

Annex for Pos 010

Performance Data

(Tolerances according to DIN 24166 class 2 have to be considered
Verification according to DIN EN ISO 5801 only in standardized Piller testing installations
Technical data subject to change)

Noise data

(noise reduction measures out of scope of supply)

General Dimensions

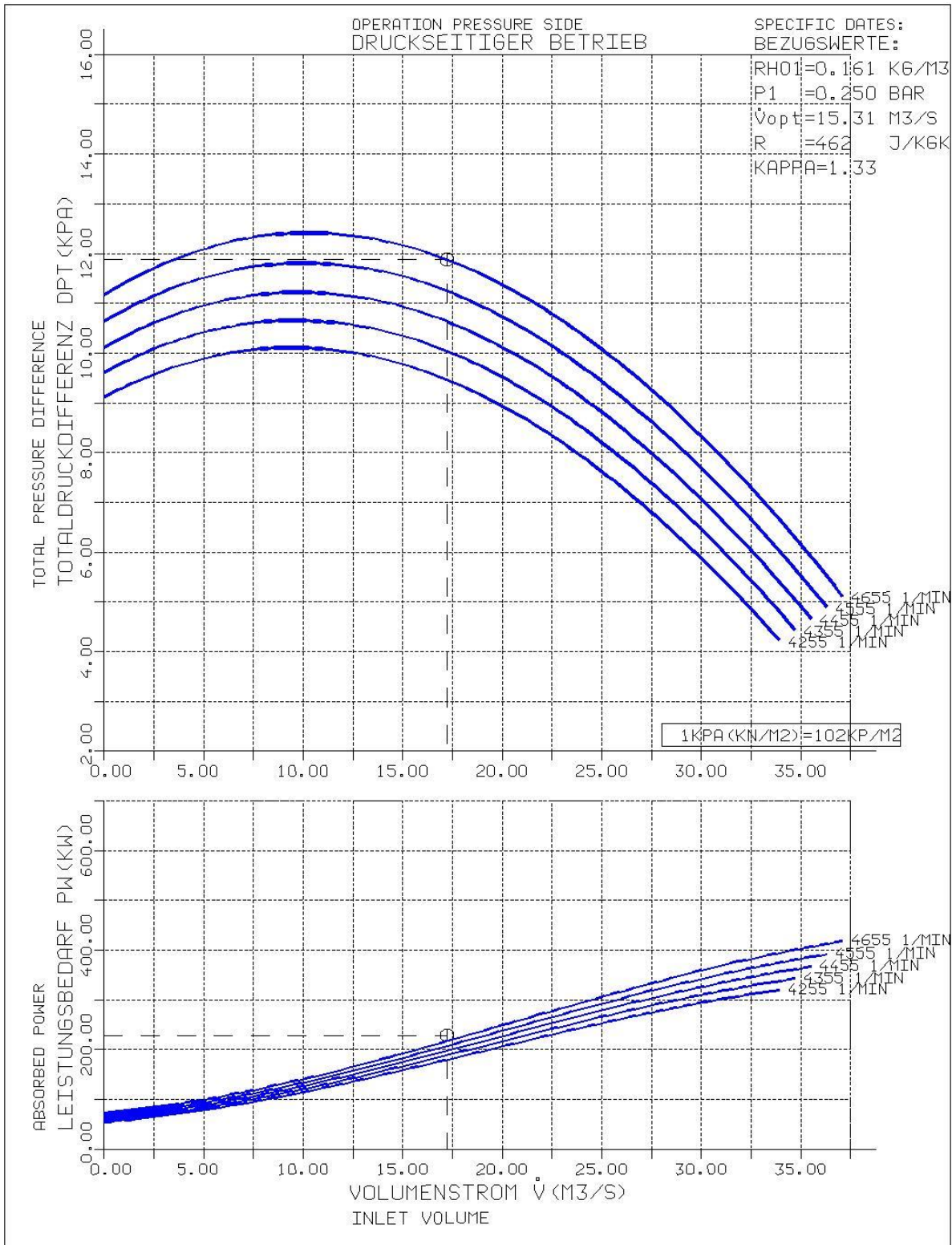
(preliminary)

21400265-00.010 / 0141C6Y

Fan type: 40770_KKXGA 80500 4SV

Operational Point		OP-1	OP-1 MAX
Fan Nr.		FAN 1	FAN 1
Mass flow	kg/h	10000.00	10000.00
Volume flow	m ³ /s	17.22	17.22
Inlet pressure	mbar	250.08	250.08
Real suction temperature	°C	65.00	65.00
Suction temperature, saturated	°C	65.00	65.00
Suction temperature, overheated	°C		
Density at operation	kg/m ³	0.16	0.16
Density overheated	kg/m ³		
Discharge pressure	mbar	366.52	366.69
Discharge temperature saturated	°C	73.80	73.81
Discharge temperature overheated	°C	107.20	107.30
Density with water	kg/m ³	0.16	0.16
Temperature difference	K	8.80	8.81
Total pressure difference	kPa	11.86	11.88
Dynamical pressure difference	mbar	2.20	2.20
Internal efficiency grade	%	80.00	80.00
Mass of injected water	kg/h	257.90	258.20
Shaft power	kW	222.90	223.10
Shaft power incl. water inj.	kW	228.60	228.80
Fan speed	rpm	4653.00	4656.00
Shut off speed	rpm	4706.00	4706.00
Discharge temperature max	°C	100.00	100.00
Moment of inertia	kg·m ²	36.00	36.00
Power density	kW/kPa/m ²	428.22	429.16
phi / phi opt	-	1.12	1.12

[VENT04 3.0] Datum/Date:29.01.14 (12.48)



 Industrieventilatoren GmbH	<p>FAN PERFORMANCE CURVE KENNLINIEN FUER RADIALVENTILATOR TYP 40770 KX6A 80500</p>	
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[VENT16 3.0]

N O I S E D A T A

29.01.14 (12.48)

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Fan type: 40770 KXGA 80500

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Volume flow : 17.230 m³/s Order : / / / /
 Total press.diferential: kPa Inquiry :
 Fan shaft speed : 4656 r.p.m Client :
 Impeller diameter : 1250 mm
 Inlet density : 0.161 kg/m³
 Inlet temperature : 20 deg.c
 Number of blades : 15
 Mat.thickn.of casing S1/S2:10.0/ 8.0 mm Blade frequency : 1164 Hz
 Impeller tip speed : 304.73 m/s Measur.-surf.lev: 18.0 dB

 O c t a v e - v a l u e s
 i n d B (A)

	Totals dB(A)	Frequency F (Hz)							
		63	125	250	500	1000	2000	4000	8000
LPS	110.0	77.0	94.5	105.5	103.0	103.0	98.5	95.5	87.0
LPD	116.0	83.0	100.5	111.5	109.0	109.0	104.5	101.5	93.0
LPR	91.0	64.0	74.0	85.0	86.0	86.0	81.5	79.0	67.5
LWR	109.0	82.0	92.0	103.0	104.0	104.0	99.5	97.0	85.5
LWISS	130.0	110.5	120.5	127.5	121.5	119.5	114.5	111.0	103.0
LWIDS	136.0	116.5	126.5	133.5	127.5	125.5	120.5	117.0	109.0
LPASSR	94.5	67.4	82.1	92.0	86.0	87.1	83.9	72.2	55.8
LPADSR	100.5	73.4	88.1	98.0	92.0	93.1	89.9	78.2	61.8
LWASSR	106.5	79.3	94.0	103.9	97.9	99.0	95.8	84.1	67.7
LWADSR	112.5	85.3	100.0	109.9	103.9	105.0	101.8	90.1	73.7

 LPS - Sound pressure level at 1 m distance in front of open inlet
 LPD - Sound pressure level at 1 m distance in front of open outlet
 LPR - Sound pressure level of noise emitted by fan casing at a dist. of 1 m
 LWR - External sound power level of LPR
 LWISS - Internal sound power level, inlet side
 LWIDS - Internal sound power level, outlet side
 LPASSR- External sound pressure level at 1.0 m distance of inlet duct
 LPADSR- External sound pressure level at 1.0 m distance of outlet duct
 LWASSR- External sound power level emitted by suction pipe
 LWADSR- External sound power level emitted by pressure pipe

Piping data based on the following assumptions : Piping -
 Material : steel Diameter (SS/PS):1100./1100. mm
 Length(SS/PS) : 5.000/ 5.000 m Wall thickness(SS/PS): 6.0/ 6.0 mm

Acoustic data and calculation methods conform to DIN 45635.

The acoustic data given here are valid for the specified operating point.
 These figures may be increased at other performance ratings.
 All external acoustic data relate to free field conditions.
 Deviations from these result in increased external sound levels.
 The above acoustic data are valid for 1 fan.
 Where several fans are operated simultaneously, the corresponding increase
 in sound levels must be allowed for.

Annex for all positions

Standards for Fans – Piller Standard 59.384.0193, 30.08.2011

Terminologie / Terminology

DIN	24901 T 4	07.83	Graphische Symbole für technische Zeichnungen für den Maschinenbau; Kompressoren, Ventilatoren; Darstellung in Fließbildern Graphical symbols for technical drawings for use in the engineering and related fields; compressors, fans; presentation in flow diagrams
DIN EN ISO	13349	12.10	Industrieventilatoren - Terminologie und Klassifizierung Industrial fans-Vocabulary and definitions of categories

Abmessungen / Dimensions

ISO	6580	02.05	Industrielüfter für allgemeine Zwecke; runde (Anschluß-)Flansche; Abmessungen General purpose industrial fans; Circular flanges; Dimensions
DIN EN	12220	06.98	Lüftung von Gebäuden - Luftleitungen - Maße von runden Flanschen für allgemeine Lüftungszwecke; Ventilation for buildings - Ductwork - Dimensions of circular flanges for general ventilation;
DIN EN ISO	13351	12.10	Industrieventilatoren - Abmessungen Industrial fans - Dimensions
DIN	24154 Teil 4	07.90	Flachflansche ungültig Circular flanges; invalid
DIN	24193 T 3	02.88	Kanalbauteile für lufttechnische Anlagen; Flansche; Flach- u. Winkelflansche Reihe 3 Ducting for ventilation equipment; flanges; series 3; flat and angle flanges

Leistungsmessung / Performance test

VDI	2044	11.0	Abnahme- und Leistungsversuche an Ventilatoren (VDI-Ventilatorregeln) 2 Acceptance and performance tests on fans (VDI code of practice for fans)
DIN EN ISO	5801	12.1	Industrieventilatoren - Leistungsmessung auf genormten Prüfständen 0 Industrial fans-Performance testing using standardized airways
DIN EN ISO	5802	10.1	Industrieventilatoren - Leistungsmessung im Einbauzustand 1 Industrial fans - Performance testing in situ
VDI/VDE	2640 Bl. 3	11.8	Netzmessungen in Strömungsquerschnitten 3 Measurement of fluid flow in closed conduits;
ISO	13348	01.0	Industrieventilatoren - Toleranzen, Methoden für die Umrechnung und Darstellung technischer Daten 7 Industrial fans-Tolerance, methods of conversion and technical data

Akustik, Schwingungstechnik / Acoustics, vibration technology

DIN	45635 T 38	04.8	Geräuschmessung an Maschinen; Luftschallemission, Hüllflächen-, Hallraum- und Kanal-Verfahren; Ventilatoren 6 Measurement of noise emitted by machines; airborne noise emission; enveloping surface method, reverberation room method and in-duct method; fans
DIN ISO	1940 T 1	04.0	Mechanische Schwingungen, Anforderungen an die Auswuchtgüte starrer Rotoren, Bestimmung der zulässigen Restunwucht; 4 Mechanical vibration - Balance quality requirements for rotors in a constant (rigid) state - Part 1: Specification and verification of balance tolerances
DIN EN ISO	5136	11.0	Akustik - Bestimmung der von Ventilatoren und anderen Strömungsmaschinen in Kanäle abgestrahlten Schalleistung - Kanal-Verfahren 9 Acoustics - Determination of sound power radiated into a duct by fans and other air-moving devices - In-duct method
DIN EN ISO	5167-1	01.0	Durchflußmessung von Fluiden mit Drosselgeräten - Teil 1: Blenden, Düsen und Venturirohre in voll durchströmten Leitungen mit Kreisquerschnitt 4 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements
DIN ISO	8821	10.9	Mechanische Schwingungen; Vereinbarung über die Paßfeder-Art beim Auswuchten von Wellen und Verbundteilen; 1 Mechanical vibration; balancing shaft and fitment key convention
DIN ISO	10816-1	08.9	Mechanische Schwingungen - Bewertung der Schwingungen von Maschinen durch Messungen an nicht-rotierenden Teilen - Teil 1: Allgemeine Anleitungen 7

			Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts - Part 1: General guidelines
DIN ISO	10816-3	08.0 9	Mechanische Schwingungen - Bewertung der Schwingungen von Maschinen durch Messungen an nicht-rotierenden Teilen - Teil 3: Industrielle Maschinen mit Nennleistungen über 15 kW und Nenndrehzahlen zwischen 120 min⁻¹ und 15000 min⁻¹ bei Messungen am Aufstellungsort
			Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts - Part 3: Industrial machines with nominal power above 15 kW and nominal operating speeds between 120 r/min and 15000 r/min when measured in situ
VDI	3731 Bl. 2	11.9 0	Emissionskennwerte technischer Schallquellen; Ventilatoren Characteristic noise emission values of technical sound sources; fans
VDI	3841	11.0 2	Schwingungsüberwachung von Maschinen - Erforderliche Messungen Vibration monitoring of machinery - Necessary measurements
VDI	3839 Blatt 1	03 01	Hinweise zur Messung und Interpretation der Schwingungen von Maschinen - Allgemeine Grundlagen Instructions on measuring and interpreting the vibrations of machines - General principals
VDI	3839 Blatt 2	05 03	Hinweise zur Messung und Interpretation der Schwingungen von Maschinen - Schwingungsbilder für Anregungen aus Unwuchten, Montagefehlern, Lagerungsstörungen und Schäden an rotierenden Bauteilen Instructions on measuring and interpreting the vibrations of machines - Vibration patterns for excitation arising from unbalance, incorrect assembly, bearing faults and damage to rotating components
DIN ISO	8821	10.9 1	Mechanische Schwingungen; Vereinbarung über die Paßfeder-Art beim Auswuchten von Wellen und Verbundteilen; Mechanical vibration; balancing shaft and fitment key convention;
*ISO	13347		Industrieventilatoren - Bestimmung der Schalleleistungspegel unter genormten Laborbedingungen Industrial fans- The determination of fan sound power levels under standardized laboratory conditions-
		-1 08.0	laboratory conditions-
		-2 4	Part 1: General overview
		-3 08.0	Part 2: Reverberant room method
		-4 408.	Part 3: Enveloping surface methods
		04	Part 4: Sound intensity method
		08.0	
		4	
			Corrigendum 10.06
			Corrigendum 10.06
			Corrigendum 11.06
			Corrigendum 10.06
*ISO	14694	03.0 3	Industrieventilatoren - Technische Vorschriften für die Wuchtgüte und Vibrationspegel Industrial fans-Specifications for balance quality and vibration levels
*ISO	14695	04.0 3	Industrieventilatoren - Methode zur Messung von Vibrationen am Ventilator Industrial fans-Method of measurement of fan vibration
DIN EN VDE	60034-14 0530	03.0 8	Drehende elektrische Maschinen - Teil 14: Mechanische Schwingungen von bestimmten Maschinen mit einer Achshöhe von 56 mm und höher; Messung, Bewertung und Grenzwerte der Schwingstärke

Sicherheitstechnik / Safety engineering

DIN EN ISO	12100	03.1 1	Sicherheit von Maschinen; Grundbegriffe, allgemeine Gestaltungsleitsätze, Risikobeurteilung und Risikominderung Safety of machinery - General principles for design -Risk assessment and risk reduction
DIN EN ISO	13857	06.0 8	Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen; Safety of machinery; safety distances to prevent danger zones from being reached by the upper and lower limbs
DIN EN	349	09.0 8	Sicherheit von Maschinen; Mindestabstände zur Vermeidung des Quetschens von Körperteilen; Safety of machinery; minimum gaps to avoid crushing of parts of the human body
DIN EN ISO	13732-1	12.0 6	Ergonomie der thermischen Umgebung - Bewertungsverfahren für menschliche Reaktionen bei Kontakt mit Oberflächen- Teil 1: Heiße Oberflächen Ergonomics of the thermal environment Part1: Hot surfaces
DIN EN	1127-1	02.0 8	Explosionsfähige Atmosphären - Explosionsschutz - Teil 1: Grundlagen und Methodik; Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology
DIN EN ISO	12499	12.1	Industrieventilatoren - Mechanische Sicherheit von Ventilatoren -

		0	Berührungsschutz Industrial fans-Mechanical safety of fans-Guarding
DIN EN	13463-1	07.0 9	Nichtelektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 1: Grundlagen und Anforderungen; Non-electrical equipment for potentially explosive atmospheres - Part 1: Basics and requirements
DIN EN	13463-5	03.0 4	Nicht-elektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 5: Schutz durch Konstruktive Sicherheit "c"; Non-electrical equipment intended for use in potentially explosive atmospheres - Part 5: Protection by constructional safety "c"
DIN EN	13463-6	07.0 5	Nicht-elektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 6: Schutz durch Zündquellenüberwachung 'b'; Non-electrical equipment for potentially explosive atmospheres - Part 6: Protection by control of ignition sources 'b';
E DIN EN	14461	10.0 2	Industrieventilatoren - Sicherheitsanforderungen Industrial fans - Safety requirements
DIN EN	14986	05.0 7	Konstruktion von Ventilatoren für den Einsatz in explosionsgefährdeten Bereichen Design of fans working in potentially explosive atmospheres
DIN EN VDE DIN EN	60079 div 0170 60204 T 1	div 06.0 7	Elektrische Betriebsmittel für gasexplosionsgefährdete Bereiche; Electrical apparatus for potentially explosive atmospheres Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen Safety of machinery - Electrical equipment of machines - Part 1: General requirements
VDMA	24167	10.9 4	Ventilatoren; Sicherheitsanforderungen Fans - Safety requirements
VDI	2263	05.9 2	Staubbrände und Staubexplosionen; Gefahren, Beurteilung, Schutzmaßnahmen Dust fires and dust explosions; hazards, assessment, protective measures
	BetrSichv	09.0 2	Betriebssicherheitsverordnung Rule for operational safety

Schweißtechnik / Welding

DIN EN ISO	3834 T1-5	03.0 6	Qualitätsanforderungen für das Schmelzschweißen metallischer Werkstoffe Quality requirements for welding of metallic materials
DIN EN ISO	15607	03.0 4	Anforderung und Qualifizierung von Schweißverfahren für metallische Werkstoffe Specification and qualification of welding procedures for metallic materials
DIN EN ISO	13918	12.9 8	Schweißen - Bolzen und Keramikringe zum Lichtbogenbolzenschweißen Welding - Studs and ceramic ferrules for arc stud welding (Norm-Entwurf) DIN EN 13918, Ausgabe:2001-01)
DIN EN	1708-1	05.9 9	Schweißen - Verbindungselemente beim Schweißen von Stahl - Teil 1: Druckbeanspruchte Bauteile neuer Entwurf 06.08 Welding - Joining elements at welding of steel - Part 1: Pressurized components
DIN EN	1708-2	10.0 0	Schweißen - Verbindungselemente beim Schweißen von Stahl - Teil 2: Nicht innendruckbeanspruchte Bauteile Welding - Joining elements at welding of steel - Part 2: Non-pressurized components
DIN EN ISO	13920	11.9 6	Allgemeintoleranzen für Schweißkonstruktionen Welding - General tolerances for welding constructions
DIN EN ISO	5817	10.0 6	Schmelzschweißverbindungen an Stahl, Nickel, Titan und deren Legierungen (ohne Strahlschweißen) - Bewertungsgruppen von Unregelmäßigkeiten Berichtigung 1: 10.07 Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections

Beschichtungen / Coating

DIN EN ISO	12944-4	07.9 8	Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Beschichtungssysteme - Teil 4: Arten von Oberflächen und Oberflächenvorbereitung Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 4: Types of surface and surface preparation
DIN EN ISO	12944-5	01.0 8	Beschichtungsstoffe - Korrosionsschutz von Stahlbau durch Beschichtungssysteme - Teil 5: Beschichtungssysteme Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 5: Protective paint systems

Zerstörungsfreie Prüfungen / Non-destructive testing

DIN EN	571-1	03.9	Zerstörungsfreie Prüfung - Eindringverfahren
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		7	Non-destructive testing - Dye-penetrant test
DIN EN ISO	3452-2	11.0 6	Zerstörungsfreie Prüfung - Eindringverfahren - Teil 2: Prüfung von Eindringmitteln
			Non-destructive testing - Dye-penetrant test - Part 2: Testing of penetrant materials
DIN EN	10160	09.9 9	Ultraschallprüfung von Flacherzeugnissen aus Stahl mit einer Dicke größer oder gleich 6mm (Reflexionsverfahren)
			Ultrasonic testing of steel flat product of thickness equal to or greater than 6mm (reflection method)
DIN EN	1435	09.0 2	Zerstörungsfreie Prüfung von Schweißverbindungen - Durchstrahlungsprüfung von Schweißverbindungen;
			Non-destructive testing of welds - Radiographic testing of welded joints

Technische Lieferbedingungen / Technical delivery terms

DIN	24166	01.89	Ventilatoren; Technische Lieferbedingungen Fans; technical delivery conditions
DIN EN	10204	01.05	Metallische Erzeugnisse - Arten von Prüfbescheinigungen Metallic products - Types of inspection documents <i>Entwurf: Ausgabe:2000-08 - (Draft standard - 2000-8)</i>

I. Quotation

1. Our Terms of Sale apply exclusively. Terms of the Buyer contrary to or deviating from our Terms of Sale are not recognized except if their validity was explicitly accepted by us. Our Terms of Sale apply also if delivery is made to the Buyer without reservation on our part even in the knowledge of contrary terms of the Buyer or of terms deviating from our Terms of Sale.
2. With the issue of the order or the acceptance of shipments, the Buyer acknowledges the validity of our General Terms Governing the Sale and Delivery of Machinery not only for the transaction in question but also for future transactions.
3. The documents associated with the quotation such as illustrations, drawings, indications of weight and dimensions are merely approximate indications unless expressly described as binding. The Supplier reserves all rights of title and copyright to all cost estimates, drawings and other documents; they may not be made accessible to third parties. The Supplier may only make such plans as the Buyer describes as confidential accessible to third parties with the latter's consent.
4. We treat all company-related and person-related data that we get in connection with the order confidentially. But in terms of a general reference, it is allowed to mention the name of the Buyer and to give a general description of the project.

II. Scope of the Delivery

The written confirmation of order from the Supplier determines the scope of the delivery and - in the event of a quotation from the Supplier with a limited period of validity and timely acceptance of the quotation - the quotation, insofar as no timely confirmation of order is received. Collateral agreements and modifications must be confirmed in writing by the Supplier.

III. Price and Payment

1. In the absence of a special agreement, prices apply ex works including loading in the works, however, exclusive of packaging. Value added tax at the statutory applicable rate is added to all prices.
2. In the absence of a separate agreement, payment shall be made as follows in cash and without deductions, free at the supplier's domicile:
1/3 on account on order confirmation
1/3 on shipping notice to the Buyer advising that main components are ready for shipment.
1/3 as a remaining amount within one month following the transfer of risk. In the event of delayed payment, penalty interest amounting to 8% above the base interest rate of the European Central Bank (ECB) shall be invoiced.
3. The Buyer may only exercise rights of set-off or retention insofar as is legally determined or undisputed. In case of defects in delivered goods, the Buyer's rights remain unaffected, in particular their right to retain a corresponding part of the purchase price.
4. The Buyer may exercise a right of retention only when his counterclaims are founded on the same contract.

IV. Delivery Period

1. The delivery period upon the dispatch of the confirmation of order, however, not before the documents, approvals, releases to be provided by the Buyer or the agreed down payment have been received.
2. The delivery period has been complied with if the subject-matter of delivery has left the works or its readiness for dispatch has been notified before the period elapses.
3. The delivery period shall be extended appropriately in the event of labor disputes, in particular strikes and lock-outs, in addition to unforeseen obstacles that are beyond the control of the Supplier, provided that such circumstances can be proven to have a considerable influence on the production or delivery of the goods to be delivered. The conclusion of the contract is subject to correct and timely delivery by our suppliers/ In the event of the non-availability of the services, the Buyer shall be informed without delay and any services already received will be refunded immediately. In particular, non-availability in this respect includes delayed delivery by our suppliers if we have carried out a so-called covering transaction, when neither us nor our suppliers are at fault or, in individual cases, if we have no obligation of procurement. The aforementioned circumstances are also not attributable to the Supplier if they occur during an already existing delay. The Supplier will notify the Buyer immediately of the beginning and end of such hindrances.
4. If despatch is delayed at the request of the Buyer, he can be charged the costs incurred for storage in the works of the Supplier, starting one month from the date of notification of readiness for despatch, however, at least 1/2 % of the invoice amount for each month. Nevertheless the Supplier is entitled, after setting a reasonable deadline and after its fruitless expiry, to dispose otherwise of the subject-matter of delivery and to supply the Buyer within a reasonably extended period.
5. Adherence to the delivery period presupposes fulfilment of the contractual duties by the Buyer.

V. Passing of the Risk and Acceptance

1. The risk of accidental loss and accidental deterioration of the goods, in addition to the risk of delay, shall, at the latest, be transferred to the Buyer with the dispatch of the goods, even if partial deliveries are made or the Supplier has assumed other services, such as shipping costs or delivery and installation. At the customer's request, the supplier shall provide (at the customer's expense) insurance on the consignment against theft, breakage, transport, fire and water damage, as well as against other insurable risks.
2. If dispatch is delayed as a result of circumstances attributable to the customer, the risk shall be transferred to the customer as from the day on which the goods are ready for dispatch, but the supplier shall be obliged - at the customer's expense and risk - to provide the insurance cover requested by the customer.
3. Without prejudice to the rights contained in Article VII, articles delivered must be accepted by the Buyer even if they exhibit slight defects.
4. An application for the institution of insolvency proceedings over the assets of the Buyer entitles the Supplier to withdraw from the agreement and demand the immediate return of the goods irrespective of his other rights.

VI. Reservation of Title

1. The Supplier reserves ownership of the goods up to the complete settlement of all claims arising out of current transactions. If additional assembly services are to be provided, the ownership of the goods passes to the Buyer only on receipt of the assembly fee or of part of the payment corresponding to the assembly service.
2. The Supplier has the right to insure the subject-matter of delivery against theft, breakage, transport damage, damage by fire or water or other risks at the expense of the Buyer, unless the Buyer can show that he has already arranged insurance himself.
3. The Buyer may not pledge the subject-matter of delivery nor transfer title thereof as security. He must notify the Supplier without delay in the event of attachment or confiscation or other disposals by third parties.
4. In the event of conduct by the Buyer which is in breach of contract, in particular default in payment, the Supplier is entitled to repossess the subject-matter of delivery after sending a warning, and the Buyer is obliged to surrender the same. The assertion of the reservation of title or attachment of the subject-matter of delivery by the Supplier is not deemed to be withdrawal from the contract.
5. The Buyer is entitled to resell the goods by way of ordinary commercial transactions. He assigns to the Supplier already at this time all claims against a third party generated by such sale up to the amount of the invoice. The Supplier accepts this assignment. After an assignment, the Buyer is authorized to collect the receivable. The Supplier reserves the right to collect the receivable directly if the Buyer fails to meet the agreed payment terms and is in delay with payment.

6. Processing and compounding of the goods by the Buyer is undertaken at all times for account and on instructions of the Supplier. If goods are compounded with products not owned by the Supplier, the Supplier acquires co-ownership in the new product at a ratio of the value of the delivered product to that of the other processed products. The same applies when the products are compounded with other goods not owned by the Supplier.

VII. Warranty

1. Defects in delivered goods shall be compensated by the Supplier at his discretion initially either by repair or replacement.
2. Any defects must be reported by the Buyer promptly and in writing.
3. Excluded from the warranty are all parts subject to wear such as seals, crank covers, clutch assemblies, drive belts, filters, paint coat, coatings and in specific cases flywheels (e.g. carriage of gases involving parts subject to wear).
4. A warranty claim by the Buyer furthermore assumes that all instructions of the Supplier on the use, maintenance and storage of supplied goods have been followed, in particular the conservation instructions and the General Terms for the Operation of Piller Fans and Components (e.g. on storage, drive etc).
5. Shipping damage or damage attributable to the Buyer, in particular due to improper or unauthorized use (non-observation of the General Terms for the Operation of Piller Fans and Components), defective assembly or start-up by the Buyer or a third party, natural wear, use of inadequate operating media, conveyance of unspecified media or gaseous compounds, substitute materials, unsuitable terrain, chemical, electrochemical or electrical influences, modifications or repairs of the product by the Buyer or a third party are excluded from the warranty.
6. The Buyer shall give the Supplier the necessary time and opportunity to make the repairs and substitute deliveries which the Supplier considers necessary at his discretion; otherwise the warranty obligation of the Supplier lapses. However, in the case of an imminent risk to operating safety or to avert a comparatively large damage or if the Supplier is in arrears with the elimination of a defect, the Buyer is entitled to repair the defect directly or have it repaired by the third party and claim reimbursement of the resulting costs from the Supplier. In this case, too, the Supplier must be advised in good time before any intended replacement.
7. If defects are identified on the goods, we are entitled at our discretion to repair the item or supply a new, defect-free product. In the event of repair, we are obliged to assume all costs necessary for said repair, in particular transport, travel, labor and material costs, providing that these do not increase due to the fact that the goods have been transported to a different location to the place of delivery.
The place of delivery is the location to which the goods were delivered in accordance with the contract signed by the Supplier and the Buyer. The warranty claims of the Buyer are subject to the fulfillment of said party's statutory inspection and complaint notification obligations (Section 377,381 HGB).
If defects are identified during the inspection or later, we must receive immediate written notification thereof. Said written notification must be received within two weeks. The timely dispatch of said notification is sufficient to confirm deadline compliance. Irrespective of this inspection and notification obligation, the Buyer must provide written notification of any identified defects (including erroneous and short deliveries) within two weeks of delivery. Timely dispatch of this is also sufficient to confirm deadline compliance. If the Buyer fails to carry out the proper inspection and/or defect notification, the Supplier is exempted from any liability for the related defects. The Buyer shall give the Supplier the necessary time and opportunity for the required supplementary performance, especially the request of goods for inspection purposes. In the event of a replacement delivery, the Buyer shall return the defective goods to the Supplier in accordance with the valid legal stipulations.
Supplementary performance does not include the disassembly of the defective part or re-installation if the Supplier was not responsible for initial installation. If the Buyer's defect removal request is declared unjustified, the Supplier may demand any related expenses from the Buyer. The Supplier is entitled to make any supplementary performance dependent on the prior payment of the pending purchase price by the Buyer. The Buyer is entitled to retain part of the purchase part as deemed appropriate in relation to the defect.
8. The warranty period for the goods including for any possibly installed required spare parts shall be extended by the duration of the repair works.
9. Referring the given performance data the tolerances in accordance to DIN 24166, class 2 or ISO 13348, grade AN3 have to be considered.
The validation of the performance data takes place in accordance to DIN EN ISO 5801, on company-owned standardized airways only.

VIII. Liability

1. In the event of premeditated or grossly negligent breaches of contract as in the case of culpable injury to life, limb or health, we shall be liable for any resulting damage without limit except if provided for otherwise by law.
2. In the event of gross negligence by our non-executive employees, our liability for property or asset damage is limited to the foreseeable contract-typical damage.
3. In the event of minor negligence, we shall be liable for property and asset damage only if essential contractual obligations have been breached. In such a case, our liability shall likewise be limited to the foreseeable contract-typical damage. Essential contractual obligations are those without whose performance the duly implementation of the contract is impossible and in which our party to the contract generally trusts and may trust.
4. Any further liability not regulated in the preceding subsections shall be excluded irrespective of the legal basis of the claims asserted. This applies in particular to unauthorized acts pursuant to Secs. 823, 831 BGB; a possible unlimited liability under the provisions of the German Product Liability Act remains unaffected.

IX. Statute of Limitations

1. All claims of the Buyer, irrespective of their legal reason, in particular warranty claims, lapse after one year.
2. This does not apply when the Supplier is culpable of premeditated or gross violations including on part of his legal representatives or vicarious agents, when involving injuries to life, body or health, or defects which the Supplier has maliciously concealed or the absence of which he has guaranteed as well as with vices when the Supplier liable for personal injury or property damage under the Product Liability Act. In these cases, the statutory periods shall apply.
3. The statutory period also applies to defects in a building or to products used in a building in accordance with their customary use thereby causing the defect in the building as well as in works that involve the supply of planning or supervisory services for a building.

X. Partial Delivery, Reduction, Withdrawal from Contract

1. The Supplier is entitled to make partial deliveries except when the acceptance of partial deliveries is not considered fair or equitable for the Buyer taking his own legitimate interests into due account.
2. If remedial performance fails in a warranty claim, the Buyer may in principle and at his discretion demand a lower price (reduction) or the cancellation of the contract (rescission). The customer shall have no recourse to damage claims, and there shall also be no liability for lost profit or damages arising from loss of production. When the contract violation is only minor, in particular in the case of minor vices, the Buyer has no right of rescission.
3. We reserve the right to withdraw from the contract if:
 - We ourselves do not receive goods completely, correctly or in accordance with delivery deadlines. We pledge to notify the Buyer immediately of any such delivery problems and in the event of contract withdrawal, to immediately refund any payment already received.
 - If Buyer debt enforcement is unsuccessfully attempted by us or any other creditor, an application procedure for opening insolvency proceedings against the assets of the Buyer is pending, said Party has made a sworn statement of their assets or a

list of assets or has opened insolvency proceedings against their assets or such opening has been rejected due to lack of assets.

- The Buyer has made false statements concerning their creditworthiness upon signing the contract or conceals a significant deterioration of assets within the current business relationship.
 - The Buyer stops making payments or a bill or check from the Buyer is protested.
 - The Buyer fails to comply with a deferred payment granted or
 - if, other than in the ordinary course of business, the Buyer sells any goods subject to our retention of title, particularly if used as collateral or a pawn, but also if the goods are transferred to other resellers regardless of whether or not payment is received.
4. If we withdraw from the contract in writing or in text (email withdrawal notification is sufficient), we are entitled to reclaim all goods delivered. The Buyer is obliged to return the goods to us or to a hauler named by us. We are entitled to resell any reclaimed goods immediately. The sale proceeds, but at least the value of the goods, will be offset against the claim we have against the Buyer, less appropriate costs for the action. Any surplus that may arise in regard to already received services (advance payment, etc.) will be paid to the Buyer.

XI. Place of Fulfilment and Court of Jurisdiction

1. This Contract is governed exclusively by the laws of the Federal Republic of Germany. The application of the UN Convention on the International Sales of Goods shall be excluded.
2. Place of fulfilment for all claims and duties (see Article VII of our General Terms and Conditions for the Delivery of Machines) is Moringen/Germany. The exclusive court of jurisdiction is Northeim or the district court of Göttingen, even for actions concerning the bill and check process and for actions against third parties who are liable for the obligations of the Buyer unless another court of jurisdiction is mandatory.
3. If any of the preceding provisions should be or become ineffective, the validity of the remaining provisions shall remain unaffected. The parties agree that an ineffective provision shall be replaced by a clause that approximates the spirit and purpose of the ineffective provision as much as possible.

Moringen, 17.12.2013

Piller Blowers & Compressors GmbH

These general conditions indicate the basic regulations for using Piller fans properly. They are supplemented by the stipulations in the operating instructions where necessary. The details of these conditions are as follows:

All maintenance instructions shall be observed.

All safety equipment is to be installed properly.

Factory settings must not be changed without our approval.

Only lubricants prescribed by the factory or equivalents may be used. Impurities are inadmissible.

When the machines are being installed permanently the foundation work shall be executed professionally with due consideration of DIN 4024, Section 2, or equivalent, and the machine attached according to our recommendations.

Constraining forces by ductworks being connected shall be kept to a minimum, for instance by installing flexible connections (compensators). If maximum support load are stipulated in the general arrangement drawing, it must not be exceeded in any case.

We accept no responsibility for defects resulting from improper start-up or operation by the end user.

Exceeding the specified maximum temperatures and speeds even briefly is inadmissible.

Every care should be taken to ensure that solid materials do not get into the impeller.

Only the medium (gas components) as specified in the order may pass through the fan.

Damages following the use of not specified mediums are not covered by warranty.

The fans may only be operated in a smooth operating condition. If a vibration monitoring system is used, the alarm and shutoff values specified by Piller shall define admissible bearing vibrations.

The alarm and shutoff functions shall be carried out with the limit values given in the operating instructions.

Operation above the alarm level is only admissible for a short time to analyse the cause of vibration.

Sudden deterioration in the vibration values may indicate the machine or part of the machine breaking down and endanger operational safety. The causes must be determined promptly and remedial measures taken.

Operation of fans without vibration monitoring being installed is only admissible, if vibration severity in the bearing levels does not exceed the figures as given in the documentation. (For solid installation 7.1 mm/s acc. ISO 14694 BV-3; for solid installation 4.5 mm/s acc. ISO 14694 BV-4)

Changes in the impellers in conjunction with on-site balancing shall be agreed upon with us.

Gasflow swirl in the direction of impeller rotation shall be avoided. Swirling in the opposite direction is inadmissible.

Permanent operation is allowed only for the operating points as shown in the order confirmation, in particular an operation at a closed slide valve or closed throttle valve is only admissible for a short time (max. 5 min. for start up).

At fans with inlet guide vanes all positions are approved for operation except a totally closed position (90° or 0°). Operation with closed inlet guide vane is only permissible for start up. After obtaining the final speed the inlet guide vane must be opened efficient. For applications with pressure increases ≥ 10 kPa the permissible inlet guide vane for permanent operation must not exceed 70°.

A minimum transport quantity of $0.3 \cdot V_{opt}$ must never be fallen below during continuous operation. When having pressure increases ≥ 20 kPa the minimum transport quantity must be increased to a minimum transport quantity of $0.5 \cdot V_{opt}$. Operating points with pressure increases $< 40\%$ of the design point must be blocked!

At fans with open suction (no inlet ductwork) the inlet flow must not be disturbed or blocked. Minimum dimensions for a free rectangular area in front of the fan inlet are $a = b = 2.5 \cdot d$ ($d =$ inlet diameter). See DIN 24163.

Heavy coatings, corrosion and visible wear on the impeller is inadmissible. Preventive measures shall be agreed upon with us without delay.

Liquid gushing into the impeller and inadequate removal of condensation from the fan casing shall be avoided in any case.

Should the motor be provided by the customer, we do not guarantee for layout, design and function, as well as for operational safety of the coupling in case of electrical malfunction (see VDI 3840).

The fan may only be started up when the machine is at standstill.

At process temperatures above 150°C, a standstill of the fan is not permissible as it can cause bearing damages.

Temperature gradients higher as 50 °C/min are not permissible, if not agreed previously.

At parallel operation of fans the operation on the left side of the top of the characteristics must be blocked.

Fans in evaporation plants

The liquid phase in steam is to be kept to a minimum to protect the impellers. The maximum admissible droplet size is approx. 1 mm.

Reduce of overheating by jets of water shall be admissible up to the saturated steam conditions on the pressure side.

The ductwork shall be designed, so that no water puddles can form and long pipe sections with great differences in height in front of and behind the fan are avoided.

Sealing fluids for the shaft seal must be added cleanly and suitably for operation.