v. 02/2006

P.LEMMENS
AIR MOVEMENT COMPANY

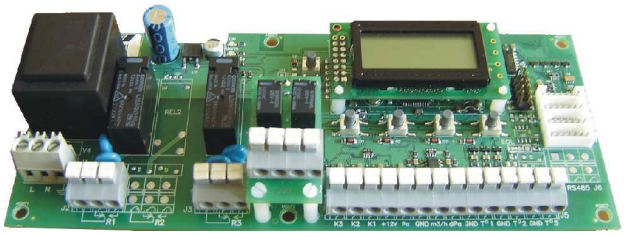
TAC3™

The 3rd generation....

Technico-commercial documentation

1.Introduction

We have the honor to present after 10 years of experience, the 3rd generation of the TAC product range, dedicated to the intelligent piloting of the TAC fans.



1.1 What is TAC-tech?

TACtech
means "Total Airflow Control Technology ", in other words «Technology of total control of the airflow». It rests on the construction of airflow algorithms, and exploits the latest developments in electrical motors such as the Electronically Commutated Motor, an intelligent DC driven. PLC applies this technology to the airflow control since 1996.

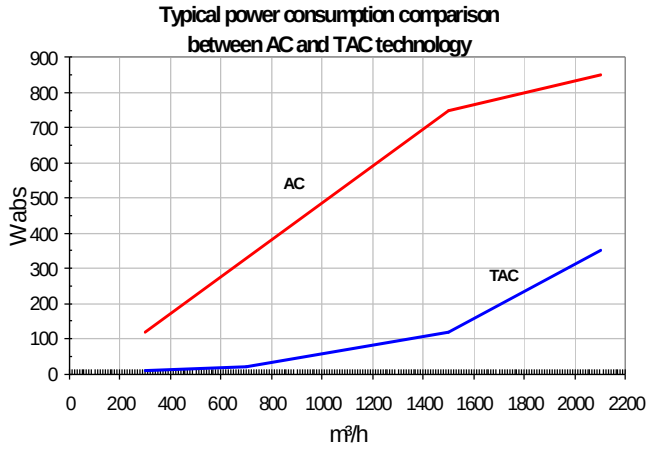
Today, we proudly present 3rd generation of this product line.

Intelligent motor, intelligent fan
The ECM motor is able to communicate instant accurate information on the motor's working point. Using this information, we have built airflow models allowing instantaneous calculation of the fan's actual working point. The result of these developments is available in the TAC3 product line.

The availability at any time of this information opens the door to numerous intelligent exploitations. The TACtech exploits this characteristic to pilot the fan according to the needs of the application.

Extremely high efficiency.
The efficiency of the DC ECM motor is very high, whatever its speed of rotation. It is included between 60 and 85 %, for a rotation speed included between 300 rpm and on 1800 rpm. This characteristic by itself already justifies the use of TACTech.

Economical = Ecological
(+ efficiency = - power consumption = - heat loss = - cooling load = + ecological).
The product is specifically developed for energy savings. Consequently, the power consumption can be reduced by 80 % with regard to a standard centrifugal AC fan (cfr graph below).



On top of the direct energy saving, there is an indirect one: less electrical consumption means less heat loss and thus in certain cases less cooling load. Less cooling load could mean air conditioning savings, in power consumption and also in investment (smaller units).

TAC technology represents a concrete result of the industry's search for better, more eco-responsible products, and its concern for the global warming threat brought forward at the Kyoto conference.

What advantages for each intervening party?

For the designer:
Integrating top state of the art technology, thus designing a top state of the art product. Satisfied customers.

For the installer:
Strongly reduced fine tuning time. Cheaper airflow control components and power components. More margins to be more competitive.

For the maintenance contractor:
Simple, easy and quick diagnostics. Accurate, foreseeable interventions that can be planned. Tele-maintenance via modem. More margins to be more competitive.

For the OEM:
A more competitive product, with lots of extra sales arguments. Less regulation costs, with more long-term quality. Possibility to individualize the production process (each fan can be programmed). Special features (display of airflow pressure, alarms) and remote diagnostics,.....

For the paying end user:
Substantial energy savings on the electrical bill, lower investments at equivalent functions, lower functioning costs, plus all of the advantages stated above.

1.2 Changes compared to Generation 2

The functionalities themselves do not change. The working modes are preserved:
CA (constant airflow, LS (link with 0/10V signal), CPf (constant Fan Pressure, without sensor), CPs (Constant Pressure with pressure sensor, but also any other value measured by a 0/10V).
The network version (n) is also preserved.
It is essentially at the level of the **conviviality** and the features that the improvements were brought:

G3 Features:

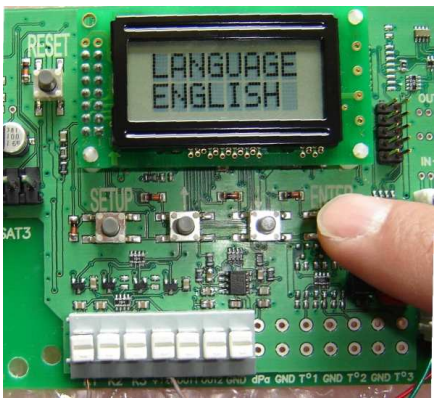
- Easy, logical, intuitive setups using LCD screen and 4 knob keyboard
- Choice between 4 languages (F, NL, GB, D)
- Easy communication for setup. Just ask it and you'll get it.
- Power Box (PB) and Control Box (CB) have been merged in 1 circuit. No more Control Cable (CCRJ45) between them.
- The CB is with a transparent lid. The display clearly shows in text the status of the fan, as well as a clear description of the possible alarm, and LEDs status.
- Fan working status (ON/OFF) via digital output
- « Advanced setup » functionalities to modify any special parameter such as motor starting torque, algorithm reaction speed (CPs), analogical output parameters, post-ventilation, etc.. (for advanced users only)
- Improved circuit boards manufacturing technology
- Improved airflow algorithms
- Full retrofit towards G2
- Easy wiring

1.3 The 5 new G3 control boxes (CB) and correspondence with the G2 CB's:

IDCode	Name	#	Application	Replaces
370003	**CB1 TAC3 CA**	1	**CA** (Constant Airflow) only. Continuous choice of 1, 2 or 3 constant airflows.	CB TACd2
370004	**CB1 TAC3 FULL**	1	**CA** (Continuous choice of 1, 2 or 3 constant airflows) **LS** (Link of the constant airflow value to a 0/10V signal) **CP** (constant pressure with pressure sensor (CPs) or without (CPf))	CB TACd2, CB TACls2, CB TACcp2, CB TACn2_SA
370002	**CB1TAC3 N**	1	**Network** version. Allows connecting 128 fans together (and more) in one network and configuration, supervision and maintenance with Eole-3 software. Requires PC and RS485 interface.	CB TACn2
370001	**CB4 TAC3 FULL**	4	**CA** (Continuous choice of 1, 2 or 3 constant airflows) **LS** (Link of the constant airflow value to a 0/10V signal) **CP** (constant pressure with pressure sensor (CPs) or without (CPf))	CBM TACd2
370000	**CB4 TAC3 REC**	4	**CA** (Continuous choice of 1, 2 or 3 constant airflows) **LS** (Link of the constant airflow value to a 0/10V signal) **CP** (constant pressure with pressure sensor (CPs) or without (CPf)) With REC type heat recovery unit control logic: by-pass control and exchanger anti-freeze protection.	R²3

#: Indicates the maximum number of fans the CB can pilot simultaneously.

1.4 Communication with LCD display and 4 knob keyboard

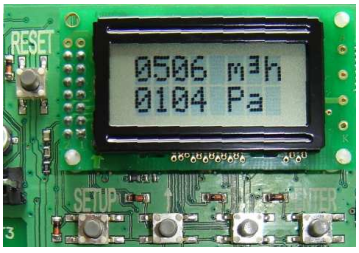


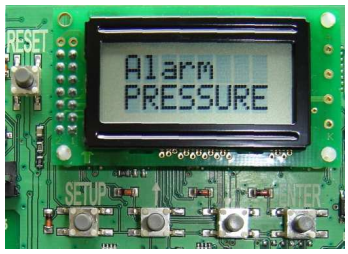
One of the big changes with regard to the previous generation is that from now on all the communication with the CB occurs with an LCD clear display and a 4 knob keyboard. The communication is thus much clearer, and especially since the LCD screen communicates in the language of your choice (F, NL, GB, D).

Programming CB's has becomes a child's game as the communication using a PC-like "intuitive" logic is as easy as setting your digital watch. The screen displays what is being asked, you just fill in the answer using the keyboard.

The 4 touch keyboard functions:

Knob	Function
SETUP	• Start setup of the CB
⇧	• Raise a value • Go up in a table
⇩	• Reduce a value • Go down in a table
ENTER	• Confirm a choice • Go to next step



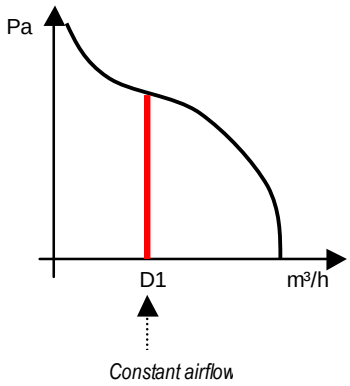


1.5 The 'RESET' function

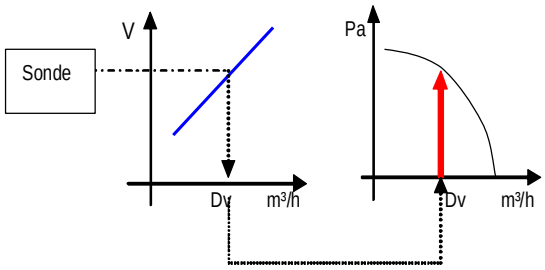
This function knob allows resetting the CB: fans are shut down, alarms are reset, and fans are then restarted according to its current configuration and to its input status. This function is not to be confused with the "factory reset" function.
Located in the "Advanced features" menu this "factory reset" function allows to reset all the settings as they are originally factory-programmed. All the user settings are then erased.

1.6 Brief reminder of the working modes (CA, LS, and CP)

CA means "Constant Airflow". It means that you choose one (or several) airflow(s) and the CB TAC3 will pilot the fan so that it is obtained, independantly from the counter pressure.



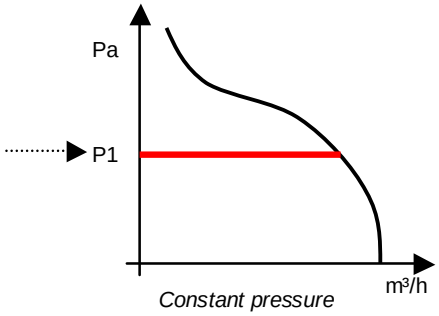
LS means « link with a 0/10V signal ». It means that the user introduces a specific linear relation between a 0/10V input signal (representing T°, relative humidity, air quality,…) and its corresponding airflow, and that the CB TAC3 will then carry out this task, independently from the actual pressure drop.



Link between 0/10V signal and constant airflow

CP means Constant Pressure. The user requests a setup airflow. The resulting counter-pressure is memorized as the reference value to be kept constant by the CB. The CB TAC3 will then pilot the fan to maintain this value constant independently from system changes.

The instantaneous pressure value at a given moment is provided either by the calculated value in the CB (the total static pressure applied against the fan) (**CPf** mode), either by a pressure sensor sensibly located somewhere in the airflow system (**CPs** mode). In both cases the algorithm will consider the instantaneous calculated (if CPf) or measured (if CPs) pressure value to adapt the working point so that the pre-determined reference pressure is kept constant.



2. Wiring principle

2.1 Introduction

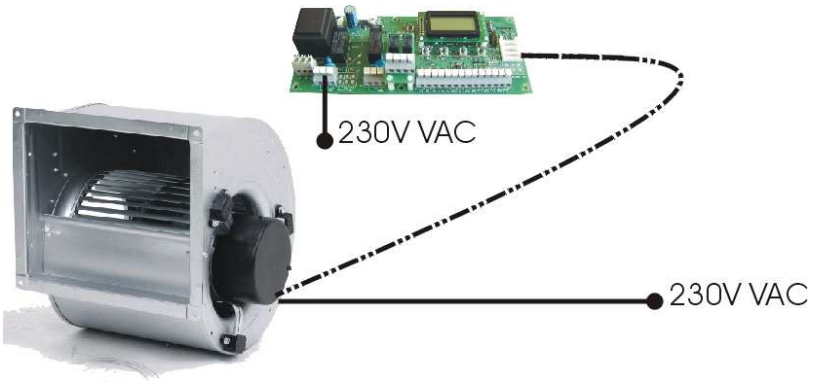
Unlike the G2, in G3, fan and CB are independently powered. This feature allows to eliminate the CC RJ45 (cable between PB and CB), which was identified as the 1st source of breakdown. The wiring finds itself simplified and much more reliable.

The electronic motors however still generate a starting peak reaching up to 150 Amps during 2 to 4 ms. This can cause starting problems during the startup of the fan, but can however be easily avoided by an appropriate electric protections choice (cfr 2.4).

Once the motor has started it is not necessary to shut the power off to stop the motor, indeed the softstop/softstart connection (see installation manual of each CB type) allows setting the motor in a stand-by mode (with low power consumption of 0,05W) while keeping it powered. It is simple, safe and inexpensive.

Special care has been brought to simplify the wiring: available space, spring WAGO connectors and clear and standardized identification of the terminals.

2.2 Power wiring schematic of TAC3 fans:



2.3 Dimensions of the CB

All the control boxes (CB) are in ABS with transparent cover allowing permanent LEDs and display legibility, with preformed holes for 10 x PG M16/20.
CB dimensions: 225 x 125 x 50 mm.
Box mounting screws (head of the screw < 7,5 mm) position = 206 x 96 mm.

2.4 Power connection characteristics:

<table>
<tr><td>Power supply :</td><td>230 VAC (208 V – 240 V)
110 VAC possible, contact us.</td></tr>
<tr><td>Frequency :</td><td>50/60 Hz</td></tr>
<tr><td>Grounding :</td><td>Grounding is COMPULSARY</td></tr>
<tr><td>Electrical Protection :</td><td>The motor is self-protected against overloading :
- The electronic device controls the working point by setting the torque/RPM relationship. It is impossible to make it work at a working point not included in the normal working range (torque cutback function).
- It is electronically protected against rotor locking. The motor controls starting torque and stops the starting procedure if it is higher than programmed.

It is thus NOT necessary to install an electrical overload protection device. We advise using a short circuit protection device with the following specifications:
- Starting peak of 150 A for 2 to 4 milliseconds.
- Use the “softstop” function to avoid creating this peak (see proper wiring diagram according to the selected setup here above).
- We recommend a class AM protection device, as it is designed to enable high starting peaks and protect against short circuits only. If a thermo-magnetic circuit breakers is used: D type “slow” reaction curves (C with PB S) – shutoff power 10.000A - AC3.
- Recommended protection caliber per motor rating :
<table>
<tr><th>Motor rating</th><th>Caliber</th></tr>
<tr><td>1/3</td><td>4A</td></tr>
<tr><td>1/2</td><td>4A</td></tr>
<tr><td>3/4</td><td>8A</td></tr>
<tr><td>1/1</td><td>10A</td></tr>
</table>
Be careful to double these values when protecting 2 fans working in parallel, as in PLC’s twin units (for example in some RECs, MB2 or COMPO M6/8).</td></tr>
<tr><td>Insulation class:</td><td>Thermal: B
Mechanical: IP44 – connectors must be oriented downwards.</td></tr>
<tr><td>Ambiant T°:</td><td>-10°to 55°C</td></tr>
<tr><td>Agencies :</td><td>- Motor: CE and UL approved
- CB : CE approved</td></tr>
<tr><td>Installation :</td><td>The installation has to be conforming to installation standards applicable.
NB: The conversion from AC to DC current creates a non sinusoidal AC line current. This creates low frequency current harmonics (not regulated by standards) introducing low frequency voltage harmonics (regulated by standards). These harmonics cannot influence the user’s equipment and can only bother the power supplier who sets limits not at each harmonic generator level but at the entrance of a sub network. The Voltage harmonic’s amplitude is directly related to the impedance of the sub network in which the motor is running. If the total level of harmonics on the sub network is not within the applicable standard, you need to raise the impedance before or after the straightener, which can be easily done by adjoining “selves” on the lines. The use of selves has to be considered only in high power consumption cases, and each case has to be considered separately.</td></tr>
<tr><td>Warning :</td><td>Be Careful to follow carefully the wiring instructions: Non conform wiring can cause fatal damage to the motor or the electronic circuits. This can jeopardize the warranty clause</td></tr>
</table>

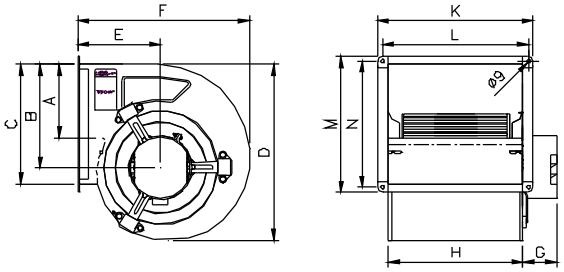
3. TAC3 fans range

3.1 Dimensions of the TAC3 fans

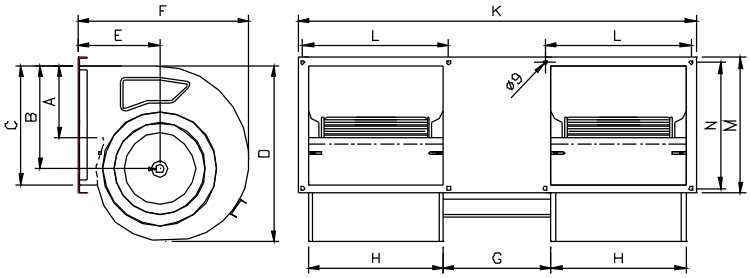
Fan type	CID	Weight Kg	Dimensions (mm)											
			A	B	C	D	E	F	G	H	K	L	M	N
DD 9-7 TH **TAC3** 1/2	720054	11.0	110	175	261	318	149	308	56	233	279	258	301	279
DD 9-9 **TAC3** 1/2	720055	12.5	163	229	265	391	180	379	70	300	346	325	301	279
DD 10-10 **TAC3** 3/4	720056	16.0	175	258	295	441	191	422	82	333	379	358	331	310
DD 11-11 **TAC3** 1/1	720057	17.5	167	262	313	456	193	432	35	370	416	395	350	329
DP 6-6 **TAC3** 1/2	720058	14.0	106	164	210	291	127	272	200	213	670	238	281	225
DP 9-7 TH **TAC3** 1/1	720059	20.5	110	175	261	318	149	308	200	233	710	258	301	279
DP 9-9 **TAC3** 1/1	720060	23.5	163	229	265	391	182	381	200	300	844	325	344	279
DS 10-4 TH **TAC3** 1/3	720071	10.0	110	175	261	318	169	328	68	135	181	160	301	279
DS 10-4 **TAC3** 1/2	720061	11.0	163	229	265	391	180	379	80	135	181	160	301	279
DS 11-4 **TAC3** 1/2	720062	12.5	175	258	295	441	191	422	70	158	204	183	331	310
DS 12-5 **TAC3** 3/4	720063	19.5	206	312	342	521	233	490	85	184	230	209	378	357
DF 280 P **TAC3** 1/3	720077	17	550	550	145	65	95	25						
DF 280 P **TAC3** 1/2	720078	18	550	550	145	78	95	25						

Principel schematics (detailed drawings : see DD DS DP selection software)

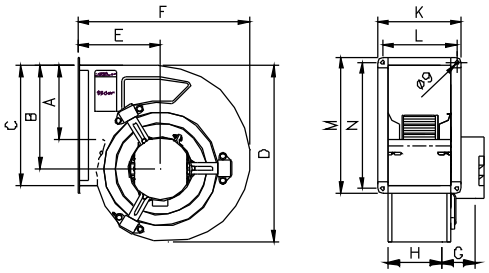
DD



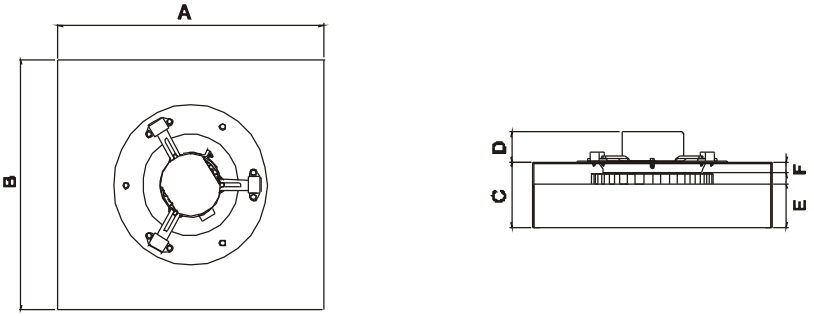
DP



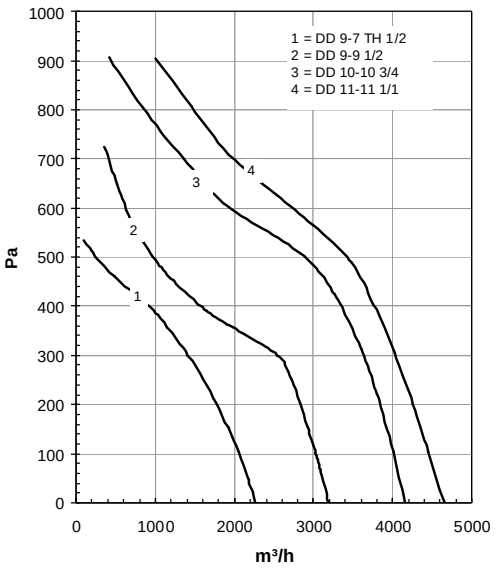
DS

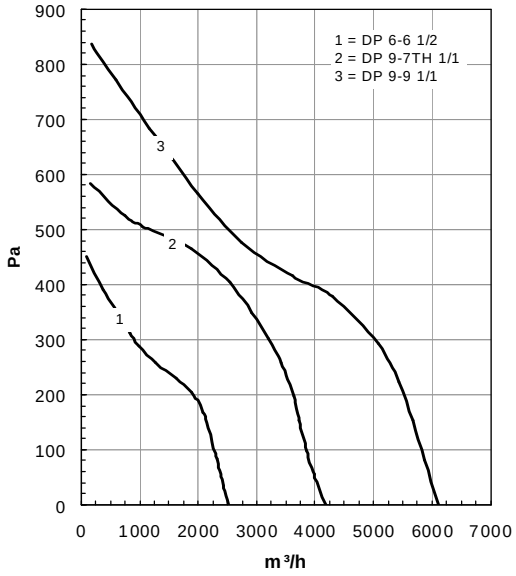


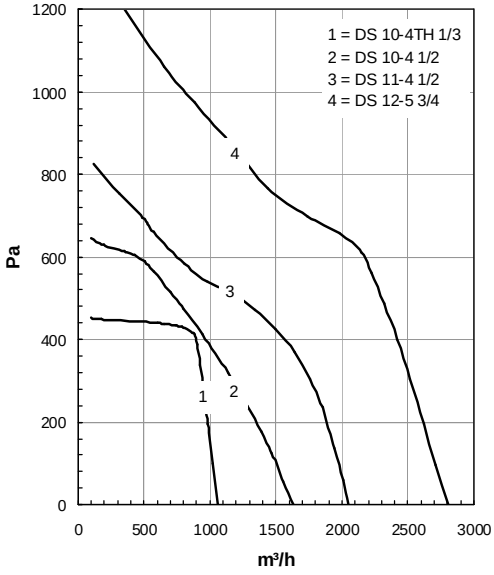
DF

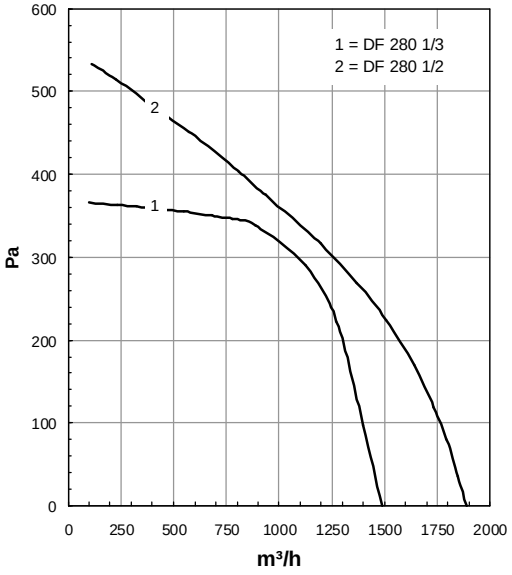


3.2 Working range of TAC3 fans:









3.3 Selection software for TAC3 fans:

We provide our customers with a selection program, or rather a simulation program, specific to the TAC3 fans. It allows to determine the exact performance of the TAC3 range fans for a given working point. A detailed technical data sheet, including an estimation of the sound level for a given configuration of the premises, can be printed for every selection. This software is free for our customers and is available from the www.lemmens.com website.