut-off and torque transducer	5	Mechanic impact	8	Computerised shut-off of the electric feed


TORQUE CONTROL SYSTEM
Nm
0,02
0,2
0,4
0.6
0,7
0,8
1,0
2,0
2,5
3
3,5
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Air screwdrivers and nutrunners with automatic shut-off
15C STRAIGHT, PISTOL, ANGLE
26C STRAIGHT, PISTOL
CDE STRAIGHT, PISTOL
CY S
AD ANGLE 90°
A6... ANGLE WITH FLAT HEAD
AF ANGLE WITH FLAT HEAD DRIVE
Air screwdrivers/nutrunners with double signal port to be connected to computerised monitoring unit TOM
VERSIONS AVAILABLE FOR ALL RANGES: 15C, 26C, AD, AG, CY E IHE
Air screwdrivers/nutrunners and torque transducer to be connected to computerised control unit TOCS-TC
VERSIONS AVAILABLE FOR ALL RANGES: 15C, 26C, AD E AG
Air screwdriver and nutrunners with slip clutch
CZ...R STRAIGHT AND PISTOL
CSE...R STRAIGHT AND PISTOL
CSE...RE STRAIGHT AND PISTOL
AZ...R - AS...R WITH ANGLE 90°- 30°
CY...R STRAIGHT AND PISTOL
Air screwdrivers
Direct drive (without clutch)
CD...PRSF PISTOL
Air mechanic impact wrenches
Hydraulic pulse wrenches
Electric and cordless screwdrivers
CBB
CL α STRAIGHT
BL STRAIGHT
CESL / CESP / ICESL
Computerised electric screwdrivers and nutrunners with torque/angle control
These solutions need to be combined to feed and control unit
CB STRAIGHT, PIS
X-PAQ. STRAIGHT, ANGLE, NUTRUNNERS

8	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	40	50	60	70	95	110	145	175	230	400	907

TRAIGHT, PISTOL - **CG** STRAIGHT

A10RYA ANGLE WITH FLAT HEAD

AG...RA ANGLE 90°

50 C ANGLE 90°

AS, AN, AY

CSI... STRAIGHT - **IM...** PISTOL

IHE... STRAIGHT AND PISTOL

TOL, ANGLE

ERGONOMICS AND SAFETY. TIGHTEN WELL, PRODUCE BETTER.

Ergonomics and good quality of the tools together with the optmization of their use in the working place are the main factors to safeguard the operator's health and safety. They are therefore **fundamental parameters of choice**.

Fiam commitment for safety, ergonomics and environment safeguard has been realised not only by **designing and manufacturing innovative and modern tools**, but also by working with European ergonomics experts, work medicine physicians, safety experts, who support Fiam with their experience.
Fiam has modern laboratories and specialized technicians in work-place analisys, measurement of noise level, vibration and other ergonomic parameters.
Fiam supports its customers with concrete instruments and services regarding ergonomics: we suggest you to read the different Fiam publications about safety.

Booklet for operators 'How to use hand-held air screwdrivers correctly to prevent any possible disease of the upper limbs'

Ergonomics according to Fiam.

Tools shape

ROUNDED SHAPES WITH NO SHARP EDGES ALLOWING VARIOUS TIGHTENING POSITIONS

Pistol grips, for example, must offer the following 4 basic grips:

- **"High" grip** for exercising sufficient thrust keeping the tool aligned with the arm. Ensures the arm is not subject to bending force which would fatigue it;
- **"Low" grip** when less thrust and more aim pressure is required;
- **"Forward" grip** to help balance the screwdriver;
- **"Up grip"** for working with an overhead air feed.

ERGONOMIC GRIPS (SAFE, WITH THERMAL ISOLATION, NO-SLIP GRIPS)

The grip of the screwdrivers is specially designed for use by **both right and left hand operators** and fpr **women's hands**, too. It is shaped so that torque reaction and axial thrust are contrasted by the operator as effectively as possible by means of a safe, **no-slip grip**.
The screwdrivers with straight grips are covered with **soft material and insulate the operator's hand from sudden changes of temperature**.
The more modern models have some shapes that avoid the slip the hand and are equipped with an anti-slip collar that avoids the slip of the hand towards the tightening point, above all in case of big thrust on the screw.
Angle nutrunners are perfect for working in small, inaccessible areas.

OTHER ERGONOMIC AND ENVIRONMENTAL IMPACT FEATURES

- Choose screwdrivers with possibility of **conveying air exhaust** away from the operator.
- Choose models **suitable both for right and left hand operators**.
- Choose models that can work with non lubricated air, thus eliminating **release of oil exhaust** into the working environment.

Reaction on the hand (torque reaction)

When the tightening operation is over and the pre-set torque is reached, it is possible to have some tool's reactions rebounding on the operator's hand.

These torque reactions may cause:

- rapid changes of wrist position
- excessive force use
- gesture quickness

These factors can generate **muscles and tendons overload**.

Therefore it is important to **choose screwdrivers/nutrunners with immediate and automatic shut-off**, because, when the pre-set torque is reached, not only does the mechanical clutch stop the air feed to the air motor but it also immediately disconnects transmission of power between the accessory (bit) and the rotating components of the screwdriver, thereby eliminating all inertia.

This minimises the reaction exercised by the screwdriver on the operator's hand after reaching the pre-set torque and reduces consequently **the reaction on the operator's hand**.

BT TELESCOPIC REACTION ARMS

They eliminate reaction on operator's hand: BT arms reduce torque reaction on operator's hand.
They can be used with every type of tool; they permit to work on wide operating areas (max work range 1700 mm) and the wide rotation of the tool around its axis. They are equipped with **3 telescopic elements** and double terminal coupling to guarantee high handiness and manouvrability. They can be easily installed on existing workplaces on ceiling or wall.

BC CARTESIAN ARMS

These efficacious mechanical devices permit operations requiring the use of tools to be ergonomic thus significantly reducing operator effort since:

- **they eliminate any counterblow actionon the operators hands;**
- **they eliminate the need for forcein holding the tool;**
- **they drastically reduce or eliminatevibrations;**
- **they allow the maintenance of a good wrist position.**

They can be used with every type of tool with diameter up to 50 mm and weight up to 7 Kg.
Made of tempered and chrome steel, their movements on vertical and horizontal axis guarantee smoothness, handiness and accuracy.
They guarantee great flexibility both in extension over its entire height (775 mm) and in the rotation at 360°. It is possible to adjust the horizontal axis to favour the return of tool at initial position and its easy position adjustment in continuous mode: this is made without disassembling components, by loosening and re-tightening screws in the new position.

Starting the tool

Doing a large number of tightening operations during the day can also fatigue the operator's fingers due to the effort required to start and keep using the tool or to untighten. This problem is solved by several, specially designed starting solutions (push, button, with reversibility next to the starting button, etc.) that help reducing considerably the effort necessary to start the tool with consequent advantages in terms of reduced fatigue.

STRAIGHT SCREWDRIVERS AND NUTRUNNERS

- Choose push to start screwdrivers if you have cross-slotted screws (as an axial thrust is necessary to maintain the connection between screw and screwdriver during torque transmission).
- Choose lever screwdrivers for other screw types.
- For tightening and untightening operations, choose models with comfortable reversibility button.

To tighten with minimum push, it is necessary to

- Use straight screwdrivers with 'overturned trumpet-shaped' handgrip or, in case a great force is needed (with cross-slotted, self-drilling, self-tapping screwd, etc.), with anti-slip collar avoiding slipping of the hand.
- Straight screwdrivers with no-slip grip.

PISTOL SCREWDRIVERS

- When using pistol screwdrivers with low effort button, the start button can be pushed with minimum pressure.
- For tightening and untightening operations, choose models with comfortable reverse button.
- The **reversibility next to starting button** permit to activate by the same hand, allowing a practical change of rotation. It is suitable for applications where screw loosening is recurring and when it is necessary to untighten several times to realign parts when not correctly tightened on the component.

To tighten with minimum push, it is necessary to choose the right pistol grip (see side).

Weight and suspension systems

Heavy and badly-balanced screwdrivers cause operator fatigue.
The ergonomic shape of the grip and the use of light alloys produce lightweight, correctly balanced screwdrivers which offer **greater handiness** at the same torque levels.
Fatigue caused by these factors can **easily be eliminated** by means of **suitable balancers**.

Tool particularly suitable to the female hand.

Noise level

A technologically advanced air screwdriver must be designed in order to **reduce noise levels at source**. The use of automatic air shut-off clutches offers considerable noise reductions, compared with those produced by traditional screwdrivers with slip clutches. With automatic air shut-off clutches, the time during which the operator remains exposed to this phenomenon is also reduced. As previously mentioned, in fact, these screwdrivers automatically stop as soon as the pre-set torque is reached. **Exposure time is reduced by about four times** compared with exposure times of traditional slip screwdrivers. As well as adapting the internal mechanisms, the use of new built-in silencing systems has considerably reduced the noise caused by the exhaust air of the screwdriver. To further reduce the noise emitted by the screwdrivers, tubes for conveying the exhaust air should also be used. All our screwdrivers are therefore designed in that sense.

Vibrations

Screwdrivers and nutrunners, similarly to most portable machines, are a source of **vibrations. This phenomenon is particularly important as vibrations are transmitted directly to the hand and arm** of the operator who grips the equipment and can give rise to considerable levels of exposure.
The use of a technologically advanced automatic air shut-off clutch reduces the vibration levels to under 1 m/s^2 (the threshold level under which the risk is considered nil is 2,5 m/s^2) with respect to traditional slip clutches. As well as generating considerably lower vibration levels, **screwdrivers with automatic air shut-off clutches also reduce the time in which the operator remains exposed to this phenomenon**.

Accessories to be used

Modality of use, materials and accessories must always be considered for risk analisys.
They are **important factors to be chosen according to type of screw, type of joint and type of work-station**.
Therefore a right choice is fundamental to have more efficient tightening operations, and respect of ergonomic principles. Following factors shall be considered:

- **type of bit** according to screw and joint (don't use too long bits: the distance between screw and screwdriver must be minimum and without spaces)
- **air supply system** (a correct air supply guarantees perfect tool functionality)
- **air exhaust conveyors** (to avoid the air exhaust to be addressed towards the operator)
- duly calibrated **balancers**
- **gloves, caps and accessories** according to local rules
- **working area:** the working lay-out often require the air feeding from different points: from above and from below. The choice of screwdrivers with the triple air inlets allow using the same pistol grip for different working lay-out with rapid sequence.

Other suggestions for a quality assembling

Efficiency of the compressed air systems is essential to guarantee tool performances.
The tools performances are also guaranteed when **programmed and preventive maintenance is** made properly by trained expert staff. It is also important always to use **original spare parts** which ensure the perfect functionality of the tools.
These precautions allow a monitoring of **T.C.O. (Total Cost of Ownership)** or the total cost of ownership of an industrial equipment that **depends not only on the initial purchasing costs, but also on all costs regarding the whole lifetime of the same including maintenance, repair and disposal costs.**
Recommended ***dynamic air pressure*** is 6,3 bar. In order to prevent compressed air leakage it is important that all accessories (couplings, nipples, …) feature **appropriate gaskets**. Another suggestion to obtain dynamic pressure at 6,3 bar is to use **appropriate air feeding hoses**.
Moreover it is recommended the use of the **FRL group** (filter, pressure regulator, lubricator) to **filter, regulate and lubricate the compressed air supply** of air tools.
This system **eliminates solids and humidity** while supplying a precise air flow and suitable lubrication. Where necessary, it is **indicated for obtaining the required torque values by adjusting the pressure of the air supply.** The tools performances are also guaranteed when **programmed and preventive maintenance** is made properly by trained expert staff. It is also important always to use **original spare parts w**hich ensure the perfect functionality of the tools.
These precautions allow a monitoring of **T.C.O. (Total Cost of Ownership)** or the total cost of ownership of an industrial equipment that **depends not only on the initial purchasing costs, but also on all costs regarding the whole lifetime of the same including maintenance, repair and disposal costs.**
For further information see Fiam Accessories catalogue.

Environmental factors

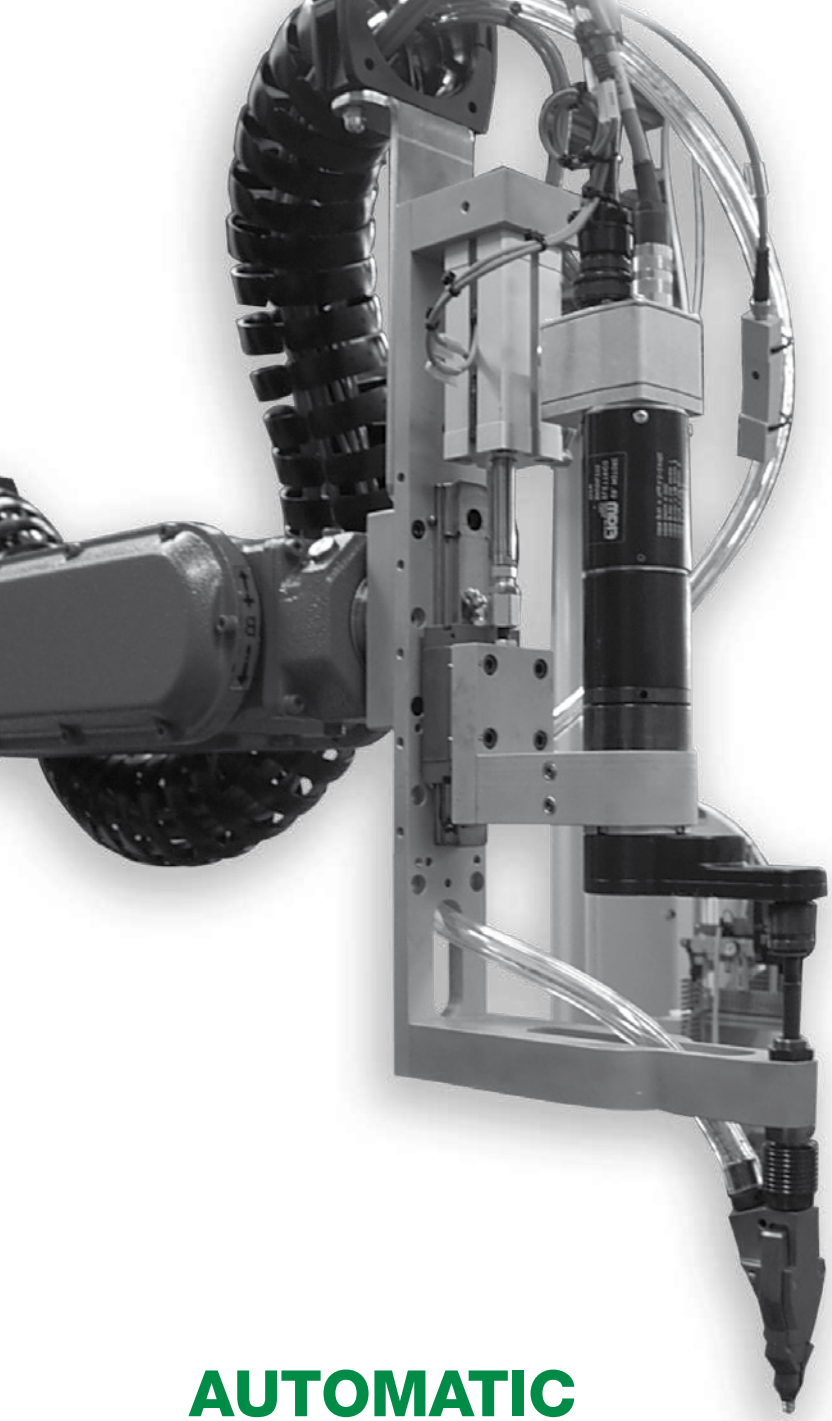
Attention to the environment and its safeguard is more important now than ever before. The correct choice of the screwdriver can reduce power consumption, oil fog emissions and noise pollution, as well as making disposal of the screwdriver itself easier.

Technological developments have allowed screwdrivers to be produced **using non-lubricated compressed air**. The most significant advantage of this is the elimination of all emissions of oil fog with the exhaust air.

This is mainly for the benefit of operator comfort but it also allows them to be used in delicate conditions (electronics, eye-glasses, precision engineering, etc…) and eliminates the costs of lubrication systems.

Another factor to consider is the **reduction in the consumption of compressed air**. An automatic air shut-off screwdriver consumes about 30% less than a traditional slip screwdriver.
New models have inner kinematic motions which optimize efficiency and the available power is being transmitted with minimum dispersions.

A further important point is that the best screwdrivers are built using recyclable materials (steel, cast iron, brass, plastic). All the components must be **easy to dispose of and must not be an environmental pollution and/or personal safety hazard**.
Attention towards environmental factors is a fundamental commitment for Fiam which has been developed into an efficient ISO 14001:2015 Certified Environmental Management System.



AUTOMATIC TIGHTENING. THE FUTURE IS HERE.

Tightening operations include some manual steps, such as for example picking up the screw and its positioning, that slow down considerably production rate.
Fiam solves these productivity problems by manufacturing tightening systems, from simple solutions, as **manual screw-drivers equipped with or automatic screw feeding, to entirely automatic assembly systems**: all effective solutions to tighten rapidly and with safety.
For further information about Fiam solutions refer to ‘Tightening automation’ catalogues.

AUTOMATIC SCREW FEEDING SYSTEM

Used for large or medium batch of equal screws, they **strongly increase productivity**, allowing a return on the investment in just a short time.
This is why:

- the **screw is automatically sent from the feeding bowl** to the head of the screwdriver;
- the **screw is positioned on the piece** at the **same time** as the screwdriver is operated
- they guarantee an evident reduction of the **tightening cycle times, saving almost 35%**: the manual phases (picking up and positioning of the screw) are eliminated; they considerably reduce the rhythm of the assembly process.

The automatic tightening systems CA Easydriver ae able to tighten on every type of component, also close to sidewalls, or inside small diameter holes or holes that are very deep.
Different models, air, electric, electronic are available with forward bit stroke or telescopic device. (See cat. Fiam CA Easydriver nr. 89).

Semi-automatic feeders CA EasyDriver

SEMI-AUTOMATIC TIGHTENING SYSTEMS

These provide a simple and continuous supply of screws and/or nuts and make the work of the operator easy as **he no longer has to pick up the screw and/or nut and position it on the screwdriver bit or on the piece**.

- **Semi-automatic feeders AM**
  For hex nuts from 5.5 to 13 mm (catalogue nr. 32)
- **Semi-automatic feeders QUICHER**
  For magnetisable screws with shank diameters from 1.4 to 5 mm, with PHILLIPS (or POZIDRIVE) cross-slot imprint (catalogue nr. 32)

Semi-automatic feeders AM

Semi-automatic feeders QUICHER

MULTI-SPINDLE UNITS WITH AIR OR ELECTRIC DRIVE

Multi-spindle units offer elevated production rhythms given that they perform **two or more tightening operations at the same time**. Multiple screwdrivers have two or more spindles with fixed or variable distance between the centre and are fitted with manual or automatic feeding devices. They can be powered by air or electricity and there are various systems for programming, controlling and monitoring the production cycle in order to guarantee reliability, accuracy and speed (Fiam catalogue nr. 1008).

AUTOFEED TIGHTENING MODULES

These solutions are a must when large and medium batches of the same screws have to be tightened. They can be **integrated** on pre-existing productive systems **(production lines, on manipulators, electric axis, robot ecc.)** to obtain **complete and indipendent** tightening systems with an external start.
The **EasyDriver MCA tightening modules** consist of **automatic screw feeder, fastening slide and air or electric nutrunner motor.**
The screws are constantly sent from the bowl to the screw holding device; the approaching and tightening on the workpiece is automatic and accurate and all tightening cycle is managed con contolled by PLC.
They are suitable for each torque need, also when used in heavy duty conditions. **Different torque control systems are available and can be chosen depending on application and type of joint and fastener** (see catalogue nr. 73).

AUTOMATIC UNITS WITH AUTOMATIC SCREW FEED

These completely automated assembly units increase productivity according to customer requirements and increase the quality of the finished product. Completely designed and manufactured by Fiam, they use air, electric and electronic nutrunner motors and they are able to assembly each type of threaded element. They reduce They r**educe process times and rationalise the work of the operators who also enjoy improved working conditions; production costs are also reduced**. The various solutions offer various levels of automation and complexity and are studied together with the customer by means of a specialised and fast consulting service.

FIAM SERVICE. THE KEY FOR A WINNING PARTNERSHIP.

The ability to meet customers' expectations is also confirmed by **many high quality services** Fiam provides to its customers through its team, every day with qualified expertise.
Dynamic persons to evaluate, respond, advise, solve and act.
The everyday face of your Business Partner Fiam.

CHOOSING THE SOLUTION

Customised screwdriver with suction device useful in case of non-magnetisable stainless steel screws

HOW TO CHOOSE THE RIGHT SOLUTION

Detailed technical-application analysis both of the manufacturing processes and of the workpieces are offered by a widespread technical-commercial network in Italy and abroad. These consultancies permit to choose the optimal solution: in order to increase quality of the assembled product, productivity and improve ergonomics of the work-stations. Therefore each investment will have the maximum yield.

CUSTOMISED SOLUTIONS

Our skilled technicians and design department work alongside with the customer from design to realization of the customized products. Flexibility is at maximum: Fiam has a production area dedicated to customized solutions and specialized for small series production.

HIRE SERVICES

A wide choice of financial solutions; simple, fast to be activated, with special terms and tax breaks. To allow you to plan your investments and work without maintenance costs.

TRY & BUY SERVICE

Advantageous opportunities to:

- test and check out the compatibility of the choice with actual production requirements;
- test the real efficacy of a new Fiam product;
- be sure to purchase what you really need;
- test the solution directly on production site;
- purchase only after checking the real reliability and efficacy of the tested product.

SERVICES INVOLVING ERGONOMICS AND SAFETY

Analysis of workstations.

The analisys can be effected directly on production site in order to evaluate some critical work situations for the operator's safety and to offer therefore customized solutions: from the simplest ones to those requiring complete design of the workstation. Our service is completed by useful suggestions on correct posture and the effective use of tools.

Measurement of vibrations and noise.

Measurement on tools on production site allows to determine the vibration risk for hand, arm or entire body of the operator, giving useful suggestions. All measurements are certified according to standards.

Measurement of frequent and repetitive movements – according to the Ocra Method.

This service provides analysis of workstations on production site according to the Ocra Method and provides suggestions to obtain ergonomic workstations.

Creation of the risk assessment document.

TRAINING

Qualified teachers support companies aiming at ambitious targets in terms of productivity and working quality.
Theoretical and practical teachings highlight the strategic importance of the entire company production process: tightening phases, maintenance, techniques to optimize the production process, knowledge and correct application of the ergonomics and safety principles.

INSTALLATION AND MAINTENANCE

Not only products: choosing Fiam means also availing oneself of a complete, extensive pre-and-after-sales service. A wide serie of supports dedicated to customer's satisfaction, eight points to make the difference. Always.

1. **INSTALLATION SERVICES AT CUSTOMER SITE**
2. **FAST AND COMPETENT TECHNICAL SERVICE**
   directly at customer's premises to ensure production continuity.
3. **REPLACEMENT PRODUCT SUPPLY SERVICES**
4. **GUARANTEED, PRECISE REPAIR SERVICES**
   at controlled prices: these are provided directly by the local Fiam dealer.
5. **SCHEDULED MAINTENANCE WORK**
   on production sites.
6. **PROMPT-DELIVERY**
   original spare parts.
7. **OBSOLETE TOOL SCRAPPING SERVICES**
8. **TOOL CALIBRATION SERVICE**
   to have tools that are always up to standard.

Choose online Fiam solution for your industrial production processes: the best technology with a clik.

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Quality Management System Certificate

Environmental Management System Certificate