IN THE UNITED STATES DISTRICT COURT FOR THE

EASTERN DISTRICT OF VIRGINIA

Alexandria Division

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| UNITED STATES OF AMERICA | ) | CRIMINAL NO. 1:14cr66 |
| | ) | |
| v. | ) | Hon. Liam O'Grady |
| | ) | |
| VAHID HOSSEINI, | ) | Sentencing Date: June 13, 2014 |
| | ) | |
| Defendant. | ) | |

**POSITION OF THE UNITED STATES**
**WITH RESPECT TO SENTENCING FACTORS**

The United States of America, through its attorneys, Dana Boente, United States Attorney, and W. Neil Hammerstrom, Jr. Assistant United States Attorney, and in accord with 18 U.S.C. § 3553(a) and the United States Sentencing Commission, *Guidelines Manual*, § 6A1.2 (Nov. 2013), files this Position of the United States with Respect to Sentencing Factors in the instant case. The United States has reviewed the Presentence Report prepared by the probation officer and concurs with the calculations of the United States Sentencing Guidelines contained therein, including the recommended guidelines range of 51-63 months.[1]

[1] Pursuant to an agreement to cooperate with the government, the defendant met with law enforcement agents and counsel for the government prior to the March 6, 2014 entry of his guilty plea and has assisted the government in the investigation of his conduct. He also timely notified the government of his intention to plead guilty, thus permitting the government to avoid having to prepare for trial and permitting the government and the Court to allocate their resources efficiently. Accordingly, the government hereby moves the Court to decrease defendant's offense level by one additional level, under U.S.S.G. § 3E1.1(b), as already factored into the recommended guidelines range by the probation officer.

## BACKGROUND

### A. The International Emergency Economic Powers Act ("IEEPA") and the Iranian Transactions and Sanctions Regulations ("ITSR")

A prosecution pursuant the International Emergency Economic Powers Act ("IEEPA"), 50 U.S.C. §§ 1701-1707, essentially draws upon three sources of law: (1) the statute itself; (2) Presidential Executive Orders; and, (3) executive branch implementing regulations, in this case regulations promulgated by the Treasury Department. The statute itself sets forth the regulatory, administrative and criminal sanction objectives of the law. IEEPA gives the President of the United States broad authority to impose economic sanctions on a foreign country in response to an unusual or extraordinary threat to the national security, foreign policy, or economy of the United States when the President declares a national emergency with respect to that threat. 50 U.S.C. § 1701. The President expresses this authority set forth in the statute through Executive Orders. Finally, the Treasury Department sets forth regulatory and licensing schemes that citizens and companies must follow to comply with the objectives of the statute.

The President and the executive branch have issued orders and regulations governing and prohibiting certain transactions with Iran by U.S. persons or involving U.S. – origin goods. Beginning with Executive Order No. 12170, issued on November 14, 1979, the President has found that "the situation in Iran constitutes an unusual and extraordinary threat to the national security, foreign policy and economy of the United States and declare[d] a national emergency to deal with that threat." On March 15, 1995, the President issued Executive Order 12957, finding that "the actions and policies of the Government of Iran constitute an unusual and extraordinary threat to the national security, foreign policy, and economy of the United States," and declared "a national emergency to deal with that threat." On May 6, 1995, the President issued Executive

Order 12959 and imposed economic sanctions, including a trade embargo, against Iran ("the Iran Trade Embargo"). On August 17, 1997, the President issued Executive Order 13059, renewing the Iran Trade Embargo, which continued throughout the time of the acts committed by the defendant in this matter.

The Executive Orders authorized the United States Secretary of the Treasury to promulgate rules and regulations necessary to carry out the Executive Orders. To implement the Iran Trade Embargo, the United States Department of the Treasury, through the Office of Foreign Assets Control ("OFAC"), issued the Iranian Transactions Regulations (31 C.F.R. Part 560), now known as the Iranian Transactions and Sanctions Regulations ("ITSR"). With certain limited exceptions not applicable here, the ITSR prohibit, among other things, the export, re-export, sale, or supply, directly or indirectly, from the United States or by a United States person wherever located, to Iran or the Government of Iran, or the financing of such export, re-export, sale, or supply, of any goods, technology, or services, without prior authorization from OFAC. *See* 31 C.F.R. § 560.204. These regulations further prohibit any transactions that evade or avoid or have the purpose of evading or avoiding any of the prohibitions contained in the ITSR, including the unauthorized exportation of goods from the United States to a third country if the goods are intended or destined for Iran.

B. The Defendant's Unlawful Conduct

The defendant pleaded guilty to a two-count criminal information. Count One charged him with conspiracy to export goods from the United States to the country of Iran without a license, in violation of Title 50, United States Code, Sections 1702, 1705(a) and (c) (IEEPA); Title 31, Code of Federal Regulations, Parts 560.203 and 560.204 (ITSR); and Title 18, United States

Code, Section 371. Count Two charged the defendant with money laundering, in violation of Title 18, United States Code, Section 1957.

The charged counts related to an ongoing illegal export business the defendant operated from his Reston, Virginia residence, under the business name Sabern Instruments, in which he procured a substantial number of commercial goods from over 60 American manufacturers which he then repackaged and shipped to end-users in Iran. The defendant supplied customers in Iran with a variety of equipment, including tachometers, power supply instruments, cables, hi-temperature probes, ammonia test tubes, conductivity cells, closed valves, machinery parts. He shipped the items primarily through two companies in the United Arab Emirates, using these locations as transshipments points to further his scheme to willfully bypass U.S. trade sanctions against Iran.

While the charged conduct spanned the time period "from at least in or about the beginning of January 2008 to on or about July 24, 2013," it should be noted that records obtained by the government -- upon which the charged offenses are based -- go back only as far as 2008. It is clear that the defendant's illegal export activity predated the 2008 time-frame. By his own admission at the time a search warrant was executed at the defendant's residence in July 2013, the defendant started his U.S.-based business, Sabern Instruments, in 1998. While he initially used this business to buy and sell items within the United States, the defendant stated that due to difficulties with the English language, his age, and health, it was difficult to conduct business in the United States, so he started doing business with individuals and companies in Dubai, UAE and Iran.

The money laundering offense relates to monies the defendant caused to be wired from

overseas into his Sabern business account at BB&T in the Eastern District of Virginia, during the time period March 19, 2008 to October 6, 2011. A total of $729,649.77 was wired into this account by eight different overseas entities. These monies were used by the defendant to promote the carrying on of his illegal export business.

C. The Sentencing Guideline Range

1. The Offense Level

a. *Count One*

Violations of 50 U.S.C. § 1705 (IEEPA) are referenced to U.S.S.G. §§ 2M5.1, 2M5.2, and 2M5.3. Here, the offense conduct in Count One relates to evasion of export controls, and thus section 2M5.1 is the applicable guideline provision.

The base offense level for section 2M5.1 is 26 if "(A) national security controls or controls relating to the proliferation of nuclear, biological, or chemical weapons or materials were evaded; or (B) the offense involved a financial transaction with a country supporting international terrorism," and 14 otherwise. Here, the offense conduct involved both the evasion of national security controls and a financial transaction with a country supporting international terrorism.

i. The defendant evaded the United States' sanctions on Iran, thus subsection (A) of guideline 2M5.1 applies.

Economic sanctions issued pursuant to IEEPA constitute "national security controls" for the purposes of guideline 2M5.1. When economic sanctions on Iran pursuant to IEEPA were first authorized by President Carter in 1979, the President found that "the situation in Iran constitutes an unusual and extraordinary threat to the national security, foreign policy and economy of the United States." Executive Order 12710 (Nov. 14, 1979). Since that time, other Presidents have made similar findings. In both 1995 and 1997, President Clinton found that the actions of the

Government of Iran posed an unusual and extraordinary threat to the national security of the United States. Executive Order 12957 (Mar. 15, 1995); Executive Order 13059 (Aug. 19, 1997). President Obama has stated that the national emergency related to Iran continues. *See* Executive Order 13645 (June 3, 2013); *see also* Executive Order 13622 (July 30, 2012). Though the guideline does not define the term "national security control," when a president recognizes a threat to national security, and uses the power granted the president under the IEEPA to address that threat through economic sanctions, those sanctions constitute "national security controls" for the purpose of guideline 2M5.1. *See United State v. Hanna*, 661 F.3d 271, 292-93 (6th Cir. 2011); *United States v. Elashyi*, 554 F.3d 480, 508-09 (5th Cir. 2008); *United States v. McKeeve*, 131 F.3d 1, 14 (1st Cir. 1997). Thus, "[e]very court to consider the issue has held that . . . such sanctions are national security controls." *Hanna*, 661 F.3d at 293 (citations and quotation marks omitted).

ii. Count One involved financial transactions with a country supporting international terrorism, thus subsection (B) of guideline 2M5.1 applies.

The application notes to guideline 2M5.1 define a "country supporting international terrorism" as a country designated under section 6(j) of the Export Administration Act (50 U.S.C. App. 2405).[2] Pursuant to that statute, the Secretary of State has the responsibility to determine whether a country is one that supports international terrorism. The Secretary of State has designated four countries pursuant to those authorities: Cuba, Syria, Sudan, and Iran. *See* Department of State, "State Sponsors of Terrorism," http://www.state.gov/j/ct/list/c14151.htm (last accessed Dec. 3, 2013). Iran has been so designated since 1984. *See id.* As established by the statement of facts, the defendant regularly sold and exported to entities in Iran various

[2] The defendant was not charged with violating the Export Administration Act. However, based on the plain text of the guideline, that fact is irrelevant to whether the offense conduct involved a financial transaction with a country supporting international terrorism.

commercial goods in violation of U.S. trade sanctions against that country. He was paid for those illegal shipments through international wire transfers to his Sabern Instruments business account here in the Eastern District of Virginia. Thus, the offense conduct involved a "financial transaction with a country supporting international terrorism" and subsection (B) of guideline 2M5.1 applies. *See United States v. Groos*, No. 06 CR 420, 2008 WL 5387852, at *3 (N.D. Ill. Dec. 16, 2008).

Accordingly, the base offense level for Count One has been properly assessed at Level 26. The statutory maximum penalty for a violation of 50 U.S.C. §§ 1702 and 1705 and 18 U.S.C. § 371 is five years of imprisonment and a $250,000 fine.

b. *Count 2*

Count Two charged the defendant with money laundering, in violation of 18 U.S.C. § 1957. Because the laundered funds were derived from the IEEPA violation charged in Court One, a base offense Level 26 has been properly assessed under guideline 2S1.1(a)(1). An additional level is added for a conviction under 18 U.S.C. § 1957. *See* guideline 2S1.1(b)(2)(A). The statutory maximum penalty for this offense is ten years of imprisonment and a $250,000 fine.

3. Sentencing Guideline Range

The defendant has no criminal history and thus is in Criminal History Category I. The defendant's conduct for the two counts group, resulting in a Level 27, minus 3 for acceptance of responsibility, for a Total Offense Level of **24** and a sentencing guidelines range of **51-63 months**.

## ARGUMENT

In *United States v. Booker*, 543 U.S. 220, 264 (2005), the Supreme Court made clear that sentencing courts should "consult [the Sentencing] Guidelines and take them into account when

sentencing." *See also United States v. Biheiri*, 356 F.Supp.2d 589, 593 (2005) ("Justice Breyer's majority opinion in [*Booker*] sensibly teaches that the Sentencing Guidelines must still be taken into account pursuant to 18 U.S.C. § 3553(a) in fashioning an appropriate sentence."). The Supreme Court provided this direction to promote the sentencing goals of Congress, namely to "'provide certainty and fairness in meeting the purposes of sentencing, [while] avoiding unwarranted sentencing disparities[.]'" *Booker*, 543 U.S. at 264 (*quoting* 28 U.S.C. § 991(b)(1)(B)). The Fourth Circuit has provided the following guidance in the wake of *Booker*:

> A district court shall first calculate (after making the appropriate findings of fact) the range prescribed by the guidelines. Then, the court shall consider that range as well as other relevant factors set forth in the guidelines and those factors set forth in [18 U.S.C.] § 3553(a) before imposing the sentence.

*United States v. Hughes*, 401 F.3d 540, 546 (4th Cir. 2005). Thus, sentencing courts must consider the factors outlined in 18 U.S.C. § 3553(a), including the need for the sentence "to reflect the seriousness of the offense, to promote respect for law, and to provide just punishment for the offense; [and] to afford adequate deterrence to criminal conduct." 18 U.S.C. § 3553(a)(2)(A) and (B); *Biheiri*, 356 F.Supp.2d at 594.

A. A Significant Sentence of Imprisonment Complies with the Factors and Considerations Set Forth in 18 U.S.C. § 3553(a) and (b).

Section 3553(a) requires a sentencing court to consider the nature and circumstances of the offense and the history and characteristics of the defendant, as well as the need for the sentence imposed to: reflect the seriousness of the offense, promote respect for the law, provide just punishment for the offense, afford adequate deterrence to criminal conduct, protect the public from further crimes of the defendant, and provide the defendant with needed educational or vocational training, medical care, or other correctional treatment in the most effective manner.

*Nature and Circumstances of the Offense*:

The Sentencing Commission has reflected the seriousness of the violations here by assigning a high base offense level to all export crimes implicating the United States' national security and non-proliferation interests. Significantly, the nature of the goods being exported is immaterial in that "any violation of the [Iranian] embargo inherently" involves the United States' national security. *Hanna*, 661 F.3d at 294 (emphasis added) (defendant's shipment of telecommunications and navigation equipment to Iraq in violation of the IEEPA warranted the enhanced Base Offense Level of 26 under U.S.S.G. § 2M5.1); *see also McKeeve*, 131 F.3d at 14 (export of computer equipment to Libya was evasion of national security controls: "[S]ection 2M5.1(a)(1) applies to any offense that involves a shipment (or proposed shipment) that offends the embargo, whether or not the goods shipped actually are intended for some innocent use").

The current Sentencing Guidelines for export crimes implicating national security interests appropriately reflect the government's enhanced efforts in recent years to enforce the sanctions and embargos against countries, like Iran, that pose serious threats to the national security of the United States. Beginning in 2006, the United States has significantly increased the penalties for the illegal export of goods from the United States to Iran. Prior to March 2006, IEEPA carried a maximum sentence of 10 years of imprisonment for individuals and fine of $10,000 (or twice the pecuniary gain or loss pursuant to 18 U.S.C. § 3571(d)) per violation. On March 9, 2006, the President signed into law the USA Patriot Act Improvement and Reauthorization Act of 2005, which increased the criminal penalties under the IEEPA to a maximum sentence of 20 years of imprisonment for individuals and fine of $50,000 per violation. Subsequently, on October 16, 2007, the President signed into law the IEEPA

Enhancement Act, which further increased the criminal penalties so that each violation was punishable by up to 20 years of imprisonment and $1,000,000 fine.[3]

Therefore, since March 2006, in direct response to the elevated threat Iran poses to the national security of the United States, the Congress and Executive Branch have enhanced the criminal and civil penalties associated with unlawful exportation of goods to Iran, regardless of their nature. This is significant in two respects. First, it should give the Court some indication that aggressive enforcement of the sanctions and embargo against Iran is extremely important in keeping with the Congress' and Executive Branch's (including the United States Sentencing Commission's) more recent treatment of this crime. Second, sentences imposed for unlawful export activities under IEEPA occurring after March 2006 are likely to be more instructive than sentences addressing similar criminal conduct occurred before March 2006.

Indeed, at least one court appears to have recognized this in the context of the unlawful shipment of computer-related goods from the United States to embargoed countries. *See Elashyi*, 554 F.3d at 508-09 (two defendants convicted of illegally exporting computer equipment to Libya and Syria in violation of IEEPA were properly given Base Offense Level of 26 because conduct involved evasion of national security controls).

The application notes to guideline 2M5.1 outline relevant factors for the court to consider when evaluating the nature and circumstances of a sanctions violation. Those circumstances are: (1) the degree to which the violation threatened a security interest of the United States; (2) the volume of commerce involved; (3) the extent of planning or sophistication; and (4) whether there were multiple occurrences involved. If any of these are present in an extreme form, a departure

3 Of course, the IEEPA violation in Count One of this case caps the defendant's statutory penalty of imprisonment at five years by charging the conspiracy under 18 U.S.C. § 371.

may be warranted. *See* Guideline § 2M5.1 *Application note 2*. Though none of these factors are present in an "extreme form" in this case, each factor is present; thus, the serious nature of the offense supports the imposition of a significant sentence.

(1) The defendant's conduct directly implicated a security interest of the United States. As noted previously, the actions and policies of Iran have constituted "an unusual and extraordinary threat to the national security, foreign policy, and economy of the United States," prompting "a national emergency to deal with that threat." *See* Executive Order 12957 *infra* p. 2. The national emergency that was declared as a result of that threat has existed in perpetuity for more than 30 years. Here, the unlawful scheme the defendant participated in was aimed at thwarting those sanctions. While the government readily concedes that there is no evidence that the defendant intended or believed that any of the items he illegally exported to Iran were destined for some nefarious purpose, the potential threat nonetheless exists with regard to certain items that left his hands. Attached, as an exhibit to this Memorandum, is an opinion submitted by Dwight L. Williams, Ph.D., P.E., a Senior Science Advisor in the Office of Intelligence and Counterintelligence at the U.S. Department of Energy. FBI Special Agent Chad W. Motley provided to Dr. Williams the technical data specification sheets (attached as Exhibits 1-A, 1-B, 1-C, 1-D) on four items exported by the defendant to end-users in Iran, specifically:

a. Dwyer Series GFM Gas Mass Flow Meter;
b. Dwyer Series GFC Gas Mass Flow Controller;
(Def. exported multiple meters and controllers from 2008 through 2011)
c. Gagemaker PN 3002 Pin Nose Diameter Gage (exported on 8/2/2011); and
d. Jaquet T400 Universal Tachometer (exported on 2/9/2012)

Dr. Williams opines that "gas flow meters and controllers are critical to the uranium enrichment process" converting uranium into a weapons-grade state. Pin diameter gages "enable electronic

devices to be designed and built with the utmost precision" and can be utilized in a number of "nuclear related contexts." "Tachometers are critical to the enrichment of uranium using gas centrifuges," and they "can also add value to other aspects of the nuclear field, including nuclear power generation, nuclear medicine, and fundamental academic nuclear research." As Dr. Williams properly concludes, bypassing export controls, as implicated in this case, "leads to serious risks related to the potential disposition and end-use of these items." *See* Technical Opinion of Dwight L. Williams, Ph.D., P.E., along with Dr. Williams' qualifications, attached as Exhibit 1. Hence, in addition to a U.S. policy finding that Iran poses a national security threat mandating the imposition of trade sanctions, the Court has before it direct evidence of a potential threat posed by some of the very items exported by the defendant, even though that was not his intent.

(2) The defendant's conduct also included a substantial amount of commerce. As documented in records obtained by the government dating back to in or about January 2008, the defendant obtained from over 60 American manufacturers a variety of industrial products that he exported to Iran. The number of items shipped and the illicit income derived therefrom was undoubtedly more extensive than the limited records reveal, based on the defendant's own admissions as to when he formed Sabern Instrument and began exporting goods to Iran and elsewhere.

(3) The conspiracy also involved a degree of sophistication and planning. At the request of his customers in Iran, the defendant solicited price quotes from a number of American companies. In none of the purchases he is known to have made did he ever reveal that the products sold and supplied by these legitimate companies were bound for end-users in Iran. In his

attempt to evade U.S. trade sanctions against Iran and disguise the true end-users, the defendant repackaged the goods he purchased and shipped them through locations in the UAE. Finally, he caused international wire transfers from eight overseas entities in order to enrich himself, while at the same time promoting and carrying on his illicit business.

(4) As to the fourth factor, there could not be a more compelling case of "multiple occurrences" – engaging in ongoing exports of products supplied by more than 60 American manufacturers for a lengthy period of over five years.

The Sentencing Commission has reflected the seriousness of the embargo violations by assigning a base offense level of 26 to all export crimes that implicate national security concerns and by not differentiating among those crimes according to the nature of the goods involved. The United States respectfully submits that the Court should give considerable weight to those determinations in fashioning the sentence.

*Promoting the Rule of Law and Providing Adequate Deterrence:*

As outlined above, the offense committed in this case is quite serious. And it is evident that the conspiracy charged in the information could not have been successful without the defendant – the only known conspirator here in the United States with access to the goods. Thus, it was the defendant's status as a U.S. citizen, living in the United States, which allowed him to deceive numerous American companies in order to obtain industrial goods and thwart the U.S. sanctions against Iran. The defendant provided a U.S. company name, a U.S. address, and presented a U.S. face to this conspiracy to violate the sanctions. This type of conduct needs to be deterred. Economic sanctions are difficult to enforce, and all too often, as in this case, industrial parts and equipment flow undetected to countries such as Iran – a designated state sponsor of

terrorism. A significant sentence is necessary to promote respect for law and deter this type of conduct.

*History and Characteristics of Defendant*: The defendant has no criminal history. Prior to participating in this conspiracy he lived in the United States for many years, having left Iran and moved to this country in 1990. In 2000, he became a naturalized citizen of the United States. The defendant is typical of many defendants who commit white collar crimes. He is well-educated, having obtained a college degree in Tehran, where he studied mechanical engineering; and he is professionally sophisticated, having started his own company and developed a thriving, albeit illicit, export business that he operated over a period of many years, generating a great deal of income for him and his family – enough to support his gambling habit (PSR ¶ 41) and daily opium use (PSR ¶ 42).

The defendant asserts that as a member of the Bahai faith he suffered persecution at the hands of the Muslim majority in Iran following the 1979 revolution and that this was the motivating factor that caused him and his family to emigrate to the United States. PSR ¶ 27. Having experienced first-hand the atrocities committed by extremists in control in Iran, the defendant knows only too well the need for the very trade sanctions that he recklessly violated.

## CONCLUSION

Therefore, for the above-stated reasons, the United States submits that a significant sentence of incarceration is appropriate to adequately punish the defendant and provide deterrence to such criminal activity.

Respectfully submitted,

Dana J. Boente
United States Attorney

/s/

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CERTIFICATE OF SERVICE

I hereby certify that on the 9th day of June, 2014, I electronically filed the foregoing with the Clerk of Court using the CM/ECF system, which will send a notification of such filing (NEF) to the following:

Karl A. Racine, Esq.
Attorney for the Defendant

Fred M. Rejali, Esq.
Attorney for the Defendant

And I hereby certify that I have sent the foregoing by email to the following individual:

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Senior U.S. Probation Officer
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/s/

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**Technical Opinion of Dr. Dwight L. Williams, Ph.D., P.E.**

## Introduction

The items in question include:

a) Dwyer Series GFM Gas Mass Flow Meter;
b) Dwyer Series GFC Gas Mass Flow Controller;
c) Gagemaker PN 3002 Pin Nose Diameter Gage; and
d) Jaquet T400 Universal Tachometer.

These are dual-use items that are export controlled because of their potential to facilitate nuclear weapons development.

The publicly available specifications for these items were reviewed by Dwight L. Williams, Ph.D., P.E., an expert in nuclear and advanced technologies. These items were evaluated with respect to their functionality within a nuclear weapons related context, and with respect to other nuclear related contexts including nuclear power generation, nuclear medicine, radioactive waste remediation, and fundamental academic nuclear research. Based upon the information reviewed, the items in question were found to be capable of adding value to a nuclear weapons program and to other nuclear related applications and research areas.

## Gas Flow Meters and Gas Flow Controllers

Gas flow meters and gas flow controllers are critical to the uranium enrichment process, which converts benign uranium (mined as ore) into nuclear weapons grade material. To enrich uranium, it must first be converted into a gas. This gas is introduced into the enrichment apparatus -- i.e., the gaseous diffusion apparatus, the gas centrifuge, the Atomic Vapor Laser Isotope Separation (AVLIS) machine, etc. (Note: According to unclassified news reports, Iran has allegedly been pursuing uranium enrichment with gas centrifuges.) Thoroughly processing this uranium in the enrichment environment converts it into weapons grade uranium. As the name implies, weapons grade uranium means that the uranium is fully functional as nuclear warhead and/or nuclear bomb material.

It is interesting to note that a less thorough processing of uranium in an enrichment environment produces reactor grade uranium, which is used to power nuclear reactors. Reactor grade uranium is much more benign in its destructive power compared to weapons grade uranium. However, depending on the specifications of nuclear reactor in which the reactor grade uranium is used, it is possible to use reactor grade uranium to generate materials (especially plutonium) that are useful for nuclear weapons. (Note: Some nuclear reactors are designed to produce plutonium from uranium that is not enriched at all.)

Some applications for gas flow meters and gas flow controllers exist within the nuclear power, radioactive waste, nuclear medicine, and fundamental nuclear research fields that are completely benign.

**Pin Diameter Gages**

Nuclear weapons electronics tend to be highly specialized. Pin diameter gages (which are used to precisely measure the specifications of pins used in electronics) enable electronic devices to be designed and built with the utmost precision. The acquisition of a wide assortment of pin diameter gages could be consistent with a nuclear weapons mission. However, specialized electronics, and therefore these gages, could also have utility in all of the other nuclear related contexts considered.

Pin diameter gages could also be used to develop the electronic diagnostic tools needed to collect scientific data from nuclear weapons and benign nuclear systems under various conditions. In some cases, developing the electronic devices to acquire the relevant nuclear weapons related diagnostic data can be just as important as developing some of the nuclear weapon electronic components.

**Universal Tachometer**

The term, "tachometer", is a technical name for a revolution counter, or an RPM (revolutions per minute) indicator. Tachometers are critical to the enrichment of uranium using gas centrifuges. (As noted above, according to unclassified news reports, Iran has allegedly been pursuing uranium enrichment with gas centrifuges.)

Gas centrifuges enrich uranium using centrifugal force (a force that is generated as a result of spinning an item). The words "centrifuge" and "centrifugal" both originate from the same Neo-Latin word: "centrifugus."

To enrich uranium using a gas centrifuge, the gaseous uranium is introduced into the centrifuge. The centrifuge then spins at a high speed, which enables the enrichment process to occur. In order for the enrichment process to occur properly, the speed of the centrifuge rotation must be known with accuracy at all times. A tachometer enables gas centrifuge users, who are trying to enrich uranium, to accurately determine the rotational speed of the centrifuge. Robust tachometers are essential to enriching uranium -- possibly to weapons grade uranium -- using gas centrifuges.

Tachometers can also add value to other aspects of the nuclear field, including nuclear power generation, nuclear medicine, and fundamental academic nuclear research.

**Additional Perspective**

To the lay person or the inexperienced nuclear scientist, delineating the relative usefulness of these dual-use items (within a weapons or another context) can be extremely challenging if not impossible. This is one reason why safeguards such as export controls are put in place. Safeguards eliminate the need for the handlers of these materials to conduct the rigorous technical analysis that would be required in order to determine the relative or overall value of

these items to a particular program. However, bypassing these safeguards leads to serious risks related to the potential disposition and end-use of these items.

**Dwight L. Williams, Ph.D., P.E.**
Senior Science Advisor (Contractor)
Office of Intelligence and Counterintelligence
U. S. Department of Energy

Dr. Dwight Williams serves as a Senior Science Advisor in the U.S. Department of Energy, Office of Intelligence and Counterintelligence. He also serves as a Research Affiliate in the Department of Nuclear Science and Engineering at the Massachusetts Institute of Technology (MIT). Prior to his current positions, he served as a Visiting Full Professor of Nuclear Science and Engineering at MIT, as Chief Engineer/Principal Nuclear Physicist at the Defense Intelligence Agency, and as an on-air television personality under contract with the Discovery Channel.

Dr. Williams has been marked with numerous distinctions throughout his career. His notable recognitions include being named a Director of National Intelligence Fellow. This award, which was conferred at a White House ceremony, is the highest honor available to U.S. scientists based upon classified research and accomplishments. He was also conferred a Certificate of Congressional Recognition and is a former National Young Engineer of the Year.

Dr. Williams earned a Ph.D. in nuclear engineering from the University of Maryland, having earned B.S. and M.S. degrees in nuclear engineering from North Carolina State University. His Ph.D., an academic credential, certifies his depth of knowledge in the nuclear discipline. He also holds a professional engineering (P.E.) license that he earned in the nuclear engineering discipline. His P.E. license, a professional credential, certifies his breadth of knowledge in the engineering discipline. (Certain states require a P.E. license in order to sign engineering blueprints or to testify as an expert witness in a court of law.)

As a result of Dr. Williams' depth and breadth of nuclear and engineering knowledge, and his long history of strong integration within the scientific, counterintelligence, and academic communities, he has the requisite experience and qualifications to interpret the nuclear weapons-related implications of classified and unclassified scientific and engineering technology.

GOVERNMENT EXHIBIT 1-A
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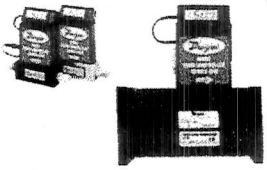

# Series GFM
## Gas Mass Flow Meter
*Flow Range Up to 1000 L/min, Pressures Up to 500 psi, NIST Traceable*

CE

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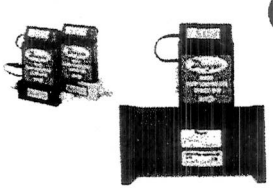
## Product Introduction

**Series GFM Gas Mass Flow Meters** combine a straight tube sensor with a restrictor flow element to provide high accuracy and repeatability. Flow rates are virtually unaffected by temperature and pressure variations. Actual gas flow is displayed in engineering units on a 3-1/2 digit, 90° tiltable LCD readout. Units can be used with Series GFT Flow Totalizer for applications requiring totalization. Series GFM includes a NIST traceable certificate.

**Note:** These units require a cable, see GFM-CBL4 or GFM-CBL5, depending on your needs.

## Product Details



## Series GFM
## Gas Mass Flow Meter

*Flow Range Up to 1000 L/min, Pressures Up to 500 psi, NIST Traceable*

CE

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Product Details

Pricing / Ordering
Introduction
Specifications
Options/Accessories
Model Chart
Instruction Manual
Dimensional Drawings
Catalog Pages
Related Products
FAQ Questions
Product Images
Product Downloads

### Product Specifications

**Service**: Clean gases compatible with wetted parts.

**Wetted Materials**: GFM-1XXX: anodized aluminum, brass, 316 SS and fluoroelastomer o-rings; GFM-2XXX: 316 SS and fluoroelastomer o-rings.

**Accuracy**: ±1.5% FS including linearity over 59 to 77°F (5 to 25°C) and 5 to 60 psia (0.35 to 4 bar).

**Repeatability**: ±0.5% of full scale.

**Response Time**: 2 seconds to within ±2% of actual flow.

**Output**: Linear 0-5 VDC and 4-20 mA.

**Maximum Particulate Size**: 5 microns.

**Temperature Limits**: 32 to 122°F (0 to 50°C).

**Power Supply**: 12-26 VDC.

**Process Connections**: 1/4" compression fitting for flow rates ≤50 L/m; 3/8" for 100 and 200 L/m; 1/2" for 500 L/min; 3/4" for 1000 L/min.

**Pressure Limits**: 500 psig (34.5 bar).

**Leak Integrity**: 1 x $10^{-7}$ sccs of Helium.

**Display**: 90° tiltable, 3-1/2 digit.

**Agency Approvals**: CE.

GOVERNMENT EXHIBIT 1-B
PENGAD-Bayonne, N.J.

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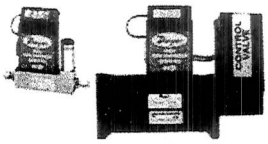
You Are Here: Flow > Mass Flowmeters and Controllers > Series GFC



# Series GFC
## Gas Mass Flow Controller
*Flow Range Up to 1000 L/min, Pressures Up to 500 psi, NIST Traceable*

CE

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## Product Details

- Pricing / Ordering
- Introduction
- Specifications
- Options/Accessories
- Approval
- Model Chart
- Instruction Manual
- *Dimensional Drawings*
- Catalog Pages
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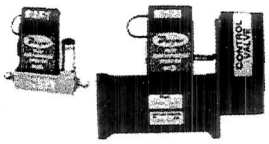
- FAQ Questions
- Product Images
- Product Downloads

## Product Introduction

**Series GFC Gas Mass Flow Controllers** combine a straight tube sensor with a restrictor flow element to provide high accuracy and repeatability. Flow rates are virtually unaffected by temperature and pressure variations. Gas mass flow controllers utilize an electromagnetic valve and PID electronics to maintain continuous control by comparing measured sensor signal set to flow rates. Setpoints can be adjusted with local potentiometers or remotely via 0 to 5 VDC or 4 to 20 mA analog signal. Actual gas flow is displayed in engineering units on a 3-1/2 digit, 90° tiltable LCD readout. Units can be used with Series GFT Flow Totalizer for applications requiring totalization. Series GFC includes a NIST traceable certificate.



# Series GFC
## Gas Mass Flow Controller
*Flow Range Up to 1000 L/min, Pressures Up to 500 psi, NIST Traceable*

CE

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## Product Specifications

**Service**: Clean gases compatible with wetted parts.

**Wetted Materials**: GFC-1XXX: anodized aluminum, brass, 316 SS and fluoroelastomer o-rings; GFC-2XXX: 316 SS and fluoroelastomer o-rings.

**Accuracy**: ±1.5% FS including linearity over 59 to 77°F (5 to 25°C) and 5 to 60 psia (0.35 to 4 bar).

**Repeatability**: ±0.5% of full scale.

**Response Time**: 2 seconds to within ±2% of actual flow.

**Output**: Linear 0-5 VDC and 4-20 mA.

**Maximum Particulate Size**: 5 microns.

**Temperature Limits**: 32 to 122°F (0 to 50°C).

**Power Supply**: ±12 VDC.

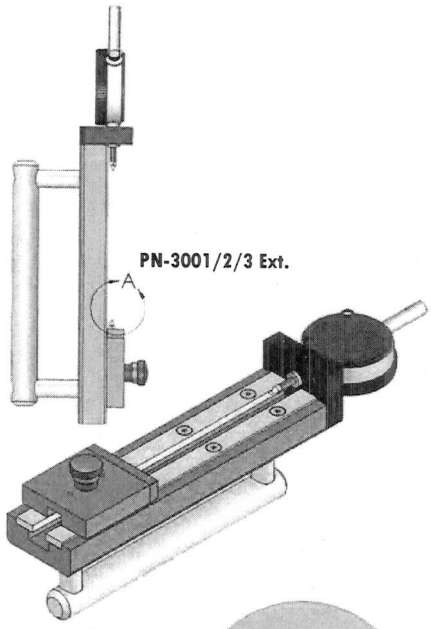
**Process Connections**: 1/4" compression fitting for flow rates ≤50 L/m; 3/8" for 100 and 200 L/m; 1/2" for 500 L/min; 3/4" for 1000 L/min.

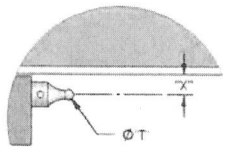
**Pressure Limits**: 500 psig (34.5 bar).

**Leak Integrity**: 1 x $10^{-7}$ sccs of Helium.

**Display**: 90° tiltable, 3-1/2 digit.

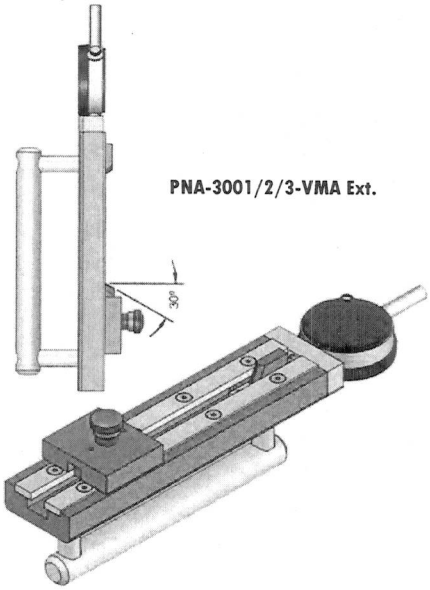
**Agency Approvals**: CE.




View A. Customer to supply standoff ("X")and point sizes ("T")




## PN-3000 SERIES PIN SEAL DIAMETERS GAGES

The PN-3000 Series of gages inspect critical pin seal diameters on premium connectors ranging from 2⅜" - 13⅜". The gage also inspects seal tapers with the addition of stand-off plates. Each model covers a specific range of connection sizes, making the PN-3000 gages exceedingly versatile and economical.

The PN-3000 gages use precision contact points that position on the seal at a fixed distance from the connector face during inspection. Contact point diameters are manufactured to tolerances of ±.0002". Each set of contact points is interchangeable to allow measuring different thread forms. The type of connector and distance from the face of the connector to the measuring plane, determine the diameter of the contact points required.

Before inspecting parts, these gages must be preset to a nominal predetermined dimension using gage blocks, Gagemaker's Pin Seal Diameter Gage Setting Master, or Frame Standards. Once the gage is preset, it is properly positioned on the part by sweeping to obtain the largest indicator reading. The gage's indicator reports actual measurement readings. The PN-3000 gage is supplied with a .0005" resolution indicator.

### Features

- Inspects pin seal diameters on premium connectors ranging from 2⅜" - 13⅜".
- Inspects seal tapers on premium connectors ranging from 2⅜" - 13⅜".
- Provides accurate measurements on the gage's indicator at the critical sealing point of the pin.
- Uses interchangeable contact points to allow inspection on a variety of thread forms.
- Supplied with a .0005" resolution indicator.
- Requires presetting using gage blocks, Gagemaker's Pin Seal Diameter Gage Setting Master, or Frame Standards.
- Allows use in a manufacturing or field environment due to durable construction.

## PN-3000 SERIES PIN NOSE DIAMETER GAGES*

The PN series measure pin nose diameter using contact points. Specify the distance from the face of the connector to the measuring plane and desired contact point diameter when ordering.

| Model | Description | Range |
|---|---|---|
| PN-3001 | Pin Nose Diameter Gage | 0" - 5½" |
| PN-3002 | Pin Nose Diameter Gage | 0" - 9½" |
| PN-3003 | Pin Nose Diameter Gage | 0" - 13½" |
| PN-3004 | Pin Nose Diameter Gage | 0" - 19½" |
| PN-3005 | Pin Nose Diameter Gage | 0" - 25½" |

**There is a separate cost to reposition the point standoff of PN-3000 Gages. Quotation available upon request.*

## PN-3000 SERIES INTERNAL "BALL CONTACT" SEAL DIAMETER GAGES

The PNI series measure the internal ball contact seal diameter using contact points. Specify the distance from the face of the connector to the measuring plane and desired contact point diameter when ordering.

| Model | Description | Range |
|---|---|---|
| PNI-3001-VMB | Internal "Ball Contact" Seal Diameter Gage | 2" - 5½" |
| PNI-3002-VMB | Internal "Ball Contact" Seal Diameter Gage | 2" - 9⅝" |
| PNI-3003-VMB | Internal "Ball Contact" Seal Diameter Gage | 2" - 13⅜" |

## PN-3000 SERIES 30° EXTERNAL APEX DIAMETER GAGES

The PNA model gages measure only the external apex diameter of the connector.

| Model | Description | Range |
|---|---|---|
| PNA-3001-VMA | 30° External Apex Diameter Gage, Anvils | 2" - 4¼" |
| PNA-3002-VMA | 30° External Apex Diameter Gage, Anvils | 2" - 9⅝" |
| PNA-3003-VMA | 30° External Apex Diameter Gage, Anvils | 2" - 13⅜" |

## PN-3000 SERIES 30° INTERNAL/EXTERNAL APEX SEAL DIAMETER GAGES

The PN-3000 Series 30° Internal/External Apex Seal Diameter gages measure both the internal and external diameters of the apex seal for the connector.

| Model | Description | Range |
|---|---|---|
| PN-31VM-30 | 30° Internal/External Apex Seal Diameter "V" | Internal 2⅜" - 6⅝" External 4"-6⅝" |
| PN-33VM-30 | 30° Internal/External Apex Seal Diameter "V" | Internal 2⅜" - 14" External 4" - 14" |

## PN-3000 PIN SEAL DIAMETER GAGE OPTIONAL EQUIPMENT

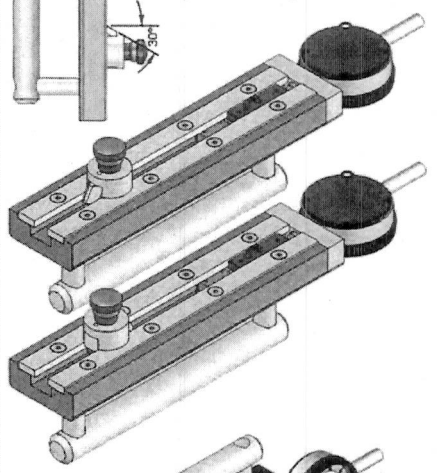
The PNS-3000 pin seal diameter gage setting standard is an adjustable standard used to preset the PN-3000 series pin seal gages. The PN-3000 gages use a dial indicator to compare a known diameter to the diameter of the machined piece. The pin seal standoff plates are available in various sizes. Additional custom sizes are available upon request. Pin seal standoff plates are sold as a set of two.

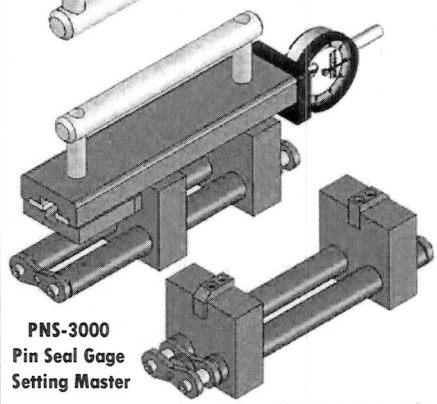
| Model | Description | Range |
|---|---|---|
| PNS-3000 | Pin Seal Gage Setting Master | 2⅜" - 13⅜" |
| PN-3000/T.04087 | Pin Seal Standoff Plate* | 0.04087" (1.038 mm) thick |
| PN-3000/T.044 | Pin Seal Standoff Plate* | 0.0440" (1.12 mm) thick |
| PN-3000/T.0472 | Pin Seal Standoff Plate* | 0.0472" (1.20 mm) thick |
| PN-3000/T.0591 | Pin Seal Standoff Plate* | 0.0591" (1.50 mm) thick |
| PN-3000/T.064 | Pin Seal Standoff Plate* | 0.0640" (1.62 mm) thick |
| PN-3000/T.072 | Pin Seal Standoff Plate* | 0.0720" (1.83 mm) thick |
| PN-3000/T.0748 | Pin Seal Standoff Plate* | 0.0748" (1.90 mm) thick |
| PN-3000/T.078 | Pin Seal Standoff Plate* | 0.0780" (1.9812 mm) thick |
| PN-3000/T.0787 | Pin Seal Standoff Plate* | 0.0787" (2.00 mm) thick |
| PN-3000/T.0811 | Pin Seal Standoff Plate* | 0.0811" (2.06 mm) thick |
| PN-3000/T.0815 | Pin Seal Standoff Plate* | 0.0815" (2.07 mm) thick |
| PN-3000/T.094 | Pin Seal Standoff Plate* | 0.0940" (2.39 mm) thick |
| PN-3000/T.100 | Pin Seal Standoff Plate* | 0.1000" (2.54 mm) thick |
| PN-3000/T.114 | Pin Seal Standoff Plate* | 0.1140" (2.90 mm) thick |
| PN-3000/T.1181 | Pin Seal Standoff Plate* | 0.1181" (3.00 mm) thick |
| PN-3000/T.121 | Pin Seal Standoff Plate* | 0.1210" (3.07 mm) thick |
| PN-3000/T.122 | Pin Seal Standoff Plate* | 0.1220" (3.10 mm) thick |
| PN-3000/T.1221 | Pin Seal Standoff Plate* | 0.1221" (3.10 mm) thick |
| PN-3000/T.1378 | Pin Seal Standoff Plate* | 0.1378" (3.50 mm) thick |
| PN-3000/T.171 | Pin Seal Standoff Plate* | 0.1710" (4.34 mm) thick |
| PN-3000/T.1969 | Pin Seal Standoff Plate* | 0.1969" (5.00 mm) thick |
| PN-3000/T.200 | Pin Seal Standoff Plate* | 0.2000" (5.08 mm) thick |
| PN-3000/T.3149 | Pin Seal Standoff Plate* | 0.3149" (8.00 mm) thick |
| PN-3000/T.350 | Pin Seal Standoff Plate* | 0.3500" (8.89 mm) thick |

*Additional plate thickness sizes are available. All plates are 2 per set.

Rotate the slider and keyway assembly for Internal/External inspection

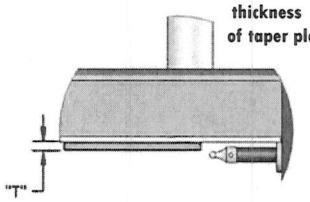
PN-31VM-30 Int./Ext.
PN-33VM-30 Int./Ext.



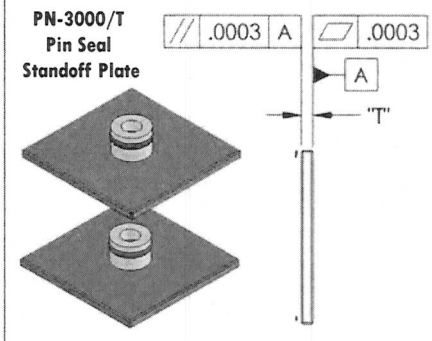



PNS-3000 Pin Seal Gage Setting Master

Customer to specify thickness ("T") of taper plates




PN-3000/T Pin Seal Standoff Plate




The round and frame style standards are designed to preset all models of the PN-3000 series gages for accurate inspection of API pin end seal taper diameters of premium connectors. These standards consist of a rigid, non-adjustable steel block machined to precise, proper size tolerances.

1-08

# JAQUET T400

## UNIVERSAL TACHOMETER



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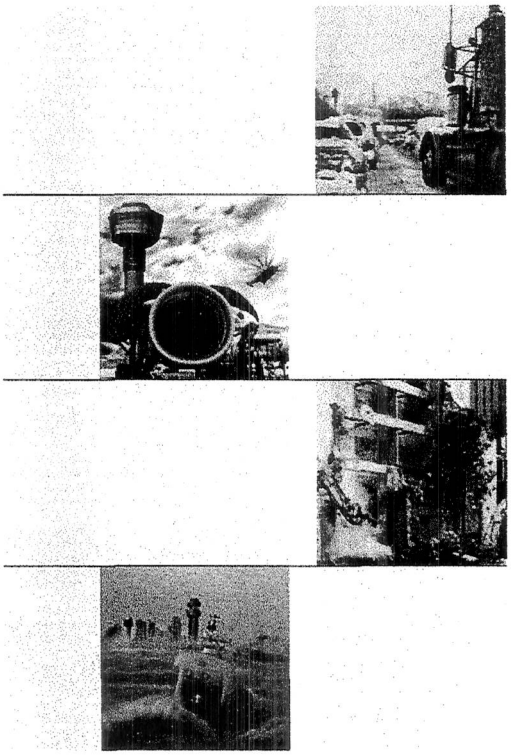

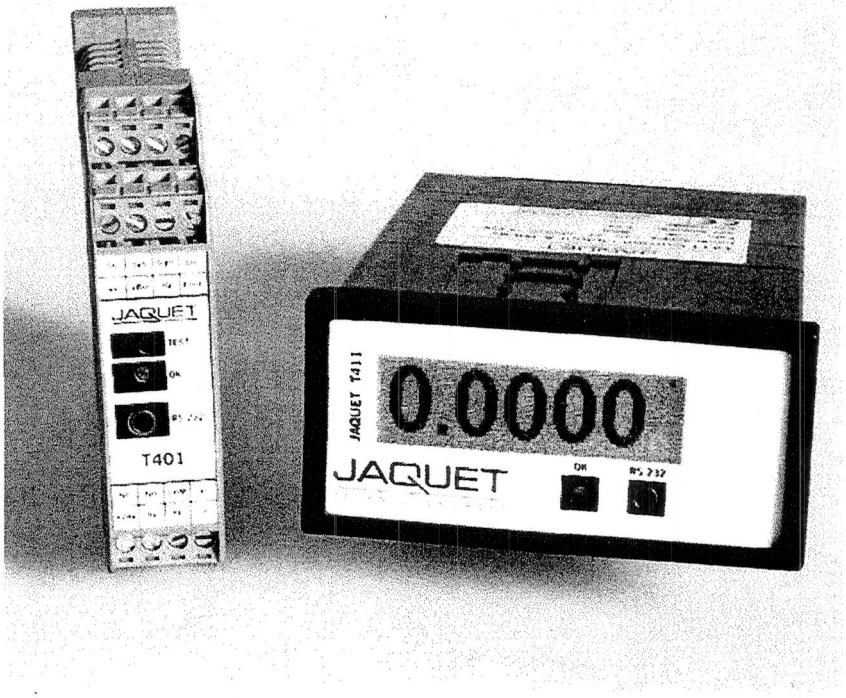


## JAQUET T400 Speed measurement, switching and indicating instruments

### TYPICAL APPLICATIONS

- DIESEL ENGINE START CONTROL AND OVERSPEED PROTECTION
- MICRO TURBINE MEASUREMENT AND PROTECTION
- TURBOCHARGER SPEED MEASUREMENT
- MACHINE PROTECTION IN SAFETY CRITICAL APPLICATIONS
- UNIVERSAL SPEED MEASUREMENT AND INDICATION

### FEATURES

- Converts absolute speed into an analog signal
- Including 2 limits (A/B) with programmable hysteresis
- One changeover relay assigned via binary input to limit (A or B)
- T411 and T412 models with display
- Isolated signal input with automatic trigger level adjustment
- Built in isolated sensor supply with sensor monitoring
- Open collector output of sensor frequency
- Accuracy class 0.05% for limits and 0.5% for analog signals
- Configuration and status via Windows® software
- 5 digit machine factor allowing configuration and display in machine units
- Wide tolerance 10...36 VDC power supply

### T400 ADVANTAGE

- Fast response to over speed conditions
- Germanischer Lloyd's and ABS approval for marine applications
- Digital display of speed value for the models T411 and T412
- 0/4...20 mA or 0/2...10 V analog output with rising or falling characteristics
- Adaptive trigger provides high noise immunity e.g. with electromagnetic sensors
- Digital input for direct treatment of frequency signals
- 2 possible relay configuration sets e.g. for start up bridging, controlled via binary inputs
- Pluggable terminals
- Integrated 2 or 3 wire sensor monitoring and system watchdog

# JAQUET T400

## UNIVERSAL TACHOMETER

### One channel tachometer family T400

| | | | |
|---|---|---|---|
| **Type and part numbers** | T401.00 | 4..20mA output | 383Z-05307 |
| | T402.00 | 2...10 V ouput | 383Z-05308 |
| | T411.00 | display; 4...20 mA output | 383Z-05318 |
| | T412.00 | display; 2...10 V output | 383Z-05319 |
| | T411.03 | display; 5 VDC sensor supply; 4...20 mA output | 383Z-05595 |
| | T412.03 | display; 5 VDC sensor supply; 2...10 V output | 383Z-05596 |
| **Optional accessories** | Power supply | 100-240 VAC /24 VDC / 1 A | 383Z-05764 |
| | Interface cable RS232 for configuration | | 830A-36889 |
| | USB adapter for interface cable | | 830A-37598 |

### Technical data

| | | | | | |
|---|---|---|---|---|---|
| **Measuring range** | Lowest: 0...1.000 Hz | | Highest: 0...35.00 kHz | | |
| **Measurement time** | Configurable min. measurement time ($t_M$): 2/5/10/20/50/100/200/500 ms, 1/2/5 s | | | | |
| **Reaction time** | Current output: | Typical | $t_M$ + 7.5 ms | Maximum | Input period + $t_M$ + 7.5 ms |
| | Relays: | Typical | $t_0$ + 10.5 ms | Maximum | Input period + $t_M$ + 10.5 ms |
| **Accuracy** | 0.5% referred to the analog output end of range value | | | | |
| **Analog output** (1) | T401/T411: Current output 0...20 mA resp. 4...20 mA | | | | |
| | T402/T412: Voltage output 0...10 V resp. 2...10 V | | | | |
| | Programmable rising or falling transfer function (min. end value 1.00 Hz) | | | | |
| | Load T401/T411: max. 500 Ohms corresponding to a maximum of 10 V | | | | |
| | Load T402/T412: min. 7 kOhm corresponding to a maximum of 1.4 mA | | | | |
| | Maximum open circuit voltage: 12 V | | | | |
| | Resolution: 12 bit corresponding to 1:4096 | | | | |
| | Maximum linearity error: 0.1 % | | | | |
| | Temperature drift: typ. ± 100 ppm/degree K, max. ± 300 ppm/degree K | | | | |
| **Set points /relay** (2) | Hysteresis: For each limit an upper and a lower set point may be set independently | | | | |
| | Change over contact: max. 250 VAC, 1250 VA (DC: see operating instructions) | | | | |
| **Data I/O** | RS232 interface with +5 V-CMOS level 3-pole. 3.5 mm stereo headphone connector on the front side. | | | | |
| **Sensor input** (1) | | | | | |
| Input resistance | Analog 30 kOhm / Digital 46 kOhm | | | | |
| Frequency range | 0.01 Hz /35 kHz | | | | |
| Trigger level | Analog input: Adaptive trigger level from 28 mV to 6.5 V or 250 mV to 6.5 V peak depending on the amplitude of the input signal. | | | | |
| | Digital input: Digital fixed trigger at 3 V ± 1.5 V hysteresi | | | | |
| **Sensor supply** | | | | | |
| Standard | + 14 V, max. 35 mA, short-circuit proof | | | | |
| S5 version | + 5 V , max. 35 mA, short-circuit proof | | | | |
| | Built-in pull up and pull down resistor 820 Ohm for connection of two-wire transmitters or daisy chaining of T400's | | | | |
| **Sensor monitoring** | Sensor monitoring 3 wire sensors: programmable current consumption limits of 0.5...35mA. Outside the selected range the sensor is signaled as faulty . | | | | |
| | Electromagnetic sensors: | continuity checked. Open circuit signaled as a fault. | | | |
| | None: | Both sensor monitoring functions may be disabled. | | | |
| **Open collector output** (1) | Galvanically separated output of sensor frequency | | | | |

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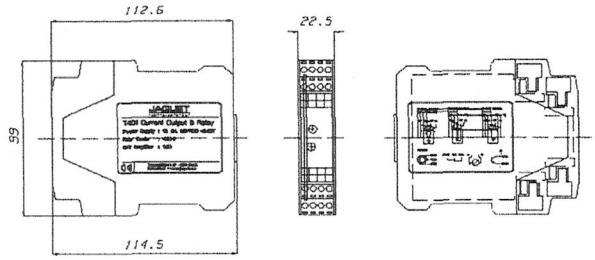
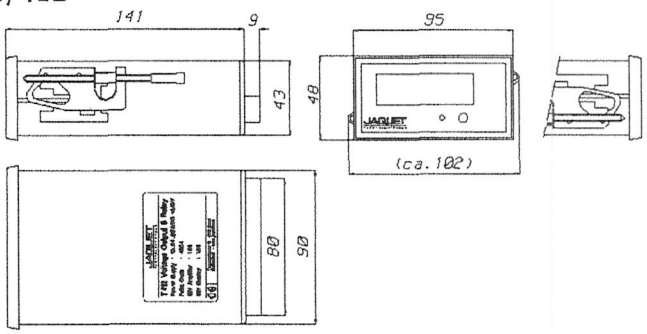
| | |
|---|---|
| **Binary inputs** (1) | For external selection between two sets (A/B) of programmable relay control and acknowledge functions: (No external pull up needed)<br>Low active :U < +1.5V High (open) :U > +3.5V |
| **Environmental** | KUE according to DIN 40 040<br>Operating temperature: - 40...+85 °C<br>Storage temperature: -40...+90 °C<br>Relative humidity up to 75% average over one year period, up to 90% max. for 30 days |
| **Power supply** | 10...36 VDC power consumption max. 3 W |
| **Insulation** | Galvanic separation between power supply, current output and the sensor power supply. Isolation 700 VDC / 500 VAC. Relay contact isolation: 1500 AC |
| **EMC** | Electromagnetic compatibility: Radiation in accordance with international standards and EN 50081-2. Immunity in accordance with international standards and EN 50082-2<br>Conducted emissions: CISPR 16-1, 16-2 Radiated emissions: EN 55011<br>Electrostatic discharge: IEC 61000-4-2 Electromagnetic fields: IEC 61000-4-3<br>Conducted fast transients: IEC 61000-4-4 Conducted slow transients: IEC 61000-4-5<br>Conducted high frequency: IEC 61000-4-6<br>Pulse modul. elec. field: ENV 50140<br>Power frequency magnetic field: IEC 1000-4-8 |
| **Standards** | EN 50155, GL / Germanischer Lloyd, ABS |

## Dimensions

### T401/402




### T411/412




| | |
|---|---|
| **Rail** | Rail DIN 4622713 (EN 50022) or mounting plate to DIN 43660 (46121) |
| **Housing** | Protection class IP40, terminals IP20 |
| **Terminals** | Pluggable |
| **Weight** | T401/T402: 150 g , T411/T412: 210 g |

T400 systems are supplied with a full documentation and the T400 Windows® Software.
The software allows:

- Quick and easy configuration of all operating parameters
- Unit interrogation of identity and parameters
- PC display of current measurement and relay status
- Archiving and printing of the configuration

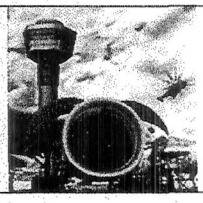
RS-232 cable not included, see page 2 for optional accessories.
**Please note: Information is subject to change. For more technical information please refer to operating instructions.**

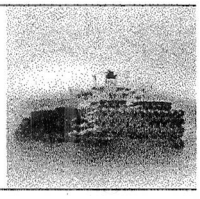
# COMPANY PROFILE

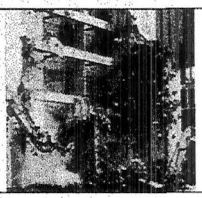
JAQUET TECHNOLOGY GROUP

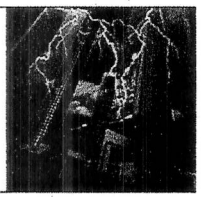
JAQUET TECHNOLOGY GROUP offers the world's most versatile and advanced range of solutions for the detection, measurement, diagnosis and management of rotational speed.

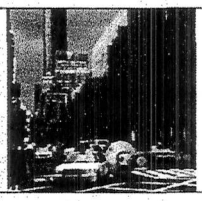
Our industry and application specific expertise ensures that you will achieve an optimum solution. Completely matched to your individual requirements, meeting key industrial standards and certifications, our products help boost the performance of your machinery while reducing cost of ownership.

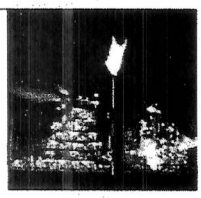












## TYPICAL INDUSTRIES SERVED

- Automotive and truck
- Aerospace
- Diesel / Gas engines
- Hydraulics
- Railway
- Turbines
- Turbochargers
- Industrial machinery

## PRODUCTS – SPEED SENSORS

- Various technologies
- Standard, custom and OEM models
- For demanding applications, e.g. 300,000 rpm, temperature up to 320 °C / 600 °F, high vibration, shock to 200 g, etc.
- GreenLine speed sensors for general applications
- Ex models for hazardous areas
- Pole bands and target wheels available where needed

## PRODUCTS – SYSTEMS

- Multi-channel overspeed protection systems
- 1–2 channel measurement, protection and control modules
- Engine diagnostic systems
- Redundant speed measurement and indication

## SPECIAL PROJECT EXAMPLES

- An automotive linear movement sensor
- Integrated power and torque measurement for display and gearbox control
- Naval spec. turbine protection for nuclear submarines
- Speed measurement in turreted, tracked vehicles

## QUALITY MANAGEMENT AND STANDARDS

- Quality management: TS 16949 and ISO 9001, ZELM ATEX 1020, KWU
- Sensors: GL, KWU, TÜV, ATEX, EN 50155 ,NF F 16-101 102 , ABS, EMC
- Systems: IEC 61508 SIL 2 and SIL 3, API 670, GL, TÜV, KWU, EX
- Environmental: RoHs - EU directive 2002/95/EC

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