Torino Informática Ltda.
CNPJ 03.619.767/0001-91
I.E. 669.369.347.110
ana.maria@grupotorino.com.br

Serra/ES, 18 de outubro de 2023

Ao
Conselho da Justiça Federal
Comissão Permanente de Licitação

Ref.: Pregão Eletrônico n.º 14/2023
Processo SEI n.º 0000179-46.2023.4.90.8000
Data de abertura da licitação: 18 de outubro de 2023 às 10h
Local: www.comprasgovernamentais.gov.br

CARTA PROPOSTA

Prezados Senhores,

Após examinar todas as cláusulas e condições estipuladas no Edital em referência, apresentamos nossa proposta nos termos consignados no mencionado ato convocatório e seus anexos, com os quais concordamos plenamente.

Nossa proposta é válida por 90 (noventa) dias, contados da data de abertura da sessão pública, sendo o preço ofertado firme e irreajustável durante o prazo de validade. O prazo de entrega dos equipamentos será de 75 (setenta e cinco) dias corridos, a contar da Ordem de Fornecimento, conforme Anexo I ao Edital, nos locais indicados no item 2.6 do mesmo anexo. Prazo de garantia de 60 (sessenta) meses "on-site", de acordo com o item 4.9 do Anexo I ao Edital.

Informamos finalmente, que nos preços adiante ofertados já estão inclusos todos os custos decorrentes da operação de venda dos produtos, objeto desta licitação, tais como transporte, mão-de-obra, impostos, encargos sociais, trabalhistas, previdenciários, fiscais e comerciais, embalagens, prêmios de seguro, fretes, taxas, assistência técnica e outras despesas incidentes ou necessárias à efetivação do cumprimento das obrigações decorrentes do presente Pregão.

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FORMULÁRIO DE PREÇOS

Item	Descrição	Localidade	Qtd	Nome dos produtos	Preço unitário	Preço total
1	Computador tipo workstation de alta performance conforme especificações técnicas do Anexo I do Módulo I do Edital - Termo de Referência	Localidades para entrega descritas no item 4.10 do Módulo I do Edital - Termo de Referência	146	HP Z4 G5	41.200,00	6.015.200,00
TOTAL					**6.015.200,00 (seis milhões, quinze mil e duzentos reais)**	

Dados da empresa:

Razão Social: Torino Informática Ltda

CNPJ/MF: 03.619.767/0005-15

IE.: 083.327.90-8

Endereço: Av. 600, s/n, Quadra 15, Módulo 10, Setor Industrial, TIMS, Serra/ES

Tel/Fax: (61) 3081-0781

CEP: 29161-419

Banco: Banco do Brasil **Agência:** 2414-7 **nº c/c:** 6320-7

Dados do Representante Legal:

Nome: Rodrigo do Amaral Rissio

Cargo: Sócio - Procurador

Cart. Ident nº: 27.954.969-6 SSP/SP

CPF/MF: 220.807.218-95

Naturalidade: São Paulo

Nacionalidade: Brasileiro

Endereço: Rua Rita de Carvalho Monteiro, 120 – Retiro São João, Sorocaba/SP

CEP: 18085-750

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Serra/ES, 18 de outubro de 2023

Ao
Conselho da Justiça Federal
Comissão Permanente de Licitação

Ref.: Pregão Eletrônico n.º 10/2019
Processo CJF – SEI n.º 0004374-87.2019.4.90.8000
Data de abertura da licitação: 18 de Novembro de 2019 às 10h
Local: www.comprasgovernamentais.gov.br

DECLARAÇÕES

A empresa Torino Informática Ltda, inscrita no CNPJ nº 03.619.767/0001-91, sediada à Rua Rita de Carvalho Monteiro, 120, Retiro São João, Sorocaba/SP, e sua matriz situada à Av. 600 s/n, Quadra 15, Módulo 10, Setor Industrial, TIMS, Serra/ES, inscrita no CNPJ sob o número 03.619.767/0005-15, declara, que:

a) o preço cotado em sua proposta é definitivo e nele estão incluídos todos os tributos, embalagens, encargos trabalhistas, previdenciários, fiscais, comerciais, taxas, emolumentos e quaisquer despesas operacionais, despesas e obrigações financeiras de qualquer natureza, fretes, seguro, etc., e quaisquer despesas, inclusive lucro, que incidam ou venham a incidir sobre o objeto desta licitação;
b) conhece e concorda com todos os termos do edital e seus Anexos.
c) entregará junto com os equipamentos: mouse pad, todos os cabos, drivers e manuais necessários à instalação e ao seu perfeito funcionamento
d) a garantia dos monitores cobre ainda o reparo ou substituição do monitor no caso de constatação de defeito ou surgimento de deadpixel (apenas 1 (um) pixel claro queimado)

Atenciosamente,

Rodrigo do Amaral Rissio
Sócio Procurador
Torino Informática Ltda
RG: 27.954.969-6 SSP/SP

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DECLARAÇÃO DE NÃO CONDENAÇÃO JUDICIAL

Declaro que eu, Rodrigo do Amaral Rissio, portador do CPF nº 220.807.218-95, representante da empresa Torino Informática Ltda, inscrita no CNPJ nº 03.619.767/0005-15, estabelecida no endereço Av. 600 s/n, Quadra 15, Módulo 10, Setor Industrial, TIMS, Serra/ES, como seu representante legal para os fins da presente declaração, que nos 5 (cinco) anos anteriores à divulgação deste edital, não foi condenada judicialmente, com trânsito em julgado, por exploração de trabalho infantil, por submissão de trabalhadores a condições análogas às de escravo ou por contratação de adolescentes nos casos vedados pela legislação trabalhista.

Atenciosamente,

_____

Rodrigo do Amaral Rissio
Sócio Procurador
Torino Informática Ltda
RG: 27.954.969-6 SSP/SP

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DECLARAÇÃO DE COMPROMETIMENTO EM PRESTAR GARANTIA

Declaro que a empresa Torino Informática Ltda, inscrita no CNPJ nº 03.619.767/0005-15, estabelecida no endereço Av. 600 s/n, Quadra 15, Módulo 10, Setor Industrial, TIMS, Serra/ES, compromete-se a prestar garantia de 60 (sessenta) meses a contar da data de recebimento do Termo de Recebimento Definitivo (TRD).

Atenciosamente,

Rodrigo do Amaral Rissio
Sócio Procurador
Torino Informática Ltda
RG: 27.954.969-6 SSP/SP

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Serra/ES, 18 de outubro de 2023

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Data de abertura da licitação: 18 de Novembro de 2019 às 10h
Local: www.comprasgovernamentais.gov.br

DECLARAÇÃO DE ATENDIMENTO AO ART. 3º, INCISO II, DECREO N.º 7174/20210

Declaro que os produtos ofertados atendem aos critérios de segurança, compatibilidade eletromagnética e eficiência energética, previstos no art. 3º, II, do Decreto n. 7.174, de 12 de maio de 2010, regulamentado pela Portaria INMETRO n. 170, de 10 de abril de 2012.

Atenciosamente,

_____

Rodrigo do Amaral Rissio
Sócio Procurador
Torino Informática Ltda
RG: 27.954.969-6 SSP/SP

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DECLARAÇÃO DE QUE OS BENS OFERTADOS NÃO CONTÊM SUBSTÂNCIAS PERIGOSAS ACIMA DA CONCENTRAÇÃO RECOMENDADA

Declaro que os bens ofertados não contêm substâncias perigosas em concentração acima da recomendada na diretiva RoHS (Restriction of Certain Hazardous Substances), tais como mercúrio (Hg), chumbo (Pb), cromo hexavalente (Cr (VI)), cádmio (Cd), bifenil polibromados (PBBs), éteres difenil-polibromados (PBDEs), em conformidade com o que dispõe o art. 5º, IV, da Instrução Normativa MPOG n. 01, de 19 de janeiro de 2010.

Atenciosamente,

_____

Rodrigo do Amaral Rissio
Sócio Procurador
Torino Informática Ltda
RG: 27.954.969-6 SSP/SP

ITEM	Descrição	Nome Doc.	Nº Página	Atende
ITEM 01 - MICROCOMPUTADOR WORKSTATION DE ALTA PERFOMANCE - MARCA HP / MODELO Z4 G5 TOWER				
1.1	**PLACA PRINCIPAL E INTERFACES**			
1.1.1	Possui 8 (oito) slots para memórias do tipo RAM DDR4 com ECC, e que permite expansão da memória para até 256 GB (duzentos e cinquenta e seis gigabytes) e suporte à memórias de 2.933MHz (dois mil, seiscentos e sessenta e seis megahertz)	HP Z4 G5	9	Sim
1.1.2	Possui tecnologia Quad Channel no chip controlador de memória RAM;	HP Z4 G5	4	Sim
1.1.3	Possui 4 (quatro) slots padrão PCIExpress, sendo, no mínimo:	HP Z4 G5	17	Sim
i.	2 (dois) PCIe Gen3 x 16; e	HP Z4 G5	17	Sim
ii.	1 (um) PCIe Gen3 x16 cabeado para x8; e	HP Z4 G5	17	Sim
iii.	1 (um) PCIe Gen3 x16 cabeado para x4.	HP Z4 G5	17	Sim
1.1.4	Possuir tecnologia RAID com placa controladora externa ou nativa na placa principal, sendo possíveis ao menos as configurações de RAID 0 e 1;	HP Z4 G5	17	Sim
1.1.5	Possui Chipset do mesmo fabricante do processador;	HP Z4 G5	17	Sim
1.1.6	Suporta gerenciamento remoto com base nas especificações Intel vPRO (Desktop and Mobile Architecture for System Hardware) e WS-MAN, definidas pelo DMTF (Desktop Management Task Force) ou DMI (Desktop Management Interface) versão 2.0 , CIM (Commom Information Model) versão 2.0;	HP Z4 G5 Intel Xeon W7-2465X	25, 31 3	Sim
1.1.7	Possui, integrado à placa-mãe do computador, sem adaptações, subsistema de segurança TPM (Trusted Plataform Module) compatível com a norma TPM Specification Version 2.0 especificada pelo TCG (Trusted Computing Group). Junto com o equipamento será fornecido software que permite à implementação desta função. Não serão ofertados qualquer tipo de adaptador acoplado para atender o item TPM. O fabricante do equipamento é membro do TCG Group comprovado através do link: https://trustedcomputinggroup.org/membership/member-companies/ na categoria Promoter;	HP Z4 G5 TCG HP BitLocker	27 1 1 a 3	Sim
1.1.8	Suporta boot por dispositivo externo na interface USB 3.0;	Carta HP	2	Sim
1.1.9	Controladora SATA de 6 GB/s (seis gigabytes por segundo), integrada e compatível com os periféricos especificados.	HP Z4 G5	5, 17, 27	Sim
1.2.	**BIOS**			
1.2.1	Capacidade de apagar definitivamente os dados contidos nas unidades de armazenamentoa, acessível pela BIOS;	Carta HP HP Secure Erase	2 1 a 5	Sim
1.2.2	BIOS está em conformidade com os padrões de mercado de maneira a usar métodos de criptografia robusta para verificar à integridade da BIOS;	Carta HP HP Sure Start	2 3, 17, 21	Sim
1.2.3	Possui ferramenta gráfica para diagnóstico de saúde do hardware;	Carta HP HP Hardware Diagnostic	2 1 a 18	Sim
1.2.4	O fabricante dispõe de software para diagnóstico com objetivo de reparar problemas de drivers, atualização de chipset e BIOS;	Carta HP HP Hardware Diagnostic HP Support Assistant	2 1 a 18 6	Sim
1.2.5	O número de série do equipamento estará gravado na BIOS do equipamento. Não permitindo alteração do número de série do equipamento pelo usuário/funcionário, independente de senha e permissão de acesso a BIOS do equipamento;	Carta HP	2	Sim
1.2.6	BIOS em português ou inglês, desenvolvida em conformidade com a especificação UEFI 2.4 (http://www.uefi.org);	Carta HP UEFI HP	2 1	Sim
1.2.7	Versão da BIOS atualizada há pelo menos 12 (doze) meses;	Carta HP	2	Sim
1.2.8	Tipo Flash Memory, utilizando memória não volátil e reprogramável, com capacidade de proteção contra gravação, realizada por software;	Carta HP	2	Sim
1.2.9	Suporte a "Plug and Play", ACPI última versão (Advanced Configuration and Power Interface) e SMBIOS (System Management BIOS);	HP Z4 G5 Carta HP	24 2	Sim
1.2.10	Capacidade de proteção da memória flash contra gravação, realizada por intermédio da desativação de opção por software em configuração no setup do BIOS;	HP Sure Start	19	Sim
1.2.11	Possui controle de permissões de acesso através de senhas, sendo uma para inicializar o computador e outra para os recursos de administração do BIOS (Power On e Setup respectivamente);	Carta HP	2	Sim
1.2.12	A placa mãe possui número de série do computador registrado no BIOS e permite a leitura remota via comandos DMI 2.3. O número de série virá registrado de fábrica no BIOS;	Carta HP	2	Sim
1.2.13	Permite o controle de habilitação das portas USB;	Carta HP	2	Sim
1.2.14	A BIOS foi desenvolvida pelo mesmo fabricante do equipamento ou esse com direitos (copyright) sobre a BIOS. Solução personalizada, tendo o fabricante direitos (copyright) e direito livre de edição sobre o BIOS. Caso o fabricante use BIOS em regime OEM deverá possuir direitos totais de uso, cópia, alteração, customização, distribuição, não limitados a interface gráfica de usuário, para tal comprovação deverá ser apresentado documento legal que contenha informações sobre o direito e propriedade e registro de copyrights cedidos pelo fabricante ou detentor do contrato com a fabricante do BIOS. As atualizações ou downgrade, quando necessárias, seãor disponibilizadas no sítio do fabricante. Não serão ofertadas customizações ou apenas cessão de direitos limitados;	Carta HP	2	Sim

1.2.15	Para a comprovação do exigido no item anterior, a LICITANTE deverá apresentar documentação legal que contenha informações sobre o direito e propriedade e registro de copyrights do fabricante da placa mãe e do BIOS, comprovando o seu desenvolvimento para o equipamento ofertado;	Carta HP	2	Sim
1.2.16	Gerenciável remotamente. Junto com o equipamento será fornecido software devidamente licenciado, que permite à implementação desta função;	Carta HP Vpro	2 3, 5	Sim
1.2.17	Permite ligar e desligar o computador remotamente;	Vpro	1 a 5	Sim
1.2.18	Permite a inicialização remota a partir de imagem (ISO ou IMG), ou de dispositivos de inicialização (CDROM, pendrives e etc);	Carta HP	2	Sim
1.2.19	Sensor de intrusão, com alertas ao sistema em caso de abertura do gabinete permitindo monitorar violações através de software de gerenciamento em conjunto com dispositivo de hardware	HP Z4 G5	24	Sim
1.2.20	Suporta o recurso PXE (Pre-boot Execution Environment) e WOL (Wake on LAN).	HP Z4 G5 Carta HP	26, 31 3	Sim
1.3.	**PROCESSADOR (Intel Xeon W7-2465X)**			
1.3.1	Velocidade real (clock interno) de 3,1 GHz (três ponto um gigahertz), por núcleo, sem o uso de recursos de turbo ou overclock;	Xeon W5-2465X	1	Sim
1.3.2	Possui arquitetura x86 e x64, com 16 (dezesseis) núcleos físicos e 32 (trinta e duas) threads - alterado via questionamento	Xeon W5-2465X	1	Sim
1.3.3	Possui tecnologia de fabricação de 7 nm (sete nanômetros);	Xeon W5-2465X	1	Sim
1.3.4	Cooler do mesmo fabricante do processador ou do fabricante do equipamento, capaz de manter o processador em perfeito funcionamento;	HP Z4 G5	23	Sim
1.3.5	Processo de fabricação em vigor por pelo menos 90 (noventa) dias após a publicação do edital (processadores descontinuados não serão aceitos);	Xeon W5-2465X	2	Sim
1.3.6	Possui memória cache de 33.75 MB (trinta e três ponto setenta e cinco megabytes);	Xeon W5-2465X	2	Sim
1.3.7	Compatível com memórias RAM DDR5 ECC de 4.800 MHz (quatro mil e oitocentos megahertz);	Xeon W5-2465X	2	Sim
1.3.8	Disponibiliza última geração disponível para o modelo, no momento da assinatura contratual;	Xeon W5-2465X	1	Sim
1.3.9	O processador tem o desempenho correspondente à pontuação de 47.973 (quarenta e sete mil, novecentos e setenta e três) pontos CPU Mark, aferidos pelo site http://www.cpubenchmark.net/cpu_list.php;	PassMark W5-2465X	1	Sim
1.4.	**MEMÓRIA RAM**			
1.4.1	Capacidade instalada de 128 GB (cento e vinte e oito gigabytes), distribuídos em 4 (quatro) módulos de 32 GB (trinta e dois gigabytes);	HP Z4 G5	9	Sim
1.4.2	Padrão DDR5, com recursos de ECC (Error Correction Check);	HP Z4 G5	9	Sim
1.4.3	Velocidade de clock de 4.800 MHz (quatro mil e oitocentos megahertz);	HP Z4 G5	9	Sim
1.5.	**UNIDADES DE ARMAZENAMENTO**			
1.5.1	Será entregue com 2 (duas) unidades de disco SSD M.2 PCIe NVMe com capacidade de 2TB (dois terabytes) para cada unidade de armazenamento;	HP Z4 G5	36	Sim
1.5.2	Suporte à tecnologia SMART (Self-Monitoring, Analysis and Reporting Technology);	HP Z4 G5	36	Sim
1.6	**INTERFACE DE VÍDEO (Nvidia RTX-A5000)**			
1.6.1	Placa de vídeo offboard com 24 GB (vinte e quatro gigabytes) de memória padrão GDDR6;	RTX A5000	1	Sim
1.6.2	Suporta Directx 12, OpenCL e OpenGL;	RTX A5000	1	Sim
1.6.3	Possui 4 (quatro) interfaces de sinal de vídeo, sendo 2 (duas) obrigatoriamente no padrão DisplayPort;	RTX A5000	1	Sim
1.6.4	A placa de video offboard ofertada obteve pontuação (score) de desempenho igual a 23.089 (vinte e três mil e oitenta e nove) pontos, mensurados por meio do indicador G3D Mark aferidos pelo site www.cpubenchmark.net, no link: https://www.videocardbenchmark.net/gpu_list.php;	PassMark RTXA5000	1	Sim
1.6.5	Permite a utilização de 2 (dois) monitores de vídeo simultaneamente, suportando nativa e individualmente a resolução de 3.840 x 2.160 (4K) no modo estendido;	RTX A5000	1	Sim
1.7	**INTERFACE DE REDE (Intel I219)**			
1.7.1	On-board, plug & play, para comunicação a 10/100/1000 Mbits/s, padrões Ethernet, Fast-Ethernet e Gigabit Ethernet, plug-and-play, totalmente configurável por software;	HP Z4 G5	56	Sim
1.7.2	Possui suporte à configuração automática de velocidade da interface (auto-sense);	Carta HP	3	Sim
1.7.3	Permite comunicação no modo Half/full-duplex;	HP Z4 G5	57	Sim
1.7.4	Possui conexão RJ-45;	HP Z4 G5	57	Sim
1.7.5	Possui supor à PXE (Pre-Boot Execution Environment);	HP Z4 G5	57	Sim
1.7.6	Possui LED indicador de atividade de rede;	Carta HP	3	Sim
1.7.7	Possui suporte a Wake-Up on LAN em funcionamento (habilitada de fábrica no BIOS);	HP Z4 G5	57	Sim
1.7.8	Suporta gerenciamento remoto;	HP Z4 G5	56	Sim
1.8	**INTERFACE DE SOM**			
1.8.1	Integrada na unidade principal, não sendo permitido o uso de adaptadores;	HP Z4 G5	9, 17	Sim
1.8.2	Possui alto falante interno de 1,0 Watt RMS, com capacidade de reproduzir os sons gerados pelo sistema operacional e alarmes gerados por problemas de inicialização. Não serão ofertadas caixas acústicas externas nem buzzer de alerta em substituição ao alto-falante interno.	HP Z4 G5	24	Sim
1.8.3	Os conectores de entrada e saída de áudio estão na parte frontal do equipamento, através de porta tipo combo, e são totalmente integradas à unidade principal;	HP Z4 G5	1	Sim
1.9	**INTERFACE USB**			

1.9.1	10 (dez) interfaces USB, vedado o uso de qualquer tipo de adaptadores;	HP Z4 G5	1, 3	Sim
1.9.2	4 (quatro) interfaces USB 3.0, sendo 1 (uma) das interfaces no padrão USB-C;	HP Z4 G5	1, 3	Sim
1.9.3	4 (quatro) interfaces com acesso frontal, sem o uso de adaptadores;	HP Z4 G5	1	Sim
1.10	**GABINETE**			
1.10.1	Possuir leitor de cartões SDCARD;	HP Z4 G5	1, 5	Sim
1.10.2	Do mesmo fabricante do equipamento fornecido, sendo aceito o regime de OEM (Original Equipment Manufacturer), desde que devidamente comprovado pelo fabricante;	HP Z4 G5	1	Sim
1.10.3	Possui sistema antifurto automático ou manual que impede o acesso aos componentes internos;	HP Z4 G5	23	Sim
1.10.4	Possui mecanismo para detecção de intrusão de gabinete, compatível com a placa principal ofertada e, no caso de abertura do chassi, o microcomputador registrará o evento, acessível através do software de gerenciamento ou através de interface web própria;	HP Z4 G5	23, 24	Sim
1.10.5	Permite a abertura do gabinete sem a utilização de ferramentas;	HP Z4 G5	23	Sim
1.10.6	O botão de liga/desliga e luzes de indicação de atividade da unidade de disco rígido e de computador ligado (power-on) estão posicionados na parte frontal do gabinete;	HP Z4 G5	24	Sim
1.10.7	Todas as conexões para periféricos externos estão localizadas no painel traseiro do gabinete, com exceção de conexões USB, leitor de cartões e conectores de áudio, que serão admitidas também na parte frontal;	HP Z4 G5	1, 3	Sim
1.10.8	Possui suportes de borracha antiderrapante;	HP Z4 G5	1	Sim
1.10.9	Possui identificação gráfica ou escrita para as interfaces de conexão;	HP Z4 G5	1, 3	Sim
1.10.10	Possui conector de encaixe para inserção de trava de segurança, sem adaptações, para impedir a abertura não autorizada do equipamento. Para cada equipamento será fornecido kit com uma trava de segurança, compatível com o conector de encaixe, com 2 (duas) chaves cada;	HP Z4 G5 Trava PH 4MM	23 1	Sim
1.10.11	A trava de segurança é fabricada em metal resistente e de tamanho que não prejudique o encaixe das conexões do equipamento;	Trava PH 4MM	1	Sim
1.10.12	Possuir conector de encaixe padrão Kensington, para a utilização de cabo de aço, que o prenderá ao monitor ou à mesa de trabalho;	HP Z4 G5	23	Sim
1.11	**FONTE DE ALIMENTAÇÃO**			
1.11.1	A fonte de alimentação é compatível com o equipamento ofertado e instalada internamente no gabinete;	HP Z4 G5	2	Sim
1.11.2	Possui potência nominal de 775 Watts, capaz de suportar todos os dispositivos internos na configuração ofertada (placa mãe, microprocessador, interfaces, unidades de armazenamento, memória RAM e demais periféricos);	HP Z4 G5	6	Sim
1.11.3	Virá com um cabo de força padrão ATX normal, 2p+t, padrão NBR 14136;	Carta HP	3	Sim
1.11.4	Possui eficiência energética de 90% quando em 50% de carga de trabalho, comprovado por meio de laudo técnico emitido pelo Instituto de Pesquisas Tecnológicas (IPT), INMETRO ou no site www.80plus.com na categoria GOLD, registrado em nome do próprio fabricante do equipamento;	HP Z4 G5 80Plus Fonte 775	6 1	Sim
1.11.5	Aceita tensões de 100 a 240VCA (+/-10%), 50-60Hz, com ajuste automático da tensão de entrada;	HP Z4 G5	21	Sim
1.12	**TECLADO (HP Wired Desktop 320K)**			
1.12.1	Padrão ABNT-2;	Carta HP	3	Sim
1.12.2	Possuir 107 (cento e sete) teclas silenciosas;	Teclado HP	2	Sim
1.12.3	Com todos os caracteres da Língua Portuguesa, inclusive “ç”;	Carta HP	3	Sim
1.12.4	Da mesma marca do fabricante da Workstation, em regime de OEM;	Teclado HP	1	Sim
1.12.5	Com ajuste de inclinação;	Teclado HP	1	Sim
1.12.6	LED indicador de teclado numérico habilitado;	Carta HP	3	Sim
1.12.7	LED indicador de tecla Caps Lock pressionada;	Carta HP	3	Sim
1.12.8	Conector USB padrão sem o uso de adaptadores;	Teclado HP	2	Sim
1.12.9	Possuir cabo com padrão USB com 1,00 m (um metro) de comprimento;	Teclado HP	2	Sim
1.12.10	Possuir bloco numérico separado das demais teclas;	Teclado HP	1	Sim
1.12.11	Possuir tecla logo do Windows para atalhos e acesso às funções especiais;	Teclado HP	2	Sim
1.12.12	Possuir doze teclas de função (F1-F12) na porção superior do teclado. As teclas de função deverão ser acionadas diretamente, ou seja, sem a combinação com teclas secundárias;	Teclado HP	2	Sim
1.12.13	A impressão sobre as teclas é do tipo permanente, não apresentando desgaste por abrasão ou uso prolongado;	Carta HP	3	Sim
1.13.	**MOUSE (HP 320M)**			
1.13.1	Mouse de 3 botões, sendo 1 tipo scroll para rolagem, com tecnologia óptica laser (sem esfera);	Mouse HP	1	Sim
1.13.2	Da mesma marca do fabricante da Workstation,em regime de OEM;	Mouse HP	1	Sim
1.13.3	Com roda ('wheel') para rolagem da tela. Não será ofertado mouse com tecnologia do tipo Scroll Point;	Mouse HP	1	Sim
1.13.4	Conector USB padrão, sem o uso de adaptadores;	Mouse HP	2	Sim
1.13.5	Possui cabo com padrão USB com 1,00 m (um metro) de comprimento;	Mouse HP	2	Sim
1.13.6	Virá acompanhado de mouse pad com superfície adequada para utilização de mouse ótico;	Proposta	3	Sim
1.13.7	Plug-and-Play, totalmente compatível com Sistema operacional Windows 10 ou superior (x64);	Mouse HP	2	Sim
1.13.8	Resolução de 1.000 dpi;	Mouse HP	2	Sim
1.14	**SISTEMA OPERACIONAL E DRIVERS**			
1.14.2	Cada equipamento virá com licenciamento do sistema operacional Microsoft Windows 11 Professional for Workstation 64 bits (OEM), no idioma Português (Brasil), previamente instalado, com licença permanente e configurado de modo a reconhecer os elementos de hardware que compõem a Workstation;	HP Z4 G5	3	Sim

1.14.3	A licença fornecida garante atualizações de segurança gratuitas durante todo o prazo de garantia estabelecida pelo fornecedor do hardware;	HP Z4 G5	3, 4	Sim
1.15	**MONITOR DE VÍDEO (AOC U27P2)**			
1.15.1	Cada computador do tipo workstation será entregue com 2 (dois) monitores cada um, sendo ambos os monitores de marca e modelo iguais;	AOC U27P2	1	Sim
1.15.2	Tela 100% plana;	AOC U27P2	1	Sim
1.15.3	Comprimento diagonal de 27'' (vinte e sete polegadas)	AOC U27P2	1	Sim
1.15.4	Formato no padrão widescreen, com relação de aspecto de 16:9;	AOC U27P2	1	Sim
1.15.5	Possui tecnologia LCD com retroiluminação LED;	AOC U27P2	1	Sim
1.15.6	Brilho de 350 cd/m² (trezentas e cinquenta candelas por metro quadrado);	AOC U27P2	1	Sim
1.15.7	Possui a capacidade de exibição de 1 (um) bilhão de cores OU adota o padrão de cores sRGB e possui suporte a 99% (noventa e nove por cento) do padrão sRGB;	AOC U27P2	1	Sim
1.15.8	Possui densidade de pixels de 151 dpi (cento e cinquenta e um pixels por polegada) OU possui medida de PIXEL PITCH de 0,16 mm x 0,16 mm, desprezando-se a terceira casa decimal;	AOC U27P2	1	Sim
1.15.9	Suporte à resolução de 3840 x 2160 (4K) com taxa de atualização mínima de 60Hz (sessenta Hertz) ou superior;	AOC U27P2	1	Sim
1.15.10	Ângulo de visão de 178º horizontal / 178º vertical ou maior;	AOC U27P2	1	Sim
1.15.11	Possui tecnologia IPS (In-Plane Switching);	AOC U27P2	1	Sim
1.15.12	Possui tela com tratamento antirreflexo ou anti ofuscamento	AOC U27P2	1	Sim
1.15.13	Possui 2 (duas) interfaces de sinal de vídeo, sendo 1 (uma) no padrão HDMI, e 1 (uma) no padrão DisplayPort;	AOC U27P2	1	Sim
1.15.14	Possui HUB USB padrão versão 3.0, disponibilizando, 02 (duas) interfaces USB. Serão fornecidos os cabos necessários para interconexão do monitor com o gabinete da Workstation para o adequado funcionamento das interfaces USB;	AOC U27P2	1	Sim
1.15.15	Controle de brilho e contraste por meio de botões na parte inferior ou traseira;	AOC U27P2	1	Sim
1.15.16	Controle vertical e horizontal automático;	AOC U27P2	1	Sim
1.15.17	Regulagem de inclinação vertical (ângulo positivo e negativo), rotação em torno de seu eixo de sustentação e ajuste de altura, sem adaptações externas;	AOC U27P2	1	Sim
1.15.18	Rotação com giro de tela (Pivot Rotation) de 90° (noventa graus), sem adaptações externas. Esta funcionalidade visa alternar a posição do monitor entre modo paisagem e retrato;	AOC U27P2	1	Sim
1.15.19	Slot para trava de segurança do tipo Kensington, sem adaptações externas;	AOC U27P2	1	Sim
1.15.20	Fonte de alimentação embutida para corrente alternada bivolt, aceitando tensões de 100 a 240VCA (+/-10%), 50-60Hz, com ajuste automático da tensão de entrada;	AOC U27P2	1	Sim
1.15.21	Serão fornecidos 2 (dois) cabos compatíveis com os padrões de entrada de vídeo HDMI e DisplayPort, com comprimento de 1,8 metro;	AOC U27P2	1	Sim
1.15.22	Os cabos são compatíveis com a resolução dos monitores ofertados 3840 x 2160 (4K);	AOC U27P2	1	Sim
1.15.23	Possui drivers para o sistema operacional Windows 10 Professional;	AOC U27P2	1	Sim
1.15.24	Os monitores pertencem à linha corporativa do fabricante, não sendo ofertados equipamentos destinados a uso residencial	Carta TPV	1	Sim
1.15.25	A garantia dos monitores cobre ainda o reparo ou substituição do monitor no caso de constatação de defeito ou surgimento de deadpixel (apenas 1 (um) pixel claro queimado);	Proposta	3	Sim
1.15.26	Será fornecido cabo de energia com conector macho no padrão ABNT 14136:2002, com comprimento de 1,8 metro;	AOC U27P2	1	Sim
1.15.27	O monitor será acompanhado de todos acessórios, drivers e manuais necessários à instalação e ao seu perfeito funcionamento em conjunto com a Workstation	AOC U27P2 Carta TPV	1 1	Sim
1.16	**CERTIFICAÇÕES PARA WORKSTATION E MONITOR**			
1.16.1	Possuir certificação EPEAT 2.0 (Eletronic Product Environmental Assessment Tool) na categoria silver (monitor) e gold (workstation);	EPEAT Z4 G5 EPEAT U27P2	1 1	Sim
1.16.2	Os modelos da Workstation e do monitor fornecidos constaM no Microsoft Windows Catalog para o Sistema Operacional WINDOWS 10. A comprovação da compatibilidade será efetuada pela apresentação do documento de Windows Compatible Products List, emitido especificamente para o modelo e o Sistema Operacional ofertado, em https://partner.microsoft.com/en us/dashboard/hardware/search/cpl. A exigência visa comprovar a total compatibilidade do equipamento com o sistema operacional;	HCL Z4 G5 HCL U27P2	1 1	Sim
1.16.3	Os fabricantes da Workstation e do monitor estão aderente às normas RoHs (Restriction of Hazardous Substances). A exigência visa a restrição de uso de substâncias nocivas no processo de fabricação dos equipamentos;	RoHs HP RoHS TPV Carta HP Carta TPV	1 a 5 1 3 1	Sim
1.16.4	Os modelos da Workstation e do monitor fornecidos ofertados possuem certificações EnergyStar, comprovado através do link www.energystar.org ou equivalente como Certificação Portaria 170/2012 do INMETRO que trata sobre eficiência energética;	EnergyStar Z4 G5 EnergyStar U27P2	1 1	Sim

Overview

HP Z4 G5 Workstation

Front

1. Integrated Front Handle
2. Power Button
3. HDD Activity LED
4. Headphone/microphone combo
5. Front I/O Premium[2]:
   2 SuperSpeed USB Type-C™ 20 Gbps signaling rate (USB Power Delivery 3.0),
   2 SuperSpeed USB Type-A 5 Gbps signaling rate [left-most Type-A port supports BC1.2 (Battery Charging)]

   Front I/O Entry:
   4 SuperSpeed USB Type-A 5 Gbps signaling rate [left-most Type-A ports supports BC1.2 (Battery Charging)]
6. SD Card Reader
7. 2x External 5.25" bay[1]

[1]Only 1 external 5.25" drive configurable from factory
[2]Premium Front IO is shown on photography

Overview

Internal View

1. 1 Intel® Xeon® Processor (Sapphire Rapids)
2. 8 DIMM slots for DDR5 ECC Memory
3.
   - Slot 1: PCIe x16 Gen5
   - Slot 2: PCIe x4 Gen4
   - Slot 3: PCIe x4 Gen4
   - Slot 4: PCIe x16 Gen4
   - Slot 5: PCIe x16 Gen4
4. 2 PCIe x4 Gen4 configurable with M.2 SSDs
5. 5 SATA ports
6. 3 Internal USB Ports. 1 single USB2.0 port, 1 dual USB2.0 port, 1 USB3.0 port (for the SD card reader)
7. 2 Internal 3.5" bays
8. 2 External 5.25" bays
9. Choice of 525W, 775W, or 1125W 90% Efficient Power Supplies
10. 1 Internal NVMe connector to front removable M.2 carrier

Overview

Rear View

1. Integrated Rear Handle
2. Power Connector (Choice of 525W, 775W, or 1125W 90% Efficient Power Supplies)
3. External Antenna
4. Rear Power Button
5. Audio In/Out
6. Manageability Port (optional)
7. Flex I/O Module (optional)
8. 1 RJ-45 Integrated LAN Port (1GbE AMT)
9. 6 SuperSpeed USB Type-A 5Gbps Signaling Rate
10. Kensington Lock Slot
11. Padlock loop

Form Factor Tower

Operating Systems

Preinstalled:
- Windows 11 Pro for Workstations[2]
- Windows 11 Pro for Workstations (preinstalled with Windows 10 Pro for Workstations Downgrade),[2,3]
- Ubuntu Linux 22.04[4]
- HP Linux®-ready (minimal OS ready for customer OS installation)[5]

License Only:
- Red Hat® Enterprise Linux® Desktop Workstation (includes paper license with 1 year support; no preinstalled OS)[6]

Supported:
- Windows 11, version 22H2, 21H2[2]
- Windows 10, version 22H2, 21H2[2]
- Red Hat® Enterprise Linux® Workstation 8 & 9[6]
- SUSE Linux® Enterprise Desktop 15[6]
- Ubuntu 20.04 & 22.04 LTS[5]

Web-supported only:
- Windows 11 Enterprise[2,1]
- Windows 10 Enterprise[2,1]

Overview

[1] Windows Enterprise sold separately and requires that customer have an enterprise license from Microsoft.
[2] Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows is automatically updated and enabled. High speed internet and Microsoft account required. ISP fees may apply and additional requirements may apply over time for updates. See http://www.windows.com.
[3]This system is preinstalled with Windows 10 Pro software and also comes with a license for Windows 11 Pro software and provision for recovery software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
[4] Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply and additional requirements may apply over time for updates.
[5]A certified preloaded version of Ubuntu® 20.04 LTS is available from HP for this platform. Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply, and additional requirements may apply over time for upgrades.
[6]For detailed Linux® OS/hardware support information, see:
http://www.hp.com/support/linux_hardware_matrix

NOTE: Your product does not support Windows 8 or Windows 7. In accordance with Microsoft's support policy, HP does not support the Windows® 8 or Windows 7 operating system on products configured with Intel® and AMD® 7th generation and forward processors or provide any Windows® 8 or Windows 7 drivers on http://www.support.hp.com. A full list of HP products and the Windows 10 versions tested is available on the HP support website. https://support.hp.com/us-en/document/c05195282

Processors

Name[1]	Cores	Threads	Frequency (GHz)				Cache (MB)	Max Memory Speed(MT/s)		TDP (W)
			Base Frequency	All-Core Frequency	Max Turbo Frequency[2]	ITBM 3.0 Frequency[2]		1 DIMM per Channel	2 DIMM per Channel	
Intel® Xeon® W7-2495X	24	48	2.5	3.3	4.8	4.8	45	4800	4400	225
Intel® Xeon® W7-2475X	20	40	2.6	3.4	4.8	4.8	37.5	4800	4400	225
Intel® Xeon® W5-2465X	16	32	3.1	3.7	4.7	4.7	33.75	4800	4400	200
Intel® Xeon® W5-2455X	12	24	3.2	3.9	4.6	4.6	30	4800	4400	200
Intel® Xeon® W5-2445	10	20	3.1	4.0	4.6	4.6	26.25	4800	4400	175
Intel® Xeon® W3-2435	8	16	3.1	4.0	4.5	4.5	22.5	4400	4400	165
Intel® Xeon® W3-2425	6	12	3.0	3.7	4.4	4.4	15	4400	4400	130
Intel® Xeon® W3-2423	6	12	2.1	3.1	4.2	4.2	15	4400	4400	110

Overview

Notes:

- Xeon W-2400 processors all feature Intel® vPro® Technology[3]
- Xeon W-2400 processors all support Hyper-Threading
- Xeon W-2400 processors do not offer integrated graphics

[1] Multicore is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering, branding and/or naming is not a measurement of higher performance.

[2] Intel Turbo Boost Max (ITBM) performance varies depending on hardware, software, and overall system configuration. See http://www.intel.com/technology/turboboost for more information.

[3] Intel vPro® requires Windows 10 Pro 64 bit or higher, a vPro supported processor, vPro enabled chipset, vPro enabled wired LAN and/or Wi-Fi 6E WLAN and TPM 2.0. Some functionality requires additional 3rd party software in order to run. Features of vPro® Essentials and Enterprise vary. See http://intel.com/vpro

Color	Black
Convertibility	No
Expansion Slots (see system board section for more details)	• Slot 1: PCIe x16 Gen5 • Slot 2: PCIe x4 Gen4 • Slot 3: PCIe x4 Gen4 • Slot 4: PCIe x16 Gen4 • Slot 5: PCIe x16 Gen4
Expansion Bays (see storage section for more details)	1 internal 3.5" bays 2 external 5.25" bays
Front I/O	Front I/O Premium: 2 SuperSpeed USB Type-C™ 20 Gbps signaling rate (USB Power Delivery 3.0), 2 SuperSpeed USB Type-A 5 Gbps signaling rate, 1 headphone/microphone combo, SD card reader (optional). [left-most Type-A ports supports BC1.2 (Battery Charging)] Front I/O Entry: 4 SuperSpeed USB Type-A 5 Gbps signaling rate, 1 headphone/microphone combo, SD card reader (optional). [left-most Type-A ports supports BC1.2 (Battery Charging)]
Internal I/O [5]	3 Internal USB ports and 5 SATA ports.
Rear I/O	Audio In/Out, 6x SuperSpeed USB Type-A 5Gbps signaling rate, 1 RJ-45 Integrated LAN port (1GbE AMT) Optional: Flex I/O Module
Optional I/O	Flex I/O Module (Serial Port v3, Dual USB-A 3.2 Gen1, USB-C 3.2 Gen2, 10GbE single port, 2.5GbE LAN single port, 1 GbE single port, 1GbE Fiber single port LC, WiFi6 + BT5.2 WLAN w/ INTAnt) External Antenna
On-board RAID Support	SATA RAID 0 Striped Array SATA RAID 1 Mirrored Array SATA RAID 10 Striped/Mirrored SATA RAID 5 Parity Array
Chassis Dimensions (H x W x D)	Footprint: H: 15.2" (386 mm) W: 6.65" (169 mm) D: 17.5" (445 mm) Maximum: H: 15.2" (386 mm) W: 6.65" (169 mm) D: 18" (458.6 mm)
Packaged Dimensions	H: 22.5" (572 mm) W: 12.4" (314 mm) D: 22.2" (563 mm)

Overview

Palletization Profile	6 units x 3 layers = 18 units per pallet 1200x1000x1836mm (pallet included)
Rack Dimensions	4U
Weight	Exact weights depend upon configuration (System weight only). Minimum: 10.5 kg (23.2 lbs.) Typical: 12.6 kg (27.8 lbs.) Maximum:19.5 kg (42.9 lbs.)
Temperature	Operating: 5° to 40°C (40° to 104°F)[1] Non-operating: -40° to 60°C (-40° to 140°F) Above 1524 m (5,000 feet) altitude, the maximum operating temperature is reduced by 1° C (1.8° F) for every 305 m (1,000 feet) increase in elevation Maximum rate of change: 10 °C/hr No direct sustained sunlight [1]40°C has been validated for configs up to a 220W CPU, 2x NVIDIA® A4000 graphics cards, 8x64GB of RAM, 4TB of M.2 storage, 4TB of HDD storage, and a 1125W PSU
Humidity	Operating: Operating: 8% to 85% RH, non-condensing, 35° C maximum wet bulb Non-operating: 8% to 90%, non-condensing, 35° C maximum wet bulb
Maximum Altitude (non-pressurized)[6]	Operating (with Rotational Hard Drives): 3,048 m (10,000 feet) Operating (with only Solid-State Drives): 5,000 m (16,404 feet) Non-operating: 9,144m (30,000ft) **NOTE:** Above 1524 m (5,000 feet) altitude, maximum operating temperature is reduced by 1° C (1.8° F) per 305 m (1,000 feet) elevation increase
Power Supply	Choice of 80 Plus Gold (90% efficiency at 50% load) Power Supplies: • 1125W (@100V/15A or 200V/10A) (Delta Efficiency Report) • 775W (@100V/15A or 200V/10A) (Delta Efficiency Report) • 525W (@100V/15A or 200V/10A) (Delta Efficiency Report) **NOTE:** not all configurations are supported on all power supplies. Configuration support depends on total system power budget and having sufficient number or type of PCIe supplemental power connectors. Confirm power supply and configuration support using configurator on hp.com. • 1125W supports up to 600W of auxiliary graphics power (dependent on system configuration) • 775W supports up to 400W of auxiliary graphics power (dependent on system configuration) • 525W supports up to 100W of auxiliary graphics power (dependent on system configuration) **NOTE:** updating graphics after purchase may require additional power distribution cables and/or auxiliary graphics adapters to support the new graphics configuration.
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html
Chipset	Intel® W790 chipset
Memory	8 DIMM slots, supporting up to 512GB, DDR5 4800 MT/s speed depending on the system configuration

Supported Components

Processors		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	Intel® Xeon® W-2400 Processors				
	Intel® Xeon® W7-2495X	Y	N		
	Intel® Xeon® W7-2475X	Y	N		
	Intel® Xeon® W5-2465X	Y	N		
	Intel® Xeon® W5-2455X	Y	N		
	Intel® Xeon® W5-2445	Y	N		
	Intel® Xeon® W3-2435	Y	N		
	Intel® Xeon® W3-2425	Y	N		
	Intel® Xeon® W3-2423	Y	N		

SATA Hard Drives		Factory Configured	Option Kit	Option Kit Part Number
	1TB 7200RPM SATA 3.5in Enterprise HDD[1,2]	Y	Y	W0R10AA
	2TB 7200RPM SATA 3.5in Enterprise HDD[1,2]	Y	Y	2Z274AA
	4TB 7200 RPM SATA 3.5in Enterprise HDD[1,2]	Y	Y	K4T76AA/AT
	8TB 7200RPM SATA 3.5in Enterprise HDD[1,2]	Y	Y	2Z273AA
	12TB 7200 RPM SATA-6G 3.5in Enterprise HDD[1,2]	Y	Y	5S461AA

NOTE: Starting November 1, 2023, HP PCs with Windows require Windows to be installed on SSD. HDD can only be configured as additional data drives and not as the boot drive.

PCIe Solid State Drives				
	Z Turbo 512GB PCIe-4x4 TLC SSD Module	Y	Y	38T80AA
	Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T81AA
	Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T76AA
	Z Turbo 1TB PCIe-4x4 TLC SSD Module	Y	Y	38T77AA
	Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	38T79AA
	Z Turbo 2TB PCIe-4x4 TLC SSD Module	Y	Y	38T75AA
	Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 SSD Module	Y	Y	5S496AA/AT
	Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	Y	Y	5S497AA/AT
	Z Turbo 512GB PCIe-4x4 TLC Z4/Z6 Kit SSD	Y	Y	56Q73AA
	Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	56Q74AA
	Z Turbo 1TB PCIe-4x4 TLC Z4/Z6 Kit SSD	Y	Y	56Q75AA
	Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	5Z7E7AA
	Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	56Q77AA
	Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	Y	Y	5S4A1AA
	HP Z Turbo Drive Dual Pro			
	HP Z Turbo Drive Dual Pro PCIe-4x4 NVMe Carrier[3]	Y	Y	56Q86AA
	Intel® Virtual RAID on CPU (Intel® VROC) for NVMe			

Supported Components

Intel VROC NVMe SSD Premium Ctlr Module[5]	N	Y	3FJ81AA
Intel VROC NVMe SSD Standard Ctlr Module[4]	N	Y	3FJ80AA

Note 1: For internal bay install, HDD option kits require separate purchase of 74Y88AA HP Z4 HDD Cable Kit. For external bay install, HDD options kits require separate purchase of 74Y88AA HP Z4 HDD Cable Kit & NQ099AA HP Optical Bay HDD Mounting Bracket.
Note 2: Up to (4) 3.5-inch 7200 rpm SATA drives: 1TB, 2TB, 4TB, 8TB, 12TB; 48TB max
Note 3: Kit includes dual pro carrier and heatsink. Requires separate purchase of ZTurbo PCIe 4x4 M.2 SSD modules.
Note 4: Enables RAID 0, 1 & 10
Note 5: Enables RAID 0, 1 & 10 plus RAID 5 with write hole closure options

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Graphics		Factory Configured	Option Kit	Option Kit Part Number	Supported # of cards
Graphics Cable Adapters	HP DisplayPort To VGA Adapter	N	Y	AS615AA/AT	
	HP DisplayPort To VGA Adapter	N	Y	F7W97AA	
	HP GFX Pwr Cbl CPU-8p to CPU-8p	Y	Y	6J6H7AA	
	HP GFX Pwr Cbl CPU-8p to x2 PCIe 8p(6+2)	Y	Y	6J6H8AA	
	HP DisplayPort to HDMI Adapter	Y	Y	2JA63AA	
	HP (Bulk 12) miniDP-to-DP Adapter Cables	N	Y	2KW87A6	
	HP Single miniDP-to-DP Adapter Cable	Y	Y	2MY05AA	
	HP miniDP-to-DP Adapter (2-pack)	Y	N		
	HP miniDP-to-DP Adapter (4-pack)	Y	N		
	HP miniDP-to-DP Adapter (8-pack)	Y	N		
	HP DisplayPort To DVI Adapter (Bulk 90)	N	Y	FH973A6	
	NVIDIA NVLink 3-Slot Bridge	Y	Y	340L3AA	
	NVIDIA 3D Stereo Bracket	N	Y	K0A25AA	
Ultra High-End Graphics	NVIDIA® RTX 6000 Ada 48GB [1,3]	Y	Y	79C23AA/AT	?
	NVIDIA® RTX A6000 48GB [1,3]	Y	Y	2S6U3AA/AT	2
	NVIDIA® RTX 5000 Ada 32 GB 4DP Graphics	Y	Y	8D6B6AA	2
	NVIDIA® RTX A5000 24GB [1]	Y	Y	20X23AA/AT	2
	NVIDIA® Quadro® Sync II	N	Y	1WT20AA	
	AMD® Radeon™ Pro W7900 48GB [1]	Y	Y	8F699AA	1
High-End Graphics	NVIDIA® RTX A4500 20GB [1]	Y	Y	5S458AA/AT	2
	NVIDIA® RTX 4000 Ada 20GB	Y	Y	8D6B7AA	2
	NVIDIA® RTX A4000 16GB[1,]	Y	Y	20X24AA/AT	2
	NVIDIA® Long-Life RTX A4000E 16GB[1,]	Y	Y	6H7J7AA	2
	AMD® Radeon™ Pro W6800 32GB [1,3]	Y	Y	340K7AA	2
Midrange Graphics	NVIDIA® RTX A2000 12GB [1]	Y	Y	5Z7D9AA/AT	2
	NVIDIA® Long-Life RTX A2000E 12GB [1]	Y	N		2
	NVIDIA® T1000 8GB [2]	Y	Y	5Z7D8AA/AT	2
	NVIDIA® Long-Life T1000E 8GB [2]	Y	Y	6V9V4AA/AT	2
	NVIDIA® T1000 4GB [2]	Y	Y	20X22AA/AT	2
	AMD® Radeon™ Pro W6600 8GB [1]	Y	Y	340K5AA	2

Supported Components

	AMD® Radeon™ RX 6700XT 12GB [1]	Y	N		1
Entry	NVIDIA® T400 4GB [2]	Y	Y	5Z7E0AA/AT	2
	AMD® Radeon™ RX 6400 4GB	Y	Y	6Q3U4AA/AT	1
	Intel Arc Pro A40 6GB	Y	Y	6E3Y8AA	1

Note 1: Single or dual graphics configuration requires the HP Z4 Fan and Front Card Guide. If configured as an after-market option, a separate purchase of the HP Z4 Fan and Front Card Guide 56Q79AA is required. If factory configured, the fan and front card guide is included.
Note 2: Dual graphics configuration requires the HP Z4 Fan and Front Card Guide. If configured as an after-market option, a separate purchase of the HP Z4 Fan and Front Card Guide 56Q79AA is required. If factory configured, the fan and front card guide is included.
Note 3: Dual graphics configuration requires the HP Z4 PCIe Retainer with Fans. If configured as an after-market option, a separate purchase of the HP Z4 PCIe Retainer with Fans 56Q84AA is required. If factory configured, the PCIe retainer with fans is included.

Memory	**Factory Configured**	**Option Kit**	**Option Kit Part Number**	**Support Notes**
16GB (1x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
32GB (2x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
64GB (4x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
64GB (2x32GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
128GB (8x16GB) DDR5 4800 DIMM ECC REG Memory	Y	N		1
128GB (4x32GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
256GB (8x32GB) DDR5 4800 DIMM ECC REG Memory	Y	N		1
256GB (4x64GB) DDR5 4800 DIMM ECC REG Memory	Y	N		
512GB (8x64GB) DDR5 4800 DIMM ECC REG Memory	Y	N		1
After Market Options				
16GB DDR5 (1x16GB) 4800 DIMM ECC REG Memory	Y	Y	340K1AA	
32GB DDR5 (1x32GB) 4800 DIMM ECC REG Memory	Y	Y	340K2AA	
64GB DDR5 (1x64GB) 4800 DIMM ECC REG Memory	Y	Y	340K3AA	

NOTE 1: This memory configuration requires the 775W or 1125W PSU

Multimedia and Audio Devices	**Factory Configured**	**Option Kit**	**Option Kit Part Number**
HyperX Cloud Mix Wireless Gaming Headset	N	Y	4P5K9AA
HyperX Cloud Core Gaming Headset	N	Y	4P4F2AA
HyperX Cloud Flight Wireless Gaming Headset	N	Y	4P5L4AA
HyperX Cloud Stinger Core Gaming Headset	N	Y	4P4F4AA
HyperX SoloCast - USB Microphone	N	Y	4P5P8AA
Integrated Realtek ALC3205-CG Audio	Y	N	

Supported Components

Optical and Removable Storage		Factory Configured	Option Kit	Option Kit Part Number
	HP CRU QX428 Removable with 200mm Cable Frame/Carrier[1]	Y	N	
	HP DX175 Removable HDD Frame/Carrier[2]	Y	Y	1ZX71AA
	HP DX175 Removable HDD Spare Carrier[2]	N	Y	1ZX72AA
	HP CRU Secure High Performance Storage Module with 2TB M.2 SSD[3]	Y	Y	56Q87AA
	HP CRU Secure High Performance Storage Module with 1TB M.2 SSD[3]	Y	Y	56Q88AA
	HP CRU Secure High Performance Storage Module with 512GB M.2 SSD[3]	Y	Y	56Q89AA
	HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA
	HP 9.5mm Slim BDXL Blu-Ray Writer Drive	Y	Y	K3R65AA
	HP 9.5mm Slim SuperMulti DVD Writer	Y	Y	K3R64AA

Note 1: Optional separate purchase of HP CRU Secure High Performance Storage (SHIPS) Module(s).
Note 2: Only supports 4TB or lower capacity HDDs.
Note 3: HP CRU SHIPS Module Kit contains select M.2 SSD for install into a factory configured front removeable storage carrier (HP CRU QX428 Frame/Carrier).

Networking and Communications		Factory Configured	Option Kit	Option Kit Part Number
	HP 10GBase-T Flex Port	Y	Y	56Q71AA
	HP 2.5GbE LAN Flex Port	Y	Y	169K0AA/AT
	HP Flex 1GbE Single Port NIC	Y	N	
	HP 1GbE Fiber LC Single Flex Port	Y	N	20J15AA
	Intel® X550 10GBASE-T Dual Port NIC	Y	Y	1QL46AA
	Intel® I225-T1 Single Port 2.5GbE PCIe NIC	Y	Y	406L9AA
	Intel® Ethernet I350-T4 4-Port 1Gb NIC	N	Y	W8X25AA
	Intel® AX210 Wi-Fi 6 non-vPro +Bluetooth® 5.2 wireless card with Internal Antenna WLAN	N	N	
	Allied Telesis AT-2914SX/LC-901 1GB LC Fiber NIC	Y	Y	1C7Q2AA
	Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC	Y	Y	6E3Y9AA/AT
	NVIDIA® Mellanox® ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC [1]	Y	Y	436M8AA
	HP 10GbE SFP+ SR/SW LC Fiber Optic Transceiver	Y	Y	860T8AA
	HP 25GbE SFP28 LC Fiber Optic Transceiver	Y	Y	860T9AA
	Intel AX210 Wi-Fi 6E non-vPro + Bluetooth® 5.2 wireless card with External Antenna WLAN	Y	Y	340L7AA

Note1: Transceivers sold separately. You must have a transceiver installed to connect this card to a network.

Supported Components

HP Anyware Remote System Controller		Factory Configured	Option Kit	Option Kit Part Number
	HP Anyware Remote System Controller	Y	Y	7K6D7AA
	HP Anyware Remote System Controller Main Board Adapter	Y	Y	7K6D8AA
	HP Anyware Integrated Remote System Controller	Y	Y	7K6D9AA
	HP Anyware Remote System Controller for Universal KVM	N	Y	7K7N2AA

Racking and Physical Security		Factory Configured	Option Kit	Option Kit Part Number
	Z2 Mini/Z2 Tower/Z4/Z6 Depth Adjustable Fixed Rail Rack Kit	N	Y	2A8Y5AA

Input Devices		Factory Configured	Option Kit	Option Kit Part Number
	HP 320K Wired Keyboard	Y	Y	9SR37AA/ET/UT
	HP 125 Wired Keyboard	Y	Y	266C9AA/ET/UT
	HP 975 USB+BT Dual-Mode Wireless Keyboard	N	Y	3Z726AA/ET/UT
	HP 455 Programmable Wireless Keyboard	N	Y	4R177AA/ET/UT/A6
	HP Wired Desktop 320MK Mouse and Keyboard	N	Y	9SR36AA/ET/UT
	HP 655 Wireless Keyboard and Mouse Combo	N	Y	4R009AA/ET/UT/A6
	HyperX Alloy MKW100 - Mechanical Gaming Keyboard	N	Y	4P5E1AA
	HP Wired 320M Mouse	Y	Y	9VA80AA/ET/UT
	HP Creator 935 Black Wireless Mouse	N	Y	1D0K8AA/ET/UT
	HP 128 LSR Wired Mouse	Y	Y	265D9AA/ET/UT
	HP 125 Wired Mouse	N	Y	265A9AA/ET/UT
	HyperX Pulsefire Haste Black Wireless Gaming Mouse 2	N	Y	6N0B0AA
	HyperX Pulsefire Haste White Wireless Gaming Mouse 2	N	Y	6N0A9AA
	HyperX Pulsefire Core - Gaming Mouse	N	Y	4P4F8AA
	HP Business Slim Smartcard Keyboard	Y	Y	Z9H48AA/AT

NOTE: Keyboard and Mouse are optional or add on features.

Supported Components

Other Hardware	Factory Configured	Option Kit	Option Kit Part Number
HP Z4 Fan and Front Card Guide Kit[5]	Y	Y	56Q79AA
HP Z4 Memory Cooling Solution[4]	Y	Y	56Q81AA
HP Z4 PCIe Retainer with Fans[5]	Y	Y	56Q84AA
HP 2.5in to 3.5in HDD Adapter Kit	N	Y	J5T63AA
HP Internal Serial+PS/2 Port	Y	Y	56Q78AA
HP Serial Port Flex IO v3	Y	Y	13L56AA/AT
HP Dual USB-A 3.2 Gen1 Flex 2020	Y	Y	141J8AA/AT
HP USB-C 3.2 Gen2 Alt Flex Port 2020	Y	Y	141K6AA/AT
HP Dual TBT4 PCIe x4 Low Profile Card	Y	Y	340L1AA
HP USB 2.0 Type-A Port Adapter Kit[1]	Y	Y	79C24AA
HP Type-C SuperSpeed USB 20Gbps Front IO v2 Premium Module	Y	Y	38T92AA
HP 2.5in HDD/SSD 2-in-1 Optical Bay Bracket	N	Y	K4T74AA
HP Z4 HDD Cable Kit[2]	N	Y	74Y88AA
HP Optical Bay HDD Mounting Bracket[3]	N	Y	NQ099AA
HP Z4 Dust Filter	Y	Y	3DY47AA
HP SD 4 Card Reader Zx G4	Y	Y	2VK54AA
HP C13 1.83m Power Cord Kit	N	Y	6Z1T9AA

Note 1: The HP USB 2.0 Type-A Port Adapter Kit 79C24AA has a single USB 2.0 type A connector.
Note 2: HP Z4 HDD Cable Kit 74Y88AA is required as a separate purchase for HDD option kit install into an internal bay. For external bay install, a separate purchase of 74Y88AA HP Z4 HDD Cable Kit & NQ099AA HP Optical Bay HDD Mounting Bracket is required.
Note 3: NQ099AA HP Optical Bay HDD Mounting Bracket is required as a separate purchase for HDD option kits installed into an external bay.
Note 4: HP Z4 Memory Cooling Solution 56Q81AA is required as a separate purchase for after-market memory configurations using 32GB Registered DIMMs or greater. If configured from the factory, configurations using 32GB Registered DIMMs or greater will include a memory cooling solution.
Note 5: HP Z4 Fan and Front Card Guide 56Q79AA and HP Z4 PCIe Retainer with Fans 56Q84AA are required for specific graphics configurations (see Graphics section).

Software	Factory Configured	Option Kit	Support Notes
Data Science Stack	Y	N	1
WSL2/Ubuntu Data Science Stack	Y	N	1
Microsoft Office Home and Business Japan 2021	Y	N	

Note 1: Only available with Ubuntu and NVIDIA® graphics

Supported Components

Operating Systems

Windows 11 Pro for Workstations[1,2]

Windows 11 Pro for Workstations (preinstalled with Windows 10 Pro for Workstations Downgrade)[1,2,3]

Ubuntu 22.04 LTS[4]

HP Linux®-ready

[1] Windows Enterprise sold separately and requires that customer have an enterprise license from Microsoft.
[2] Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows is automatically updated and enabled. High speed internet and Microsoft account required. ISP fees may apply and additional requirements may apply over time for updates. See http://www.windows.com.
[3]This system is preinstalled with Windows 10 Pro software and also comes with a license for Windows 11 Pro software and provision for recovery software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
[4] Not all features are available in all editions or versions of Ubuntu. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS to take full advantage of Ubuntu functionality. Ubuntu may be automatically updated. ISP fees may apply and additional requirements may apply over time for updates.
NOTE: Your product does not support Windows 8 or Windows 7. In accordance with Microsoft's support policy, HP does not support the Windows® 8 or Windows 7 operating system on products configured with Intel® and AMD® 7th generation and forward processors or provide any Windows® 8 or Windows 7 drivers on http://www.support.hp.com. A full list of HP products and the Windows 10 versions tested is available on the HP support website. https://support.hp.com/us-en/document/c05195282

HP BIOS

Key features of the HP BIOS include:

- Deployment and manageability - HP BIOS provides several technologies that help integrate the HP Z4 G5 Workstation into the enterprise, such as PXE, remote recovery, remote configuration, remote control, and BIOS (F10) Setup support for 15 languages.
- Network firmware updates -Update your BIOS via the cloud or standardize on a BIOS version hosted on an Enterprise network.
- Stability - HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.
- Class 3 UEFI specification version 2.7
- Absolute Persistence agent - For tracking and tracing services, available in select countries, separate software and purchase of a subscription is required.
- Thermal and power management - The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Workstation computer in any enterprise environment.
- Acoustic performance - Industry leading acoustic emissions across the range of operating conditions.
- Serviceability - HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery - HP BIOS provides numerous ways to upgrade HP Workstation computers, including BIOS updates from within Windows (HP Firmware Update and Recovery), Capsule update, HP Client Manager, and fail-safe recovery. In addition, the HP BIOS Configuration Utility enables replication of BIOS settings within Windows while the Replicated Setup feature provides the same capability within BIOS (F10) Setup. The BIOS Configuration Utility is available from the HP support website.

Supported Components

- HP BIOS uses PKI signing of the BIOS for trusted BIOS upgrades and recovery. Additional HP BIOS Features:
  - Power-On password - Helps prevent an unauthorized user from powering on the system.
  - Administrator password - Also known as the BIOS Setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS cannot be updated and changes cannot be made to BIOS settings using BIOS Setup or under the OS.
  - S4/S5 Maximum Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 0.5W in S4/S5 (when turned off). When S4/S5 Maximum Power Savings feature is enabled below features are turned off:
    - Power to expansion connectors / slots
    - Most Wake events other than power buttons and WOL (Wake on LAN supported by embedded Lan controller under S4/S5 Maximum Power Saving Enabled)
    - USB charging ports

HP Sure Start Gen7

- BIOS Integrity checking - Sure Start protection ensures that only trusted BIOS code is executed and not rootkits, viruses and malware. Verification is done upon boot up, shutdown and while the system is on.
- Sure Start is set by default to automatically repair the BIOS if corrupted or compromised but is policy driven for better manageability. Start is set by default to automatically repair the BIOS if corrupted or compromised but is policy driven for better manageability.
- Protecting beyond BIOS - Integrity checking and repair is extended to other data that should be protected such as network configuration parameters, platform specific information (i.e. system IDs), secure boot credentials, and other code the system needs to boot.
- Audit enabled - System Audit via Sure Start Event Logs capture data such as incident, repair date and time for troubleshooting and investigating.

SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS

Software
HP Support Assistant [14]
HP Image Assistant
HP Desktop Support Utility
HP Documentation
HP Notifications
HP PC Hardware Diagnostics UEFI
HP PC Hardware Diagnostics Windows
HP Performance Advisor[1]
myHP
HP Easy Clean[20]
HP Smart Health[21]
WSL/Ubuntu Data Science Stack
HP Privacy Settings
Touchpoint Customizer for Commercial
HP Services Scan[23]

Manageability Features
HP Driver Packs[2]
HP UWP Pack

Supported Components

HP System Software Manager (SSM)
HP Manageability Integration Kit Gen4[3]
HP Smart Support[5]
HP Client Catalog (download)
HP Image Assistant (download)
HP Cloud Recovery
HP Client Management Script Library (download)
HP BIOSphere Gen6 [13]

Client Security Software
HP Client Security Suite Gen7[4] including: (including Credential Manager, HP Password Manager[6], HP Spare Key)
HP Power On Authentication
Microsoft Defender[7]

Security Management
HP Secure Erase [16]
HP Wolf Pro Security Edition (optional) [18]
HP Wolf Security for Business[22] Includes:
HP Sure Click[11]
HP Sure Sense[12]
HP Sure Run Gen5[9]
HP Sure Recover Gen4 [10]
HP Sure Start Gen7[8]
HP Tamper Lock
HP Sure Admin [17]
HP Client Security Manager Gen 7[4]

[1] HP Performance Advisor Software - HP Performance Advisor is ready to help you get the most out of your HP Workstation from day one-and every day after. Learn more or download at: http://hp.com/PerformanceAdvisor

[2] HP Driver Packs not preinstalled, however available for download at http://www.hp.com/go/clientmanagement.

[3] HP Manageability Integration Kit can be downloaded from https://ftp.ext.hp.com/pub/caps-softpaq/cmit/HPMIK.html

[4] HP Client Security Manager Gen7 requires Windows and is available on the select HP PCs.

[5] HP Smart Support automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights and is available preinstalled on select products, thru HP Factory Configuration Services; or it can be downloaded. For more information about how to enable HP Smart Support or for download, please visit http://www.hp.com/smart-support.

[6] HP Password Manager requires Internet Explorer or Chrome or FireFox. Some websites and applications may not be supported. User may need to enable or allow the add-on / extension in the internet browser.

[7] Microsoft Defender Opt in and internet connection required for updates.

[8] HP Sure Start Gen 7 is available on select HP PCs and workstations. See product specifications for availability.

[9] HP Sure Run Gen5 is available on select Windows 11 based HP Pro, Elite and Workstation PCs with select Intel® or AMD processors

[10] HP Sure Recover Gen4 is available on select HP PCs and requires Windows 10 and an open network connection. You must back up important files, data, photos, videos, etc. before using HP Sure Recover to avoid loss of data. Network based recovery using Wi-Fi is only available on PCs with Intel Wi-Fi Module

[11] HP Sure Click requires Windows 10 Pro or higher or Enterprise. See https://bit.ly/2PrLT6A_SureClick for complete details.
[12] HP Sure Sense requires Windows 11 Pro or Enterprise and supports Microsoft Internet Explorer, Google Chrome™, and Chromium™. Supported attachments include Microsoft Office (Word, Excel, PowerPoint) and PDF files in read only mode, when Microsoft Office or Adobe Acrobat are installed.
[13] HP BIOSphere Gen6 features may vary depending on the platform and configurations.
[14] HP Support Assistant requires Windows and Internet access.
[16] Secure Erase - For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 "Clear" sanitation method. HP Secure Erase does not support platforms with Intel® Optane.
[17] HP Sure Admin requires Windows 11, HP BIOS, HP Manageability Integration Kit from http://www.hp.com/go/clientmanagement

Supported Components

and HP Sure Admin Local Access Authenticator smartphone app from the Android or Apple store.
[18] HP Wolf Pro Security Edition is available preloaded on select SKUs and, depending on the HP product purchased, includes a paid 1-year or 3-year license. The HP Wolf Pro Security Edition software is licensed under the license terms of the HP Wolf Security Software - End-User license Agreement (EULA) that can be found at: https://support.hp.com/us-en/document/ish_3875769-3873014-16 as that EULA is modified by the following: "7. Term. Unless otherwise terminated earlier pursuant to the terms contained in this EULA, the license for the HP Wolf Pro Security Edition (HP Sure Sense Pro and HP Sure Click Pro) is effective upon activation and will continue for either a twelve (12) month or thirty-six (36) month license term ("Initial Term"?). At the end of the Initial Term you may either (a) purchase a renewal license for the HP Wolf Pro Security Edition from HP.com, HP Sales or an HP Channel Partner, or (b) continue using the standard versions of HP Sure Click and HP Sure Sense at no additional cost with no future software updates or HP Support.
[20] HP Easy Clean requires Windows 10 RS3 and higher and will disable the keyboard, touchscreen, and clickpad only. Ports are not disabled. See user guide for cleaning instructions.
[21] HP Smart Health automatically collects the telemetry necessary upon initial boot of the product to deliver device-level configuration data and health insights and is available preinstalled on select products, thru HP Factory Configuration Services; or it can be downloaded. For more information about how to enable HP Smart Support or for download, please visit http://www.hp.com/smart-support.
[22] HP Wolf Security for Business requires Windows 10 or higher, includes various HP security features and is available on HP Pro, Elite, RPOS and Workstation products. See product details for included security features
[23] HP Services Scan is provided with Windows Update on select products and will check entitlement on each hardware device to determine if an HP TechPulse-enabled service has been purchased, and will download applicable software automatically. HP TechPulse is a telemetry and analytics platform that provides critical data around devices and applications. For full system requirements or to disable this feature, please visit http://www.hpdaas.com/requirements . Not applicable in China.

System Board

System Board Form Factor	Approximately 284.48mm x 297.18mm (11.2x11.9 inches).	
Processor Socket	Single LGA-4677	
CPU Bus Speed	DMI Gen4 x 8 lanes	
Chipset	Intel W790 Alder Lake - WS PCH	
Super I/O Controller	Nuvoton SIO21	
Memory Expansion Slots	8 DDR5 memory slots	
Memory Type Supported	DDR5, RDIMM (Registered) ECC	
Memory Modes	Non- Interleaved for single channel. Interleaved when multiple channels are populated	
Memory Speed Supported	4800MT/s for 1DPC and 4400MHz for 2DPC	
Memory Protection	ECC on data	
Maximum Memory	512GB	
Memory Configuration (Supported)	16GB, 32GB and 64GB RDIMMs are supported. (64GB RDIMM cannot be mixed with other module capacities in the same system)	
NVDIMM Memory	No	
PCI Express Connectors	Standard PCIe Slots • 1 PCI Express Gen5 slot x16 mechanical/ x16 electrical (full height, full length) • 2 PCI Express Gen4 slot x16 mechanical/ x16 electrical (full height, full length) • 2 PCI Express Gen4 slot x4 mechanical/ x4 electrical (full height, half length) M.2 Slots: • 2 PCI Express Gen4 slot x4. Other PCIe Connections • 1 Front NVMe Storage (SlimSAS PCIe Gen4 x8) (supports two x4 M.2 devices via QX428)	
Supported Drive Interfaces	**SATA**	Number of SATA ports: 5 Intel® SATA controller: primary SATA
	Integrated RAID	On-board RAID Support Intel® VROC® SATA RAID 0, 1, 5, and 10 supported on Windows 10 and 11, RHEL 8.6 and later, SLE 15 SP4 and later Intel® VROC® NVMe RAID 0, 1, 5, and 10 supported with presence of appropriate VROC upgrade module (after-market kits) on Windows 10 and 11, RHEL 8.6 and later, SLE 15 SP4 and later Factory Configured RAID: None
	Integrated Graphics	No
	Network Controller	WGI219LM. WGI219LMLOM provides Management capabilities: WOL, PXE 2.1, DASH 1.1 and AMT
	External SATA (eSATA)	No
	Serial	1 internal header (requires optional Serial Port Adapter Kit)
	2nd Serial	No
	HD Integrated Audio	Yes
USB Connector(s)	**Front**	Front I/O Entry: 4 USB 3.1 Gen1 Type-A (left-most port supports Battery Charging 1.2) Front I/O Premium:

System Technical Specifications

		2x USB 3.2 Gen2x2 Type-C™ (Power Delivery 3.0) 2x USB 3.1 Gen1 Type-A (left-most port supports Battery Charging 1.2) • USB Type-C Ports provide 3 Amps @ 5 Volts • Charging USB Type-A port provides 1.5 Amps @ 5 Volts • Standard USB Type-A Ports provide 900mA @ 5 Volts
	Rear	4x USB 3.1 Gen1 Type-A with USB hub and 2x USB 3.2 Gen 1 Type-A without hub. (Optional: 2x USB 3.0 Type-A (optional via Flex module) or 1x USB 3.1 Gen2 Type-C charging port (optional via Flex module).
	Internal	1 USB 3.2 Gen1 header, with a single 12-pin shrouded connector.This header supports a USB Media Card reader. 1 USB 2.0 single port header 1 USB 2.0 dual port header.
Flash ROM	Yes	
CPU Fan Header	Yes	
Memory Fan Header	Yes (dual header)	
Chassis Fan Header	1 front, one rear and one Aux Fan Header (dual)	
Front PCI Fan Header	Yes (connects to AUX fan header)	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 2.0. Convertible to FIPS 140-2 Certified Mode through firmware v15.21. The TPM module is disabled where restricted by law.	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	
Clear Password Jumper	Yes	
Keyboard/Mouse	USB and PS/2 (option)	

[1]Maximum memory capacities assume 64-bit operating systems, such as Genuine Windows® 11 Professional 64 bit, Red Hat Linux 64-bit.
[2]M.2 storage supports compatible devices up to 80mm

System Configurations		
Example Configuration #1	**Processor Info**	1x Intel Xeon w3-2425 6C 3.0GHz 4800 130W
	Memory Info	16GB DDR5 (1x16GB) RegRAM
	Graphics Info	1xNvidia T1000
	Disks/Optical/Floppy	1x Internal 4TB M.2 + 1xDVDRW SATA
	PSU	525W
	Other	N/A

System Technical Specifications

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	58.901	57.056	59.256	57.246	58.889	57.005
	Windows Busy Typ (S0)	201.08		198.26		200.56	
	Windows Busy Max (S0)	513.451		206.345		205.432	
	Sleep (S3)	3.570	3.489	3.577	3.495	3.569	3.487
	Off (S5)	2.100	2.097	2.112	2.110	2.095	2.090
	Zero Power Mode (EuP)	0.153		0.193		0.152	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	200.97	194.67	202.18	195.32	200.988	194.558
	Windows Busy Typ (S0)	686.08		676.46		684.31	
	Windows Busy Max (S0)	728.508		704.255		701.139	
	Sleep (S3)	12.180	11.904	12.204	11.924	12.177	11.897
	Off (S5)	7.165	7.154	7.206	7.199	7.148	7.131
	Zero Power Mode (EuP)	0.522		0.659		0.518	

Example Configuration #2	**Processor Info**	1x Intel Xeon w3-2435 8C 3.1GHz 4800 165W
	Memory Info	32GB DDR5 (2x16GB) RegRAM
	Graphics Info	1xNVIDIA Quadro A2000
	Disks/Optical/Floppy	1x 1TB SATA HDD + 1xInternal 4TB M.2 + 1xDVDRW SATA
	PSU	775W
	Other	N/A

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	66.084	65.053	66.356	65.226	65.852	64.789
	Windows Busy Typ (S0)	258.55		254.89		257.86	
	Windows Busy Max (S0)	279.94		275.59		278.95	
	Sleep (S3)	3.916	3.808	3.925	3.812	3.912	3.801
	Off (S5)	22.36	2.216	2.248	2.224	2.234	2.213
	Zero Power Mode (EuP)	0.202		0.241		0.201	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	225.47	221.96	226.40	222.55	224.687	221.060
	Windows Busy Typ (S0)	882.17		869.68		879.81	
	Windows Busy Max (S0)	955.15		940.31		951.77	
	Sleep (S3)	13.361	12.992	13.392	13.006	13.347	12.969
	Off (S5)	7.629	7.560	7.670	7.588	7.622	7.550
	Zero Power Mode (EuP)	0.689		0.822		0.685	

System Technical Specifications

Example Configuration #3	**Processor Info**	1x Intel Xeon w5-2455X 12C 3.2GHz 4800 200W
	Memory Info	64GB DDR5 (4x16GB) RegRAM
	Graphics Info	1xNvidia Quadro A4000
	Disks/Optical/Floppy	2x 1TB SATA HDD + 1xInternal 4TB M.2 + 1xDVDRW SATA
	PSU	1125W
	Other	N/A

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	82.533	79.464	82.821	79.725	82.412	79.325
	Windows Busy Typ (S0)	400.06		396.25		399.23	
	Windows Busy Max (S0)	411.532		403.423		404.356	
	Sleep (S3)	4.403	4.332	4.409	4.335	4.400	4.328
	Off (S5)	2.411	2.395	2.418	2.400	2.406	2.390
	Zero Power Mode (EuP)	0.236		0.278		0.234	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	281.60	271.13	282.58	272.02	281.18	270.65
	Windows Busy Typ (S0)	1365.00		1352.00		1362.17	
	Windows Busy Max (S0)	1404.558		1376.883		1380.067	
	Sleep (S3)	15.023	14.780	15.043	14.791	15.012	14.767
	Off (S5)	8.226	8.171	8.250	8.177	8.209	8.154
	Zero Power Mode (EuP)	0.805		0.948		0.798	

Example Configuration #4	**Processor Info**	1x Intel w7-2495X 24C 2.5GHz 4800 225W
	Memory Info	128GB DDR5 (4x32GB) RegRAM
	Graphics Info	1xNVIDIA Quadro A6000
	Disks/Optical/Floppy	2x 4TB 7200 RPM SATA + 2x Internal 4TB M.2 + 1xDVDRW SATA
	PSU	1125W
	Other	N/A

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows dle (S0)	596.25	592.56	595.23	596.25	592.56	595.23
	Windows Busy Typ (S0)	608.784		600.412		601.314	
	Windows Busy Max (S0)	6.080		5.936		6.085	
	Sleep (S3)	2.361	2.356	2.370	2.361	2.356	2.370
	Off (S5)	0.231	0.279	0.230	0.231	0.279	0.230
	Zero Power Mode (EuP)	596.25		592.56		595.23	

System Technical Specifications

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	308.25	298.73	309.32	299.65	307.88	298.33
	Windows Busy Typ (S0)	2034.40		3021.81		2030.92	
	Windows Busy Max (S0)	2077.779		2049.206		2052.285	
	Sleep (S3)	20.744	20.253	20.762	20.267	20.727	20.233
	Off (S5)	8.055	8.038	8.086	8.067	8.048	8.025
	Zero Power Mode (EuP)	0.788		0.951		0.784	

NOTE: The numbers in this table are from actual measurements on a single system. There will be some variation from unit to unit.

NOTE: The busy power number and associated BTU/hr number for each configuration will be a strong function of the actual application software run on the system. There can be a great deal of variation in this number.

NOTE: The Power Supply Efficiency report may be found at the following links:

https://www.plugloadsolutions.com/80PlusPowerSuppliesDetail.aspx?id=0&type=2

Operating Voltage Range	90-269 VAC
Rated Voltage Range	100-240 VAC
Rated Line Frequency	50-60 Hz
Operating Line Frequency Range	47-66 Hz
ENERGY STAR® certified (Config Dependent)	Yes
CECP Compliant @ 220V	Yes
FEMP Standby Power Compliant	Yes, with Wake-on-LAN disabled: <1W in S5 - Power Off
Built-in Self Test (BIST) **LED**	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes
Hood Lock Header	Yes
ErP Lot 6- Tier 1 Compliance @ 230V (<1W in S5 - Power Off)	Yes
ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5 - Power Off)	Yes

System Technical Specifications

Declared Noise Emissions (Entry-level, Mid-level, and High-end configurations; tested on floor)		
System Configuration (Entry level)	**Processor Info**	1x Intel Xeon w3-2425 6C 3.0GHz 4800 130W
	Memory Info	32GB (2x 16GB) DDR5 4800MHz RDIMM
	Graphics Info	1xNVIDIA Quadro A2000
	Disks/Optical	1x512GB SSD + 1xInternal 1TB M.2+ 1xDVDRW SATA
	Power Supply	525W

Declared Noise Emissions		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.4	15
	Hard drive Operating (Drive Random Seek)	3.4	15
	Active mode	3.3	15

System Configuration (Mid-level)	**Processor Info**	1x Intel Xeon w5-2455X 12C 3.2GHz 4800 200W
	Memory Info	128GB (8*16GB) DDR5 4800MHz RDIMM
	Graphics Info	1xNVIDIA Quadro A4000
	Disks/Optical	1x1TB HDD + 2xInternal 1TB M.2 SSD + 1xDVDRW SATA
	Power Supply	775W

Declared Noise Emissions		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.4	16
	Hard drive Operating (Drive Random Seek)	3.4	16
	Active mode	3.4	16

System Configuration (High-end)	**Processor Info**	1x Intel Xeon w7-2495X 24C 2.5GHz 4800 225W
	Memory Info	512GB (8x64GB) DDR5 4800MHz RDIMM
	Graphics Info	2xNVIDIA Quadro A6000
	Disks/Optical	2x4TB HDD + 2xInternal 4TB M.2 SSD + 1xDVDRW SATA
	Power Supply	1125W

Declared Noise Emissions		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.7	21
	Hard drive Operating (Drive Random Seek)	3.8	21
	Active mode	4.0	23

System Technical Specifications

Environmental Requirements	**Temperature**	Operating: 5° to 40° C (40° to 104° F) Non-operating: -40° to 60° C (-40° to 140° F)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating (with Rotational Hard Drives): 3,048 m (10,000 feet) Operating (with only Solid-State Drives): 5,000 m (16,404 feet) Non-operating: 9,144 m (30,000 feet)
	Dynamic	Shock Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g **NOTE:** Values represent individual shock events and do not indicate repetitive shock events Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz **NOTE:** Values do not indicate continuous vibration.
	Cooling	Above 1524 m (5,000 feet) altitude, the maximum operating temperature is reduced by 1° C (1.8° F) for every 305 m (1,000 feet) increase in elevation, up to 3048 m (10,000 feet)

Physical Security and Serviceability

Access Panel	Tool-less Includes system board and memory information
Optical Drive	Tool-less, Optical Drive requires a 5.25" bay carrier
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Screw-in processor coolers
Blue User Touch Points	Yes, on tool-less internal chassis mechanisms
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-in
Dual Color Power and HD LED on Front of Computer	Yes
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 7.0 mm (0.2756 in) diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable with threaded feature at rear of system
Chassis Interlock Sensor	Yes Sensor detects when the access panel has been removed. The access panel must be installed for the system to power ON. Removal of the access panel during operation will power OFF the system.

System Technical Specifications

Solenoid Lock and Hood Sensor	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed
Rear Port Control Cover	No
Serial, USB, Audio, Network, Enable/Disable Port Control	Yes
Power-On Password	Yes
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration.
3.3V Aux Power LED on System PCA	None
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A torx driver (T30) is needed to remove the processor heatsink. CPU attached to heatsink via tool-less clip
Power Supply Diagnostic LED	Yes
Front Power Button	Yes
Front Power LED	Yes
Front Hard Drive Activity LED	Yes
Front ODD Activity LED	Yes, on device
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Yes
Cooling Solutions	Air cooled forced convection
Power Supply Fans	80 mm x 80 mm x 25 mm (non-serviceable)
CPU Heatsink Fan	108 mm x 108 mm x 25 mm
Chassis Fan	Rear: 120 mm x 120mm x 25 mm Front (optional): 92 mm x 92 mm x 25 mm PCIe Retainer (optional based on configuration): Dual 80 mm x 80 mm x 20 mm
Memory Heatsink Fan	Dual 60 mm x 60 mm x 25 mm Blindmate (optional based on configuration)
Access Panel Key Lock	Yes, side panel barrel keylock (optional from the factory only)
ACPI-Ready Hardware	Advanced Configuration and Power Management Interface (ACPI). • Allows the system to wake from a low power mode. • Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.
Integrated Chassis Handles	Yes, front handle and dedicated rear recess
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (all), front (full-length cards with extender, using Fan and Front Card Guide Kit)
Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes

System Technical Specifications

DIMM Connectors	Yes

Service, Support, and Warranty

On-site Warranty and Service[1]: Three-years, limited warranty and service offering delivers on-site, next business-day[2] service for parts and labor and includes free telephone support[3] 8am - 5pm. Global coverage[2] ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering. 24/7 operation will not void the HP warranty. Storage devices are not covered under warranty for 24/7 operation except for Enterprise class HDDs.

NOTE 1: Terms and conditions may vary by country. Certain restrictions and exclusions apply.
NOTE 2: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.
NOTE 3: Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries.
HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/lookuptool. Service levels and response times for HP Care Packs may vary depending on your geographic location.

Certification and Compliance
Environmental Sustainability questions concerning:

- Ecolabels (EPEAT, TCO, etc.)
- ENERGY STAR, California Energy Commission (CEC)
- Compliance with Environmental legislation (EU ErP, China CECP, EU RoHS and other countries)
- Supply Chain Social Environmental Responsibility (SER) (conflict minerals; human rights, etc.)
- Product specific environmental features (material content, packaging content, recycled content, etc.)
- China Energy Label (CEL)

Please contact sustainability@hp.com
For country specific Regulatory Compliance approval documents or Regulatory and Safety questions concerning:

- Declarations of Conformity (for self-service, go to https://www.hp.com/uk-en/certifications/technical/regulations-certificates.html?jumpid=ex_r135_uk/en/any/corp/hpuk-mu_chev/certificates)
- GS Certificates
- Product Safety Certificates (UL, CB, BIS, etc.)
- EMC Certificates, Declarations of Conformity, or Certificates of Conformity (CE, FCC, ICES, etc.)
- CCC Certificates
- Ergonomics

Please contact techregshelp@hp.com

BIOS

PCIe 5.0 Support	Full BIOS support for PCI Express through industry standard interfaces. Supported speeds and slot information vary.
ATA/ATAPI	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
BIOS Power On	Users can define a specific date and time for the system to power on.

System Technical Specifications

ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	Saves BIOS settings to USB flash device in human readable file (HpSetup.txt). BiosConfigurationUtility.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS Reference Specification, Version 3.2
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 6.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS and WMI) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 15 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bifurcation, speed) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
UEFI Specification Revision	2.7
ACPI	Advanced Configuration and Power Management Interface, Version 6.0
CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0

System Technical Specifications

PCI Express	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0 PCI Express Base Specification, Revision 4.0 PCI Express Base Specification, Revision 5.0
SATA	Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
SPD	JEDEC JESD300-5
TPM	Trusted Computing Group TPM Specification Version 2.0 (Infineon SLB 9672). Common Criteria EAL4+ certified. FIPS 140-2 Certification TCG TPM Certified products list: http://www.trustedcomputinggroup.org/certification/tpm-certified-products/
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.1 Specification Universal Serial Bus Revision 3.2 Specification USB Battery Charging specification, Revision 1.2 USB Power Delivery specification Revision 3.0
SMBIOS	System Management BIOS Reference Specification, Version 3.2

Social and Environmental Responsibility

Eco-Label Certifications & Declarations

This product is low halogen except for HP Z Turbo Quad Pro PCIe TLC SSD, CRU QX428 removable storage frames, ConnectX-6 DX Amphenol 10 & 25 Gb Transceivers, power cords, cables, and peripherals. Service parts obtained after purchase may not be Low Halogen.

This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

- IT ECO declaration
- US ENERGY STAR®
- US Federal Energy Management Program (FEMP)
- EPEAT? Gold registered in the United States. See http://www.epeat.net for registration status in your country.
- TCO Certified
- China Energy Conservation Program (CECP)
- China State Environmental Protection Administration (SEPA)
- Taiwan Green Mark
- Korea Eco-label
- Japan PC Green label*

Sustainable Impact Specifications

- Product Carbon Footprint (hp.com)
- Ocean-bound plastic in System fan, CPU fan
- 40% post-consumer recycled plastic
- 10% recycled metal
- Low halogen
- Outside Box and corrugated cushions are 100% sustainably sourced and recyclable
- Molded Paper Pulp Cushion inside box is 100% sustainably sourced and recyclable
- Recycled Plastic cushions

System Configuration

The configuration used for the Energy Consumption and Declared Noise Emissions data for the Workstation model is based on a "Typically Configured Workstation"?.

System Technical Specifications

Energy Consumption (in accordance with US ENERGY STAR® test method)	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Short idle)	76.42 W	81.45 W	78.99 W
Normal Operation (Long idle)	73.99 W	68.7 W	73.77 W
Sleep	8.52 W	8.64 W	8.56 W
Off	2.92 W	3 W	2.91 W

NOTE:
Energy efficiency data listed is for an ENERGY STAR® compliant product if offered within the model family . HP computers marked with the ENERGY STAR® Logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR® specifications for computers. If a model family does not offer ENERGY STAR® compliant configurations, then energy efficiency data listed is for a typically configured PC featuring a hard disk drive, a high efficiency power supply, and a Microsoft Windows® operating system.

Heat Dissipation*	115VAC, 60Hz	230VAC, 50Hz	100VAC, 50Hz
Normal Operation (Short idle)	261.4 BTU/hr	278.6 BTU/hr	270.1 BTU/hr
Normal Operation (Long idle)	253.0 BTU/hr	235.0 BTU/hr	252.3 BTU/hr
Sleep	29.1 BTU/hr	29.5 BTU/hr	29.3 BTU/hr
Off	10.0 BTU/hr	10.3 BTU/hr	1.0 BTU/hr

***NOTE:** Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (L_{WAd}, bels)	Sound Pressure (L_{pAm}, decibels)
Typically Configured - Idle	3.4	15
Drive Random Seek	3.4	15
Active Mode	3.3	15

Longevity and Upgrading This product can be upgraded, possibly extending its useful life by several years. Upgradeable features and/or components contained in the

Spare parts are available throughout the warranty period and or for up to "5"? years after the end of production.

Additional Information

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2011/65/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see www.epeat.net
- Plastics parts weighing over 25 grams used in the product are marked per ISO11469 and ISO1043.
- This product is 94.4% recycle-able when properly disposed of at end of life.

Packaging Materials			
	External:	PAPER/Corrugated	1127 g
		PAPER/ Corrugated	332 g
		PAPER/Molded Pulp	508 g
	Internal:	PLASTIC/Polyethylene low density - LDPE	50 g

System Technical Specifications

	PLASTIC/Polyethylene Expanded - EPE	9 g

The plastic packaging material contains at least 73.7% recycled content.

The corrugated paper packaging materials contains at least 61.7% recycled content.

RoHS Compliance

HP Inc. complies fully with materials regulations. We were among the first companies to extend the restrictions in the European Union (EU) Restriction of Hazardous Substances (RoHS) Directive to our products worldwide through the HP GSE. HP has contributed to the development of related legislation in Europe, as well as China, India, and Vietnam.

We believe the RoHS directive and similar laws play an important role in promoting industry-wide elimination of substances of concern. We have supported the inclusion of additional substances-including PVC, BFRs, and certain phthalates-in future RoHS legislation that pertains to electrical and electronics products.

We met our voluntary objective to achieve worldwide compliance with the new EU RoHS requirements for virtually all relevant products by July 2013, and we will continue to extend the scope of the commitment to include further restricted substances as regulations continue to evolve.

To obtain a copy of the HP RoHS Compliance Statement, see HP RoHS position statement.

Material Usage

This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants - may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Bis(2-Ethylhexyl) phthalate (DEHP)
- Benzyl butyl phthalate (BBP)
- Dibutyl phthalate (DBP)
- Diisobutyl phthalate (DIBP)
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel - finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) - except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

Packaging Usage

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.

- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

End-of-life Management and Recycling

HP offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

HP, Inc. Corporate Environmental Information

For more information about HP's commitment to the environment:

Global Citizenship Report

http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html

Eco-label certifications

http://www8.hp.com/us/en/hp-information/environment/ecolabels.html

ISO 14001 certificates:
http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04755842
and
http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/cert.pdf

footnotes

- Percentage of ocean-bound plastic contained in each component varies by product
- Recycled plastic content percentage is based on the definition set in the IEEE 1680.1-2018 standard.
- External power supplies, WWAN modules, power cords, cables and peripherals excluded.
- 100% outer box packaging and corrugated cushions made from sustainably sourced certified and recycled fibers.
- Fiber cushions made from 100% recycled wood fiber and organic materials.
- Plastic cushions are made from >90% recycled plastic.
- Recycled metal is expressed as a percentage of the total weight of the metal according to ISO 14021 definitions for metal parts over 25 grams.

System Technical Specifications

Manageability

Industry Standard Specifications

This product meets the following industry standard specifications for manageability functionality:

- DASH 1.2 (via Intel® LAN on motherboard)

Intel® Active Management Technology (AMT)

Intel® Active Management Technology (AMT) 16.10

An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 16.10 includes the following advanced management functions:

- Power Management (on, off, reset, graceful shutdown, sleep and hibernate)
    - Support in Max Power Savings (Shutdown and Hibernate Modes)
- Hardware Inventory (includes BIOS and firmware revisions)
- Hardware Alerting
- Agent Presence
- System Defense Filters
- Serial Over LAN (SOL)
- USB Redirect (Media Redirection)
- ME Wake-on-LAN (WOL), even with Maximum Power Savings Enabled
- DASH 1.2 compliance
- IPv6 Support
- Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection
- Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance.
- Remote Alerts - automatically alert IT or service provider if issues arise
- Access Monitor - Provides oversight into Intel® AMT actions to support security requirements
- PC Alarm Clock
- Microsoft NAP Support
- Host Base set-up and configuration
- Management Engine (ME) firmware roll back
- Local Time Sync to UTC
- Remote Memory Dump Command - Creates memory dump for debug

Intel® vPro™ Technology

Yes, when configured with an Intel® vPro™ supporting processor.

Stable & Consistent Offerings

Global Series SKUs

As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section.

Stable & Consistent Offerings

HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers-no special programs, no additional cost-no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you'll be able to buy that same configuration throughout the lifecycle of the product.

Processors	Product #	Offering
	6M6F2AV	Intel Xeon W3-2423
	57M48AV	Intel Xeon W3-2435

Graphics	Product #	Offering
	6Z2Z0AV	NVIDIA Long-Life T1000E
	6Z2Y4AV	NVIDIA Long-Life RTX A2000E
	6Z2Y6AV	NVIDIA Long-Life RTX A4000E
	695F0AV	AMD Radeon RX 6400
	57K43AV	AMD Radeon Pro 6600

Storage	Product #	Offering
	57L12AV	Z Turbo 1TB PCIe-4x4 2280 TLC M.2 Solid State Drive
	57K65AV	1TB 7200RPM SATA 3.5in Enterprise

STORAGE/HARD DRIVES

Performance PCIe SSDs for HP Workstations	**Z Turbo 512GB 2280 PCIe-4x4 TLC SSD**	**Capacity**	512GB	
		Protocol	PCIe	
		Form Factor	M.2	
		Controller	NVMe	
		NAND Type	3D TLC	
		Endurance	300TBW (TB Written)	
		Reliability	1.5M hours	
		Rated for 24/7/365 operation	No	
		Interface	PCI Express 4.0 x4 electrical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
		Performance	**Sequential Read**	up to 6400MB/s*
			Sequential Write	up to 3400MB/s*
			Random Read	up to 600K IOPS*
			Random Write	up to 600K IOPS*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD	**Capacity**	512GB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6400MB/s*
		Sequential Write	up to 3400MB/s*
		Random Read	up to 600K IOPS*
		Random Write	up to 600K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD Module	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Z Turbo 1TB 2280 PCIe-4x4 TLC SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

Z Turbo 1TB 2280 PCIe-4x4 TLC SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD	**Capacity**	2TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	500TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

Z Turbo 2TB 2280 PCIe-4x4 TLC SSD	**Capacity**	2TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	500TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Z Turbo 4TB 2280 PCIe-4x4 TLC M.2 SSD	**Capacity**	4TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	600TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 700K IOPS*
		Random Write	up to 700K IOPS*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 SSD	**Capacity**	4TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	600TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 700K IOPS*
		Random Write	up to 700K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Z Turbo 512GB PCIe-4x4 TLC Z4/Z6 Kit SSD	**Capacity**	512GB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6400MB/s*
		Sequential Write	up to 3400MB/s*
		Random Read	up to 600K IOPS*
		Random Write	up to 600K IOPS*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

Z Turbo 512GB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	**Capacity**	512GB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6400MB/s*
		Sequential Write	up to 3400MB/s*
		Random Read	up to 600K IOPS*
		Random Write	up to 600K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Z Turbo 1TB PCIe-4x4 TLC Z4/Z6 Kit SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

Z Turbo 1TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Z Turbo 2TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	**Capacity**	2TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	500TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 800K IOPS*
		Random Write	up to 800K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

Z Turbo 4TB 2280 PCIe-4x4 SED OPAL2 TLC M.2 Z4/Z6 Kit SSD	**Capacity**	4TB	
	Protocol	PCIe	
	Form Factor	M.2	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	600TBW (TB Written)	
	Reliability	1.5M hours	
	Rated for 24/7/365 operation	No	
	Interface	PCI Express 4.0 x4 electrical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	up to 6500MB/s*
		Sequential Write	up to 5000MB/s*
		Random Read	up to 700K IOPS*
		Random Write	up to 700K IOPS*
	Self-Encrypting Drive Support	OPAL 2	

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

SATA Hard Drives for HP Workstations	**1TB 7200RPM SATA 3.5in Enterprise HDD**	**Capacity**	1TB
		Protocol	SATA
		Form Factor	3.5"
		Controller	AHCI
		Reliability	2.0M hours
		Rated Power On Hours	8760/yr
		Annualized Failure Rate (based on Rated POH)	<0.62%
		Rated for 24/7/365 operation	YES
		Height	1 in; 2.54 cm
		Width	**Media Diameter** 3.5 in; 8.9 cm
			Physical Size 4 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s *
		Buffer	128MB
		Cache	Adaptive
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track** 0.32 ms *
			Average 7.45 ms *
			Full Stroke 14.2 ms *
		Rotational Speed	7,200 rpm
		Logical Blocks	1,953,525,168
		Operating Temperature	41° to 131° F (5° to 55° C)

	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	up to 226MB/s*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

2TB 7200RPM SATA 3.5in Enterprise HDD	**Capacity**	2TB	
	Protocol	SATA	
	Form Factor	3.5"	
	Controller	AHCI	
	Reliability	2.0M hours	
	Rated Power On Hours	8760/yr	
	Annualized Failure Rate (based on Rated POH)	<0.62%	
	Rated for 24/7/365 operation	YES	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *	
	Buffer	128MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms *
		Average	8.5 ms *
		Full Stroke	15.7 ms *
	Rotational Speed	7,200 rpm	
	Logical Blocks	3,907,029,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	up to 226MB/s*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Storage Drives

4TB 7200 RPM SATA 3.5in Enterprise HDD	**Capacity**	4TB	
	Protocol	SATA	
	Form Factor	3.5"	
	Controller	AHCI	
	Reliability	2.0M hours	
	Rated Power On Hours	8760/yr	
	Annualized Failure Rate (based on Rated POH)	<0.62%	
	Rated for 24/7/365 operation	YES	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *	
	Buffer	256MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms *
		Average	8.5 ms *
		Full Stroke	15.7 ms *
	Rotational Speed	7,200 rpm	
	Logical Blocks	7,814,037,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	up to 226MB/s*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

8TB 7200RPM SATA 3.5in Enterprise HDD	**Capacity**	8TB	
	Protocol	SATA	
	Form Factor	3.5"	
	Controller	AHCI	
	Reliability	2.0M hours	
	Rated Power On Hours	8760/yr	
	Annualized Failure Rate (based on Rated POH)	<0.62%	
	Rated for 24/7/365 operation	YES	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *	
	Buffer	256MB	

	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms *
		Average	8.5 ms *
		Full Stroke	15.7 ms *
	Rotational Speed	7,200 rpm	
	Logical Blocks	15,628,053,168	
	Operating Temperature	41° to 140° F (5° to 60° C)	
	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	up to 226MB/s*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

12TB 7200 RPM SATA-6G 3.5in Enterprise HDD	**Capacity**	12TB	
	Protocol	SATA	
	Form Factor	3.5"	
	Controller	AHCI	
	Reliability	2.0M hours	
	Rated Power On Hours	8760/yr	
	Annualized Failure Rate (based on Rated POH)	<0.62%	
	Rated for 24/7/365 operation	YES	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s *	
	Buffer	256MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms *
		Average	8.5 ms *
		Full Stroke	15.7 ms *
	Rotational Speed	7,200 rpm	
	Logical Blocks	23,437,770,752	
	Operating Temperature	41° to 140° F (5° to 60° C)	
	Performance	**Sequential Read**	up to 226MB/s*
		Sequential Write	up to 226MB/s*

*Actual performance may vary.

NOTE: For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 36GB of system disk (for Windows) is reserved for system recovery software.

Technical Specifications - Graphics

GRAPHICS

NVIDIA® RTX™ 6000 Ada 48GB	**Form Factor**	Full-Height Dual Slot (4.4"? Height x 10.5"? Length) Weight: 1230 grams / 2.71 lbs (with extender)
	Max Power Consumption	Power: 300 Watts Cooling: Active
	GPU Memory	48GB GDDR6 memory ECC Memory Bandwidth: Up to 960 GB/s Memory Width: 384 bits
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires CEM 5.0 16-pin auxiliary power adapter
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

NVIDIA® RTX™ A6000 48GB	**Form Factor**	Full-Height Dual Slot (4.4"? Height x 10.5"? Length) Weight: 1230 grams / 2.71 lbs (with extender)
	Max Power Consumption	Power: 300 Watts Cooling: Active
	GPU Memory	48GB GDDR6 memory ECC optional Memory Bandwidth: Up to 768 GB/s Memory Width: 384 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Technical Specifications - Graphics

NVIDIA® RTX™ 5000 Ada 32GB	**Form Factor**	Full-Height Dual Slot (5.0"? Height x 13.85"? Length) Weight: 1130 grams / 2.49 lbs (excluding extender)
	Max Power Consumption	Power: 250 Watts Cooling: Active
	GPU Memory	32GB GDDR6 memory ECC Memory Bandwidth: Up to 576 GB/s Memory Width: 256 bits
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires CEM 5.0 16-pin auxiliary power adapter
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® RTX™ A5000 24GB	**Form Factor**	Full-Height Dual Slot (4.4"? Height x 11"? Length) Weight: 1049 grams + 80 grams extender
	Max Power Consumption	Power: 230W Cooling: Active
	GPU Memory	24GB GDDR6 memory ECC optional Memory Bandwidth: Up to 768 GB/s Memory Width: 384 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ Pro W7900 48GB	**Form Factor**	Full-Height Triple Slot (4.4"? Height x 10.5"? Length)
	Max Power Consumption	Power: 295W Cooling: Active
	GPU Memory	48GB GDDR6 memory Memory Bandwidth: Up to 864 GB/s Memory Width: 384 bit
	Connectors	3x DisplayPort 2.1 1x Enhanced Mini DisplayPort 2.1 Requires 2x 8-pin auxiliary power connectors
	Maximum Resolution	12288x6912 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Technical Specifications - Graphics

NVIDIA® RTX™ A4500 20GB	**Form Factor**	Full-Height Dual Slot (4.4"? Height x 10.5"? Length) Weight: 1049 grams + 80 grams extender
	Max Power Consumption	Power: 200W Cooling: Active
	GPU Memory	20GB GDDR6 memory Memory Bandwidth: Up to 640 GB/s Memory Width: 320 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector NVLink® Stereo Sync Requires 8-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

NVIDIA® RTX™ 4000 Ada 20GB	**Form Factor**	Full-Height Single Slot (4.4"? Height x 9.5"? Length)
	Max Power Consumption	Power: 130W Cooling: Active
	GPU Memory	20GB GDDR6 memory Memory Bandwidth: Up to 360 GB/s Memory Width: 256 bit
	Connectors	4x DisplayPort 1.4a Requires 6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

NVIDIA® RTX™ A4000 16GB	**Form Factor**	Full-Height Single Slot (4.4"? Height x 9.5"? Length) Weight: 500 grams
	Max Power Consumption	Power: 140W Cooling: Active
	GPU Memory	16GB GDDR6 memory Memory Bandwidth: Up to 448 GB/s Memory Width: 256 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires 6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Technical Specifications - Graphics

NVIDIA® Long-Life RTX™ A4000E 16GB	**Form Factor**	Full-Height Single Slot (4.4"? Height x 9.5"? Length) Weight: 500 grams
	Max Power Consumption	Power: 140W Cooling: Active
	GPU Memory	16GB GDDR6 memory Memory Bandwidth: Up to 448 GB/s Memory Width: 256 bit
	Connectors	4x DisplayPort 1.4a Quadro Sync II connector Stereo Sync Requires 6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ Pro W6800 32GB	**Form Factor**	Full-Height Dual Slot (4.4"? Height x 10.5"? Length) Weight: 850 grams
	Max Power Consumption	Power: 261W Cooling: Active
	GPU Memory	32GB GDDR6 memory Memory Bandwidth: Up to 512 GB/s Memory Width: 256 bit
	Connectors	6x mini-DisplayPort 1.4 Requires 8-pin+6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 60Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® RTX™ A2000 12GB	**Form Factor**	Half-Height Dual Slot (2.713"? Height x 6.6"? Length) Weight: 306 grams
	Max Power Consumption	Power: 70W Cooling: Active
	GPU Memory	12GB GDDR6 memory Memory Bandwidth: Up to 288 GB/s Memory Width: 192 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Technical Specifications - Graphics

NVIDIA® Long-Life RTX A2000E 12GB	**Form Factor**	Half-Height Dual Slot (2.713"? Height x 6.6"? Length) Weight: 306 grams
	Max Power Consumption	Power: 70W Cooling: Active
	GPU Memory	12GB GDDR6 memory Memory Bandwidth: Up to 288 GB/s Memory Width: 192 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® T1000 8GB	**Form Factor**	Half-Height Single Slot (2.713"? Height x 6.137"? Length) Weight: 132.6 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	8GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
NVIDIA® Long-Life T1000E 8GB	**Form Factor**	Half-Height Single Slot (2.713"? Height x 6.137"? Length) Weight: 132.6 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	8GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Technical Specifications - Graphics

NVIDIA® T1000 4GB	**Form Factor**	Half-Height Single Slot (2.713"? Height x 6.137"? Length) Weight: 132.6 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	4GB GDDR6 memory Memory Bandwidth: Up to 160 GB/s Memory Width: 128 bit
	Connectors	4x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ Pro W6600 8GB	**Form Factor**	Full-Height Single Slot (4.38"? Height x 9.50"? Length) Weight: 132.6 grams
	Max Power Consumption	Power: 122W Cooling: Active
	GPU Memory	8GB GDDR6 memory Memory Bandwidth: Up to 224 GB/s Memory Width: 128 bit
	Connectors	4x DisplayPort 1.4 Requires 6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 60Hz
	Bus Type	PCI Express 4.0 x16 (x8 electrical)
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit
AMD® Radeon™ RX 6700XT 12GB	**Form Factor**	Full-Height Dual Slot (4.30"? Height x 10.0"? Length) Weight: 684 grams
	Max Power Consumption	Power: 238W Cooling: Active
	GPU Memory	12GB GDDR6 memory Memory Bandwidth: Up to 384 GB/s Memory Width: 192 bit
	Connectors	4x DisplayPort 1.4 1x HDMI Requires 8-pin+6-pin auxiliary power
	Maximum Resolution	7680x4320 @ 60Hz
	Bus Type	PCI Express 4.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Technical Specifications - Graphics

NVIDIA® T400 4GB	**Form Factor**	Half-Height Single Slot (2.713"? Height x 6.137"? Length) Weight: 123.5 grams
	Max Power Consumption	Power: 30W Cooling: Active
	GPU Memory	4GB GDDR6 memory Memory Bandwidth: Up to 80 GB/s Memory Width: 64 bit
	Connectors	3x mini-DisplayPort 1.4a
	Maximum Resolution	7680x4320 @ 120Hz
	Bus Type	PCI Express 3.0 x16
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

AMD® Radeon™ RX 6400 4GB	**Form Factor**	Half-Height Single Slot (4.4"? Height x 10.5"? Length) Weight: 155 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	4GB GDDR6 memory Memory Bandwidth: Memory Width:
	Connectors	1x DisplayPort 1.4a 1x HDMI
	Maximum Resolution	7680x4320 @ 60Hz
	Bus Type	PCI Express 4.0 x4
	Available Graphics Drivers	Windows 11 Windows 10 Linux® 64-bit

Intel® Arc Pro A40 6GB	**Form Factor**	Half-Height Single Slot (2.7"? Height x 6.6"? Length) Weight: 220 grams
	Max Power Consumption	Power: 50W Cooling: Active
	GPU Memory	6GB GDDR6 memory Memory Bandwidth: 192GB Memory Width: 96 bit
	Connectors	4x mini- DisplayPort 1.4
	Maximum Resolution	7680x4320 @ 60Hz
	Bus Type	PCI Express 4.0 x8
	Available Graphics Drivers	Windows 11 Windows 10

Technical Specifications - Graphics

Notes for all graphics cards:

- Some graphics and GPU compute cards can consume a great deal of power, thus combinations of cards with other components may exceed a particular power supply's output capability.
- Some graphics and GPU compute cards require supplemental power cables.
- Not all chassis/PSU configurations have enough supplemental power cables of the correct type for all graphics configurations.
- Refer to the Power Supply section within Overview for more information.

Technical Specifications - Optical and Removable Storage

OPTICAL AND REMOVABLE STORAGE

HP 9.5mm Slim Blu-Ray Writer	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	BD-ROM BD-R BD-RE DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
	Disc Capacity	**DVD-ROM**	8.5 GB DL or 4.7 GB standard
		Blu-ray	25 GB (single-layer) 50 GB (dual-layer) 100/128 GB (BDXL)
		Full Stroke DVD	< 230 ms (seek)
		Full Stroke CD	< 220 ms (seek)
		Blu-ray	< 230 ms (seek) (Full Stroke Blu-ray)
		Startup Time	(Time to drive ready from tray loading) BD-ROM (SL/DL) 25S / 28S BD-R (SL/DL) 25S / 28S BD-RE (SL/DL) 25S / 28S DVD-ROM (SL/DL) 18S / 18S DVD-R (SL/DL) 25S / 25S DVD-RW 25S DVD+R (SL/DL) 25S / 25S DVD+RW 25S CD-ROM 15S
	Maximum Data Transfer Rates	**CD ROM Read**	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
		DVD ROM Read	DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
		Blu-ray	BD-ROM Up to 6X BD-ROM DL Up to 6X BD-R Up to 6X BD-R DL Up to 6X BD-R Up to 6X BD-RE SL/DL Up to 6X

Technical Specifications - Optical and Removable Storage

Power	**Source**	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -900 mA typical, 2000mA maximum
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)
Operating Systems Supported	Windows 11, Windows 10, Windows 7 Professional 64-bit, Red Hat® Enterprise Linux® (RHEL) 8, 9 Desktop/Workstation SUSE Linux® Enterprise Desktop 15 Ubuntu 20.04, 22.04 LTS No driver is required for this device. Native support is provided by the operating system.	
Kit Contents	9.5mm Slim BDXL Blu-Ray Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.	

NOTE: HD-DVD disks cannot be played on the DVD-ROM drive. No support for DVD-RAM. Actual speeds may vary. Don't copy copyright-protected materials. Double Layer discs can store more data than single layer discs. Discs burned with this drive may not be compatible with many existing single-layer DVD drives and players. Flawless playback on all systems is not guaranteed.

HP 9.5mm Slim DVD Writer	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
	Disc Capacity	**DVD-ROM**	8.5 GB DL or 4.7 GB standard
		Full Stroke DVD	< 200 ms (seek)
		Full Stroke CD	< 200 ms (seek)
	Maximum Data Transfer Rates	**CD ROM Read**	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
		DVD ROM Read	DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X

Technical Specifications - Optical and Removable Storage

		DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
Power	**Source**	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -< 800 mA typical, <1600 mA maximum
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)
Operating Systems Supported	Windows 11, Windows 10, Windows 7 Professional 64-bit, Windows Vista Business 64*, Windows 2000. Red Hat® Enterprise Linux® (RHEL) 8, 9 Desktop/Workstation SUSE Linux® Enterprise Desktop 15 Ubuntu 20.04, 22.04 LTS * No driver is required for this device. Native support is provided by the operating system	
Kit Contents	HP SATA DVD Writer drive, installation guide.	

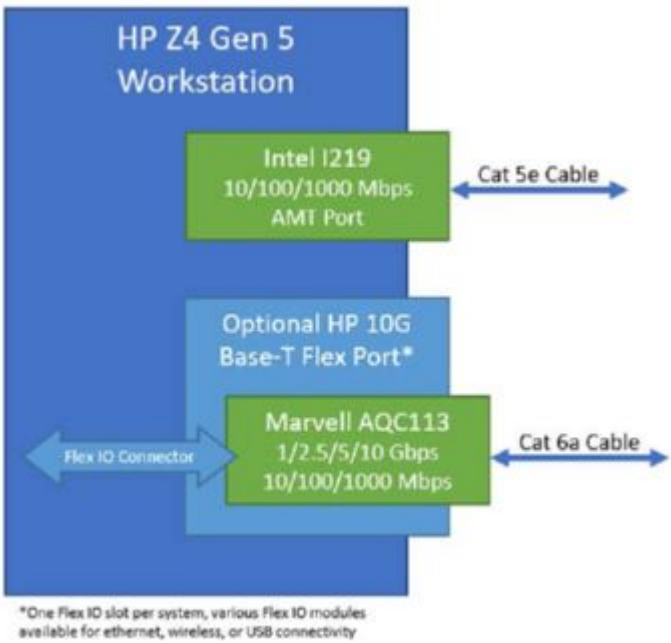
NOTE: Actual speeds may vary. No support for DVD-RAM (DVD Writer). Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

HP 9.5mm Slim DVD-ROM	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Disc Capacity	**DVD-ROM**	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	**DVD-ROM Single Layer**	< 110 ms (typical)
		CD-ROM Mode 1	< 110 ms (typical)
		Full Stroke DVD	< 230 ms (typical)
		Full Stroke CD	< 220 ms (typical)
	Power	**Source**	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC -< 800 mA typical, <1600 mA maximum
	Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	Windows 11, Windows 10, Windows 8.1, Windows 7 Professional 64-bit Red Hat® Enterprise Linux® (RHEL) 8, 9 Desktop/Workstation SUSE Linux® Enterprise Desktop 15 Ubuntu 20.04, 22.04 LTS	

	No driver is required for this device. Native support is provided by the operating system.
Kit Contents	9.5mm Slim DVD-ROM Drive, 5.25"" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide

NOTE: Actual speeds may vary. No support for DVD-RAM (DVD Writer). Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

NETWORKING AND COMMUNICATIONS



I219 (integrated)	**Connector**	RJ-45
	Cabling	Up to 100m with Cat 5e or better
	Controller	Intel I219LM
	Memory	N/A
	Data Rates Supported	10/100/1000Mbps
	Compliance	IEEE 802.3az, 802.3u, 802.1as/1588, 802.1Q, 802.1p
	Bus Architecture	PCIe
	Data Transfer Mode	BASE-T
	Power Requirements	N/A
	Network Transfer Mode	BASE-T
	Network Transfer Rate	10/100/1000Mbps
	Management Capabilities	Intel AMT, Wake-on-LAN, PXE, UEFI
	Kit Contents	Integrated into system

Technical Specifications - Networking and Communications

HP 10GBase-T Flex Port	**Connector**	RJ-45 (Single Port)
	Cabling	Twisted Pair Cabling, up to 100 meters
	Controller	Marvell AQC113C
	Memory	128KB Tx Buffer, 192KB Rx Buffer on-chip
	Data Rates Supported	10/100/1000 Mbps and 2.5/5/10 Gbps
	Compliance	802.3 - 2018, 802.1AS-2011
	Bus Architecture	PCI Express and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and S
	Power Requirement	Requires 0.7V VDD, 1V, and 2V for analog, 3.3V for VDDIO
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex
	Network Transfer Rate	10GBASE-T 5GBASE-T 2.5GBASE-T 1000BASE-T 100BASE-TX 10BASE-Te
	Management Capabilities	WOL, PXE, UEFI,
	Kit Contents	HP 10GBase-T Flex Port NIC Module
HP 2.5GbE LAN Flex Port	**Connector**	RJ45 (Single Port)
	Cabling	Copper twisted pair, Cat5e up to 100 meters
	Controller	Intel® I225-V
	Memory	4 Tx and 4 Rx Queues, Jumbo Frames up to 9KB and without TS
	Data Rates Supported	10/100/1000Mbps and 2.5Gbps BASE-T
	Compliance	IEEE 802.3, 802.3u (auto-negotiation), 802.3ab, 1588, 802.1AS 802.3br, 802.3az
	Bus Architecture	PCIe G2x1
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and S (Sx low power state)
	Power Requirements	2.2 Watts
	Network Transfer Mode	Automatic link configuration for speed duplex and flow control
	Network Transfer Rate	2500BASE-T 1000BASE-T 100BASE-TX (Half-duplex supported) 10BASE-Te (Half-duplex supported)
	Management Capabilities	WOL, PXE, UEFI, Intel vPro® support with appropriate Intel Chi buffers, UDP/TCP/IP Checksum Offload, SCTP receive and trans
	Kit Contents	HP 2.5GbE LAN Flex Port Networking Interface Card

Technical Specifications - Networking and Communications

HP 1GbE Fiber LC Single Flex Port	**Connector**	LC (Little Connector) Fiber (Single Port)
	Cabling	LC Fiber Cabling
	Controller	AT-29M2
	Data Rates Supported	1GBASE-SX
	Bus Architecture	USB 3.1G1
	Power Requirements	Up to 3.3 Watts
	Network Transfer Mode	1GBASE-SX
	Network Transfer Rate	1GBASE-SX
	Management Capabilities	Wake on LAN, Digital Diagnostic Monitoring
	Kit Contents	HP 1GbE Fiber LC Single Flex Port NIC
HP Flex 1GbE Single Port NIC	**Connector**	RJ45 (Single Port)
	Cabling	1GbE over Category 5e (or better) up to 100m
	Controller	Realtek RTL8153
	Data Rates Supported	10/100/1000 Mbps
	Bus Architecture	USB3.1G1, USB2
	Power Requirements	Requires 3.3V (integrated regulators for core Vdc)
	Network Transfer Mode	Full-duplex; Half-duplex
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	Wake on LAN, PXE, UEFI
	Kit Contents	HP 1GbE Single Flex Port
Intel® X550 10GBASE-T Dual Port NIC	**Connector**	2 x RJ-45
	Cabling	Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps, 2.5Gbps, or 5Gbps Cat6 (or higher) for 10Gbps up to 55m Cat6a (or higher) for 10Gbps up to 100m
	Controller	Intel X550-AT2
	Memory	Jumbo Frames up to 15.5KB, 64 Tx and 64Rx Queues per port, 1 transmit buffers
	Data Rates Supported	100Mbps (BASE-TX), 1Gbps (BASE-T, 2.5Gbps, 5Gbps, 10Gbps
	Compliance	802.1q (VLAN), 802.1Qbb, 802.1p, 802.1Qaz
	Bus Architecture	PCIe 3x4
	Data Transfer Mode	PCIe Gen 3 x4 based interface
	Power Requirements	3.9W at 100Mbps 5.5W at 1Gbps 11.2W at 10Gbps
	Boot ROM Support	Yes
	Network Transfer Mode	Auto negotiation between 1GbE, 2.5GbE, 5GbE and 10GbE
	Management Capabilities	DMI 2.0 Support, Windows Management Instrumentation (WMI) Multi-mode I/O Virtualization, VxLAN, VMDq, VLAN support wit
	Kit Contents	Intel® X550 10GBASE-T Dual Port NIC

Technical Specifications - Networking and Communications

Intel® I225-T1 Single Port 2.5GbE PCIe NIC	**Connector**	RJ-45 (Single Port)
	Cabling	Cat5e (or better) up to 100m
	Controller	Intel® Ethernet I225 Controller
	Memory	Jumbo Frames up to 9.5KB, 4 Tx and Rx Queues,
	Data Rates Supported	2.5GbE, 1GbE, 100MbE, 10MbE
	Compliance	IEEE 802.3 auto negotiation, 802.3x, 802.3z
	Bus Architecture	PCIe Gen 3.1x1
	Data Transfer Mode	PCIe-based interface for active state operation
	Power Requirements	1.9 Watts (typical)
	Management Capabilities	WOL, PXE 2.1, Power Management Protocol Offload (proxying), Power Management,
	Kit Contents	Intel® I225-T1 1-Port 2.5GbE NIC with standard height bracket a and Low-profile bracket included Product Literature
Intel® Ethernet I350-T4V2 4-Port 1Gb NIC	**Connector**	4x RJ-45 (Quad Port)
	Cabling	Cat3 (or higher) for 10Mbps Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps up to 100m
	Controller	Intel® I350
	Memory	Jumbo Frames up to 9.5KB, 8 Tx/Rx Queue pairs per port, Main
	Data Rates Supported	10Mbps, 100Mbps, 1Gbps
	Compliance	IEEE 802.3 auto negotiation, 802.3, 802.3u, 802.3ab, 802.3x, 80 implementation, 802.3az EEE
	Bus Architecture	PCI Express 2.1 x4
	Data Transfer Mode	PCIe-based interface for active state operation
	Power Requirements	5W
	Network Transfer Mode	Multi-speed, full, and half-duplex
	Network Transfer Rate	10BASE-T 100BASE-Tx 1000BASE-T
	Management Capabilities	WOL, PXE 2.1, UEFI, Power Management Protocol Offload (proxy State Power Management, VLAN, ACPI
	Kit Contents	Intel® Ethernet I350-T4V2 4-Port 1Gb NIC with full-height brack Low-profile bracket included
Intel® AX210 Wi-Fi 6 + Bluetooth® 5.2 wireless card Flex Port NIC with Internal Antenna	**Connector**	Wireless
	Cabling	N/A
	Controller	Intel® AX210
	Data Rates Supported	Wi-Fi 6 (2.4GHz/5GHz)
	Compliance	Wi-Fi Alliance* Wi-Fi Alliance CERTIFIED 6, WiFi CERTIFIED a/b/g, WPA3, Wi-Fi Direct, and Wi-Fi Agile Multiband IEEE WLAN Standard 802.11-2016, 802.11a, b, d, e, g, h, I, k, n, r
	Bus Architecture	PCIe G3x1 for WLAN, USB3.1G1 for BT

Technical Specifications - Networking and Communications

	Management Capabilities	Authentication Protocols: 802.1X EAP-TLS, EAP-TTLS/MSCHAP AKA, EAP-AKA') Encryption: 128-bit AES-CCMP, 256-bit AES-GCMP UEFI
	Kit Contents	Intel® AX210 Wi-Fi 6 + Bluetooth® 5.2 Flex Port NIC Installation Instructions
	* Wireless access point and Internet service required and sold separately. Availability of public wirel (802.11ax) is backwards compatible with prior 802.11 specs.	
Intel® AX210 Wi-Fi 6E non-vPro + Bluetooth® 5.2 wireless card with External Antenna WLAN	**Connector**	Wireless
	Cabling	N/A
	Controller	Intel® AX210
	Data Rates Supported	Wi-Fi 6e (2.4GHz/5GHz/6GHz)
	Compliance	Wi-Fi Alliance* Wi-Fi Alliance CERTIFIED 6, WiFi CERTIFIED a/b/g WPA3, Wi-Fi Direct, and Wi-Fi Agile Multiband IEEE WLAN Standard 802.11-2016, 802.11a, b, d, e, g, h, I, k, n, r
	Bus Architecture	PCIe G3x1 for WLAN, USB3.1G1 for BT
	Management Capabilities	Authentication Protocols: 802.1X EAP-TLS, EAP-TTLS/MSCHAP AKA, EAP-AKA') Encryption: 128-bit AES-CCMP, 256-bit AES-GCMP UEFI
	Kit Contents	Intel® AX210 Wi-Fi 6 + Bluetooth® 5.2 PCIe NIC External Dipole Antenna Installation Instructions
	*Wi-Fi 6E requires a Wi-Fi 6E router, sold separately to function in the 6GHz band. Availability of pub is backwards compatible with prior 802.11 specs. And available in countries where Wi-Fi 6E is suppo	

Allies Telesis AT-2914SX/LC 1GB LC Fiber NIC	**Connector**	LC Fiber (Single Port)
	Cabling	50/125 µm (core/cladding) multimode fiber optic cable up to 5 62.5/125 µm (core/cladding) multimode fiber optic cable up to
	Memory	Jumbo Frames up to 9.6KB
	Data Rates Supported	1000SX (1GbE Fiber at 850nm Wavelength)
	Compliance	IEEE 802.1p (Quality of Service), IEEE 802.1Q (VLANs), IEEE 802 (Flow control auto-negotiation), IEEE 802.3z (1000 Base-X), IEE RoHS, UL, FCC/EN55022 Class A, TUV, EN55024, CE, C-TICK, VC
	Bus Architecture	PCIe x1
	Data Transfer Mode	PCIe-based interface
	Power Requirements	1.5 Watts (typical)
	Network Transfer Rate	1000SX only (1GbE Fiber at 850nm Wavelength)
	Management Capabilities	UEFI, Smart Load Balancing and failover, Link aggregation (IEEE IEEE 802.3ad-draft static, VLAN Support
	Kit Contents	Allied Telesis AT-2914SX/LC 1GB LC Fiber NIC with low-profile b bracket included

Technical Specifications - Networking and Communications

Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC	**Connector**	2 x RJ-45 (Dual Port)
	Cabling	Cat3 (or higher) for 10Mbps Cat5 (or higher) for 100Mbps Cat5e (or higher) for 1Gbps up to 100m
	Memory	17 Rx and 16 Tx queues
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1p (Quality of Service), IEEE 802.1Q (VLANs), IEEE 802 (Flow control auto-negotiation), IEEE 802.3z (1000 Base-X), IEE 802.3ab (10/100/1000T) RoHS, UL, FCC/EN55022 Class A, TUV, EN55024, CE, C-TICK, VC
	Bus Architecture	PCIe 2x1
	Data Transfer Mode	PCIe-based interface
	Power Requirements	2.4 Watts (typical)
	Management Capabilities	VLAN support, Link aggregation LACP, Link aggregation smart (SLB), iSCSI boot support, Windows Management Instrumentat
	Kit Contents	Allied Telesis AT-2911T/2-901 Dual Port 1GbE NIC with low-pro bracket included

NVIDIA® Mellanox® ConnectX-6 DX Dual Port 10/25GbE SFP28 NIC	**Connector**	2 x SFP28 Transceiver Cage (Dual Port)*
	Cabling	Depends on transceiver pairing. Typically OM4 or higher MMF L Transceivers.
	Controller	ConnectX6-DX
	Memory	256Mbit SPI Quad Flash Device
	Data Rates Supported	1/10/25GbE
	Compliance	- IEEE 802.3by 25 Gigabit Ethernet - IEEE 802.3ae 10 Gigabit Ethernet - IEEE 802.3ap based auto-negotiation and KR startup - IEEE 802.3ad, 802.1AX Link Aggregation - IEEE 802.1Q, 802.1P VLAN tags and priority - IEEE 802.1Qau (QCN) - Congestion Notification - IEEE 802.1Qaz (ETS) - IEEE 802.1Qbb (PFC) - IEEE 802.1Qbg - IEEE 1588v2 - Jumbo frame support (9.6KB) - Safety: CB/cTUVus/CE - EMC: CE/FCC/VCCI/RCM - RoHS Compliant - KCC - CAN ICES-3 (B) - NM EN 55035/55032 (Morocco) - UKCA
	Bus Architecture	PCIe Gen 4 x8
	Data Transfer Mode	PCI Express - stores and accesses Ethernet fabric connection in
	Power Requirements	11.5 Watts (typical)
	Network Transfer Rate	1Gbps, 10Gbps, 25Gbps **NOTE:** Network Transfer Rate depends on transceiver model.*
	Kit Contents	NVIDIA® Mellanox® ConnectX-6 DX Dual Port 10/25GbE SFP28 N

Technical Specifications - Networking and Communications

Summary of Changes

Date of change:	Version History:		Description of change:
March 1, 2023	From v1 to v2	Changed	Optical and Removable Storage, Networking and Communications sections and Changed Format
March 30, 2023	From v2 to v3	Changed	Image page 1
April 1, 2023	From v3 to v4	Changed	Format
April 6, 2023	From v4 to v5	Changed	PCIe Solid State Drives section
May 1, 2023	From v5 to v6	Changed	Power Supply section
June 1, 2023	From v6 to v7	Changed	Graphics, Storage, Networking and Communications, Social and Environmental Responsibility, Overview sections
July 1, 2023	From v7 to v8	Added	HP Anyware Remote System Controller section
		Changed	Optical and Removable Storage, Networking and Communications sections
July 12, 2023	From v8 to v9	Changed	Power Supply section
August 1, 2023	From v9 to v10	Changed	Storage Drives, Social and Environmental Responsibility sections
August 1, 2023	From v10 to v11	Changed	ENVIRONMENTAL DATA section
September 1,2023	From v11 to v12	Changed	Overview, Graphics, NETWORKING AND COMMUNICATIONS sections
September 21, 2023	From v12 to v13	Changed	SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS section
September 25, 2023	From v13 to v14	Changed	SOFTWARE AND SECURITY section
October 1, 2023	From v14 to v15	Changed	Graphics, Input Devices sections

title

HP Brasil Indústria e Comércio de Equipamentos Eletrônicos Ltda.
Alameda Xingu, n.º 350, 8º andar
Alphaville Industrial, Barueri/SP
CEP: 06455-030
Brasil

declaração

Barueri, 10 de Outubro de 2023

Ao/À

CONSELHO DE JUSTICA FEDERAL

Assunto:
PREGÃO ELETRÔNICO 14/2023

BDI 20763

A empresa **Torino Informática Ltda**, inscrita no CNPJ **03.619.767/0001-91** sediada na RUA RITA DE CARVALHO MONTEIRO, 120, RETIRO SÃO JOÃO, SOROCABA, SP - CEP 18085-750 com filial inscrita no CNPJ **03.619.767/0005-15** situada a Avenida 600, s/n, Quadra 15, Módulo 10, Setor Industrial, TIMS, Serra, ES, CEP 29161-419, é um **PARCEIRO AUTORIZADO HP, PARA COMPRA DIRETA DE PRODUTOS DA HP**, estando apto a comercializar as linhas de produtos HP de nossa fabricação descritas abaixo.

Declaramos ainda que a TORINO INFORMÁTICA LTDA. é o parceiro de serviços do programa AMPLIFY, autorizado a prestar serviço de assistência técnica dos produtos que comercializa no telefone 0800 201-5666.

Produtos:

81C88LA#AK4 – HP Z4 G5 TWR – garantia padrão do fabricante.

38T75AA – HP Z Turbo 2TB PCIe-4x4 TLC SSD Module – garantia padrão do fabricante.

Declaramos ainda que, o produto **81C88LA#AK4** – HP Z4 G5 TWR:

- Além de possuir equipamentos com configurações padrão de fábrica a HPI realiza customizações para atendimento as necessidades dos clientes. Para atendimento a este edital a CONTRATADA fará as solicitações de customização à HP de modo a atender plenamente as exigências edilícias. Estas customizações deverão estar descritas na proposta comercial emitida pela CONTRADA. As declarações a seguir, se aplicam aos modelos de equipamento mencionados, independentemente das customizações a serem realizadas; Informações técnicas básicas como modelo do processador, capacidade de memória instalada, capacidade e tipo do dispositivo de armazenamento, versão do sistema operacional, tamanho da tela do notebook e garantia padrão de fábrica estarão descritas na proposta comercial emitida pela CONTRADA;
- Modelo de equipamento ofertado é a mais recente geração disponibilizada pela HP com comercialização no Brasil;
- A HP disponibiliza a ferramenta HP Support Assistant que permite a verificação e instalação das últimas atualizações de todas as ferramentas e drivers disponibilizadas pela HP para o equipamento. Sendo capaz de monitorar o sistema, realizar diagnósticos, emitir alertas e ajudar a

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reparar erros do sistema, ajudando assim a manter a saúde e segurança do sistema. Permite verificar o status da garantia pela ferramenta;

- Possui BIOS HP com direitos de copyrights, em conformidade com a especificação mínima UEFI 2.6 (http://www.uefi.org/) e capturáveis pela aplicação de inventário como por exemplo SCCM (System Center Configuration Manager);
- Possui BIOS com descrição do modelo, número de série e função de registro de número de patrimônio com extensão mínima de 15 dígitos, todos gravados em memória não volátil e sendo estas capturáveis por aplicações de inventario como por exemplo SCCM, Landesk, etc;
- Possui BIOS com interface gráfica com navegação utilizando mouse ou teclado, disponível em mais de 3 idiomas (espanhol, inglês etc.);
- Possui BIOS atualizável com opção de recuperação de falha, a partir de arquivo de recuperação no disco rígido ou USB externa; Possui BIOS com suporte à verificação de integridade;
- As atualizações da BIOS, quando necessárias, são disponibilizadas no site da HP Inc.;
- Possui BIOS implementada em "flash ROM" atualizável diretamente pelo microcomputador, utilizando memória não volátil e reprogramável, Plug and Play, entregue na versão mais atual disponibilizada pela HP. Podendo ser atualizada por software de gerenciamento remoto; Possui BIOS com capacidade de habilitar / desabilitar portas USB;
- Possui BIOS com possibilidade de configuração de senhas para Power On, Administrador e unidade de armazenamento; Possui BIOS com suporte à tecnologia de previsão/contingenciamento de falhas de disco rígido S.M.A.R.T habilitada;
- Possui BIOS com suporte a boot por pendrive ou unidade de armazenamento externo, conectado a uma porta USB 2.0 ou superior; Possui BIOS compatível com o padrão ACPI 6.0, DMI, SNMP, SMBIOS; Possui BIOS em conformidade com a normativa NIST 800-147 e NIST 800-193 (HP Sure Start);
- Possui a ferramenta HP Secure Erase integrada no BIOS, que possibilita apagar de forma definitiva e irrecuperável todos os dados da unidade de armazenamento, permitindo o descarte seguro de seus equipamentos (NIST 800-88);
- Possui BIOS com ferramenta de diagnóstico UEFI de componentes internos de hardware (processador, memória, unidade de armazenamento, áudio, teclado, rede, placa mãe, portas USBe vídeo). Acessível via BIOS ou teclas de atalho (F1...F12). A mensagem de erro é suficiente para abertura de chamado em garantia;
- Possui BIOS com ferramenta de diagnóstico de componentes internos de hardware (processador, memoria, unidade de armazenamento). Acessível via BIOS ou teclas de atalho (F1...F12). A mensagem de erro é suficiente para abertura de chamado em garantia;
- Possui sistema de monitoramento de temperatura controlada pela BIOS, adequado ao processador, fonte e demais componentes internos ao gabinete;
- Possui recurso para realizar downgrade de BIOS e replicação de configurações de BIOS em escala utilizando um arquivo referência ou via Powershell;
- Possui placa mãe fabricada e desenvolvida pela HP, exclusiva para o modelo, com o nome da HP identificado na mesma;
- Possui placa mãe com capacidade de desligamento do vídeo e da unidade de armazenamento após tempo determinado pelo usuário e reiniciar por acionamento de teclado ou pela movimentação do mouse e possui função de economia de energia;
- Possui chip TPM integrado, acompanhado de drivers e a ferramenta nativa do Windows (tpm.msc) para utilização do chip e possibilitando a utilização de todos os recursos de segurança e criptografia (A ferramenta tpm.msc é fornecida com os equipamentos adquiridos com o Sistema Operacional Windows 10 / 11 Pro);
- O chipset é do mesmo fabricante do processador, com tecnologia que permite que o sistema retome rapidamente do estado de hibernação tanto para unidades de armazenamento do tipo SATA e do tipo PCIe;
- Sempre que o equipamento for inicializado, será mostrado no monitor de vídeo o nome da HP;
- Possuem os mesmos padrões de cores, sendo o preto ou cinza escuro a cor predominante e com o logotipo da HP impresso;
- Possui acabamento interno composto de superfícies não cortantes; O gabinete possui tratamento anticorrosivo;
- O gabinete possui base/superfície antiderrapante;

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- Possui gabinete feito em liga metálica e front bezel de ABS O equipamento pode funcionar na posição horizontal ou vertical. Possui afixado no gabinete do equipamento, o Selo Certificado de Autenticidade (COA – Certificate of Authenticity) do software Windows na versão instalada e com serial de ativação do sistema operacional gravado no BIOS, quando adquirido com o sistema operacional Windows 10 / 11; O fluxo do ar interno segue as orientações do fabricante do microprocessador;
- Possui processador da geração mais recente fabricada pela HP no Brasil para este modelo de desktop de uso corporativo;
- Possui tecnologia implementada que controle o nível de desempenho do processador automaticamente, ajustando dinamicamente a frequência e a voltagem a cada a necessidade requerida pela atividade do momento para que seja otimizada a autonomia de bateria do equipamento;
- Possui suporte a implementação de tecnologia dual-channel para a memória RAM;
- As unidades de armazenamento disponíveis para fabricação do modelo, possuem suporte à tecnologia de segurança SMART e NCQ;
- Todos os conectores das portas de entrada/saída são identificados por cores ou símbolos, de acordo com o padrão PC'99 System Design Guide;
- Possui controladora de áudio onboard, com entrada e saída de áudio estéreo (combo jack), capaz de reproduzir os sons gerados pelo sistema (como músicas e beeps de alerta de diagnósticos), e está conectado diretamente a placa mãe sem uso de adaptadores, com suporte a 16bits;
- O sistema de áudio onboard possui a possibilidade de desativação por software ou automaticamente quando houver conexão com a caixa de som ou fone de ouvido;
- Possui controladora de rede Gigabit Ethernet 10/100/1000 Mbps com reconhecimento automático da velocidade da rede, com capacidade de operar no modo full-duplex, autosense, plug and play, com suporte ao protocolo SNMP, totalmente configurável por software, com suporte a VLAN, com suporte a PXE 2.1 e com função Wake-On-Lan instalada e em funcionamento. Com conector RJ-45 com LEDs de diagnostico;
- Possui interface de comunicação wireless integrado desde que a CONTRATADA incluía este item na proposta comercial. Esta placa wireless tem suporte aos padrões 802.11ax, 802.11ac, 802.11a, 802.11b, 802.11g e 802.11n, com suporte aos protocolos 802.11i (WLAN security, TKIP e AES), WPA, WPA2, WEP 64 e 128, IEEE 802.11 (Wired Equivalent Privacy), IEEE 802.1x. Com certificado de homologação válido da ANATEL, e no Wi-fi Certified Aliance. O ajuste da potência é de acordo com a recepção do sinal, de forma a proporcionar economia de bateria;
- Possui teclado da HP integrado, padrão ABNT-2 com todos os caracteres da língua portuguesa incluindo ç, com 87 teclas, com teclado numérico embutido na fileira superior, com teclas Windows Logo (acesso ao menu iniciar) e Aplicação (acesso ao menu de atalhos, equivalente ao botão direito do mouse), com LEDs indicativos de “caps lock” e “num lock”. A impressão sobre as teclas é do tipo permanente, não apresentando desgaste por abrasão ou uso prolongado e com sistema de proteção contra derramamento acidental de líquidos. O cabo USB tem no mínimo 1.5m;
- Possui mouse óptico da HP, com conector USB, cabo com comprimento mínimo de 1.8m, com resolução mínima de 800dpi, com 03 botões (esquerdo, direito e central próprio para rolagem (scroll), formato ergonômico e de conformação ambidestra;
- Fonte interna com ajuste automático (bivolt), suficiente para suportar todas as configurações do equipamento conforme as especificações técnicas contidas no catálogo técnico do mesmo, permitindo o funcionamento por no mínimo 10 horas por dia e 5 dias por semana;
- Possui cabo de energia para a fonte de alimentação de acordo com o novo padrão ABNT (NBR 14136);
- Todos os componentes do produto são novos (sem uso, reforma ou recondicionamento) e estão em linha de fabricação; Pertence a linha corporativa da HP;
- A HP possui programas de Logística Reversa (https://www.hp.com/br-pt/hp-information/sustainableimpact/planet-product-recycling.html);
- São bens constituídos em parte, por material reciclado, atóxico, biodegradável e atendem à diretiva RoHS;
- Todos os itens e seus acessórios são novos, não recondicionados, de primeiro uso, em pleno estado de funcionamento, livres de arranhões, amassados, frisagens, furações, fitas adesivas, marcas, falhas de fabricação ou qualquer outro procedimento ou emprego de materiais inadequados que

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adaptem forçadamente o equipamento ou suas partes que sejam fisicamente ou logicamente incompatíveis;

- As unidades dos equipamentos serão entregues devidamente acondicionadas em embalagens individuais adequadas, utilizando sempre que possível de materiais recicláveis, de forma a garantir a máxima proteção durante o transporte e a armazenagem;
- Cada equipamento possui um número de série único, afixado em local visível em etiqueta de difícil remoção ou impresso a laser, constando a marca, o modelo e o número de série do equipamento e na embalagem, que pode ser acessado o número de série no site da HP para identificá-lo em suas características e a validade e período de garantia;
- Os drivers, softwares e sistema operacional fornecido com o equipamento da HP estão disponíveis para download no site da HP, permitindo a instalação e recuperação do sistema operacional ao padrão de fábrica. A HP disponibiliza a ferramenta HP Cloud Recovery que permite realizar o download dos Drivers e do Sistema Operacional de forma automatizada para gerar pendrive de reinstalação;
- É disponibilizada documentação técnica necessária à instalação e operação do equipamento em português; A HP Disponibiliza "Central de atendimento telefônico" com número de telefone 0800 ou Whatsapp para abertura de chamado, em dias úteis, (segunda-feira a sexta-feira), em horário comercial (das 8h às18h) e "Central de atendimento via sistema web" para abertura de chamado 24x07, (domingo a domingo), a qualquer horário (das 00:00h às 23:59h);
- A HP Mantém os registros dos chamados que foram abertos, mantendo as informações que foram registradas sobre ele;
- A ferramenta Web de abertura de chamados da HP permite que o cliente a visualize e acompanhe os chamados abertos anteriormente;
- Possui garantia padrão de fábrica de 01 ou 03 anos para reposição de peças, mão de obra, com atendimento "on-site", conforme descrito na proposta comercial emitida pela CONTRATADA;
- Permite a extensão de garantia para 04 ou 05 anos para reposição de peças, mão de obra, para o monitor, com atendimento do tipo "on-site" através de aquisição da CONTRADA de carepack de extensão de garantia, devendo descrever em sua proposta comercial a descrição da extensão da garantia (HP Carepack);
- A assistência técnica "on-site" será realizada, durante todo o período de garantia dos equipamentos, pela própria HP ou por empresa de Assistência Técnica Autorizada da HP, a fim de que sejam mantidos válidos todos os direitos oriundos da garantia;
- Durante o prazo de garantia será substituída sem ônus para a contratante, a parte ou peça defeituosa, salvo quando o defeito for provocado por uso inadequado dos equipamentos;
- Certificado de Garantia é válido em todo o território nacional;
- Abertura do equipamento para limpeza, adição de memória ou SSD pela CONTRATANTE não implicará em perca da garantia desde que não cause mau uso. A garantia da HP não cobrirá o suporte destas peças.

Declaramos ainda que, o produto **38T75AA** – HP Z Turbo 2TB PCIe-4x4 TLC SSD Module:

- Possui suporte à tecnologia SMART (Self-Monitoring, Analysis and Reporting Technology);

Durante o período de garantia do Produto HP, a Fabricante HP responsabiliza-se pela garantia no prazo e condições padrão HP, conforme especificado no termo de garantia que acompanha o Produto HP e no manual técnico do Produto HP.

Serviços adicionais ao especificado na garantia padrão da Fabricante HP poderá ser adquiridos pelo Parceiro HP, com prazos e condições customizados:

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81C88LA#AK4 – HP Z4 G5 TWR – Carepack Adicional U1G39E – Suporte a hardware de estação de trabalho HP resposta no próximo dia útil no local 5 anos

Declaramos que os equipamentos fabricados pela HP são novos, que não foram submetidos a uso, nem recondicionamento, ressalvados os testes de fábrica.

Os Produtos da marca HP são de fabricação própria ou homologados por regime de O&M e estão em linha de produção atual.

Declaramos, ainda, que a HP possui site na internet - www.hp.com.br – onde pode ser efetuado download de drivers para os Produtos HP e número de telefone para Grande São Paulo – (011) 4004-7751 e demais regiões – 0800 709 77 51 - para informações e aberturas de chamados técnicos.

A Rede de Serviços Autorizados HP está distribuída em todo território nacional, ou conforme indicado a seguir, com uso de peças e componentes originais e com técnicos devidamente treinados pela HP

01. ACRE

Nome: UNISYS BRASIL LTDA

CPNJ: 33.426.420/0001-93

Endereço: Rua Teixeira de Freitas, 31, Andar 10, Andar 12 - Centro

Cidade: Rio de Janeiro - RJ - CEP: 20021-350

Contato:

E-mail: FESInnovationNFE@unisys.com

Telefone: 55 11 4680-6119

02. MARANHÃO

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03. MATO GROSSO

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04. **MATO GROSSO DO SUL**

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05. **MINAS GERAIS**

Nome: PROCEDATA INFORMATICA LTDA. (Juiz de Fora)

CPNJ: 65.181.075/0004-04

Endereço: Avenida Brasil, 1438 – Sobreloja – Bairro Costa Carvalho

Cidade: Juiz de Fora, MG - CEP: 36070-060

Contato:

E-mail:

Telefone: (32) 3215-7632

Nome: PROCEDATA INFORMATICA LTDA. (Montes Claros)

CPNJ: 65.181.075/0005-95

Endereço: Avenida Dulce Sarmento, 140 sala 312

Cidade: Montes Claros, MG – CEP: 39400-318

Telefone: (38) 3222-3995

Nome: PROCEDATA INFORMATICA LTDA. (Belo Horizonte)

CPNJ: 65.181.075/0001-61

Endereço: Avenida Nossa Senhora do Carmo, 45 - SALAS 501 à 504 -Carmo Sion

Cidade: Belo Horizonte, MG - CEP: 30310-000

Contato: Lúcio Guerra / Iara Martins

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Nome: UNISYS BRASIL LTDA

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06. PARÁ

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07. PARAÍBA

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08. PARANÁ

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09. **ALAGOAS**

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10. **PERNAMBUCO**

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11. **PIAUÍ**

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12. **RIO DE JANEIRO**

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Contato:

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13. **RIO GRANDE DO NORTE**

Nome: UNISYS BRASIL LTDA

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Cidade: Rio de Janeiro - RJ - CEP: 20021-350

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Telefone: 55 11 4680-6119

14. **RIO GRANDE DO SUL**

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15. **RONDÔNIA**

Nome: UNISYS BRASIL LTDA

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16. **RORAIMA**

Nome: UNISYS BRASIL LTDA

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E-mail: FESInnovationNFE@unisys.com

Telefone: 55 11 4680-6119

17. **SANTA CATARINA**

Nome: UNISYS BRASIL LTDA

CPNJ: 33.426.420/0001-93

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Cidade: Rio de Janeiro - RJ - CEP: 20021-350

Contato:

E-mail: enio@obus.com.br

Telefone: 55 11 4680-6119

18. **SÃO PAULO**

Nome: ATS SOLUÇÕES EM INFORMÁTICA LTDA (Ribeirão Preto)

CPNJ: 07.882.993/0004-64

Endereço: RUA MARTIM AFONSO DE SOUZA, 51, VILA MARIA LUIZA

Cidade: Ribeirão Preto - SP - CEP: 14055-453

Telefone: (16) 3441-6726

Nome: ATS SOLUÇÕES EM INFORMÁTICA LTDA (São José do Rio Preto)

CPNJ: 07.882.993/0002-00

Endereço: Rua XV de Novembro, 3057, Sala 1107 – Centro

Cidade: São José do Rio Preto – SP - CEP: 15015-907

Telefone: (17) 3301-2935

19. **AMAPÁ**

Nome: UNISYS BRASIL LTDA

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Esta declaração é válida por 30 (trinta) dias corridos, a contar da data de sua emissão.

Atenciosamente,

_____

Patrícia dos Santos Hajdú
Representante Legal
HP Indústria e Comércio de Equipamentos Eletrônicos Ltda.

AO
CONSELHO DA JUSTIÇA FEDERAL - CJF

EDITAL PREGÃO ELETRÔNICO Nº 14/2023

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São Paulo, 17 de outubro de 2023.

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The Platform of Choice for Business Computing

Intel vPro® with 12th Gen Intel® Core™ processors

PLATFORM BRIEF

Computing endpoints with 12th Gen Intel® Core™ processors propel business today, while helping them prepare for tomorrow

Businesses today are demanding more from their technology than ever before. With remote work now commonplace, users need a computing experience that empowers productivity wherever they may be. Furthermore, technology decision makers require platforms that facilitate these new workplace trends and that can also be deployed and maintained with confidence. The Intel vPro® platform with 12th Gen Intel® Core™ processors meets these technology demands and offers a wide array of computing options to empower businesses of all sizes.

New Intel vPro® Platform Portfolio

New for 12th Gen Intel Core processors, Intel is expanding the platform portfolio as follows.

- **Intel vPro® Enterprise for Windows** is the full-featured commercial platform focused on large enterprises and managed businesses. It features a comprehensive set of technologies to help businesses stay ahead of security threats. In addition, Intel vPro Enterprise for Windows offers complete modern management capabilities and platform stability suited for businesses with formal PC purchase practices.
- **Intel vPro® Essentials** extends security and device management capabilities previously targeting large enterprise to the small and medium business segment. These businesses also need to protect devices, applications, and data, so Intel vPro Essentials also incorporates Intel® Hardware Shield to help protect platforms based on the Windows operating system. In addition, Intel vPro Essentials supports partner-ready device management with Intel® Standard Manageability.
- **Intel vPro® Enterprise for Chrome** creates a new class of Chromebooks for business environments with the performance, stability, and security technologies that businesses require. This new platform further enables decision makers to match the right device to the right user.
- Finally, **Intel vPro®, An Evo™ Design** devices meet both the Intel vPro and Intel Evo design criteria, identifying notebooks that bring compelling user experiences to mobile business environments.

All versions of Intel vPro® provide a targeted set of performance, security, manageability, and stability features to meet the needs of each market segment.

Leading Business Productivity

12th Gen Intel Core processors feature a new architecture consisting of performance cores and efficient cores that excel at both single-threaded and multithreaded software environments.[1] This architecture empowers users to be more productive and enjoy higher performance from their PC, especially for multitasking and collaboration. Performance is optimized in real time by Intel® Thread Director, which works with the operating system to assign the right task to the right core at the right time.[2] This level of sophistication enables business PCs to execute demanding workloads, inclusive of user applications and IT software.

In addition, the new 12th Gen Intel Core processor family addresses the computing needs of nearly every type of worker, with an extensive portfolio of mobile and desktop processors with varying core counts and power offerings. Specific processors in Intel's portfolio are eligible for the various versions of Intel vPro (see table on page 4).

The performance of 12th Gen Intel Core processors is further enhanced with support for DDR5 and LPDDR5 memory. Intel vPro Enterprise entry workstations also support ECC memory with the corresponding Intel chipset.

Intel offers networking and I/O solutions that result in a more complete platform. 12th Gen Intel Core processors integrate Intel® Wi-Fi 6E Gig+ and mobile platforms also feature the new Intel® Connectivity Performance Suite, which optimizes wireless performance for popular use cases such as video conferencing.[3] Mobile users may also adopt Thunderbolt™ 4 docking solutions to connect peripherals to the PC via a single cable for a more elegant workspace. Intel vPro continues to support traditional wired connectivity for the 1 Gbps and 2.5 Gbps Ethernet standards.

Comprehensive Platform Security

Intel vPro features a comprehensive set of security technologies to help protect the full computing stack including hardware, firmware, the operating system, and applications.

Windows Devices

For Windows PCs, Intel® Hardware Shield continues to meet or exceed Microsoft Secured-core PC requirements. On both Intel vPro Essentials and Intel vPro Enterprise platforms, Intel Hardware Shield supports dynamic root of trust, OS reporting, and an expanded set of policies for protecting system management mode (SMM) operations.

Intel® Control Flow Enforcement Technology (Intel® CET), available on mobile beginning with 11th Gen Intel Core processors, comes to desktop processors for the first time with the 12th Gen Intel vPro platform. Intel CET helps protect against malicious code insertion into applications executing in PC memory.

Also new for 12th Gen Intel Core processors, Intel® Threat Detection Technology (Intel® TDT) is upgraded with anomalous behavior detection, making anti-virus software enabled for Intel TDT more effective at intercepting threats.

Finally, with Intel® Total Memory Encryption - Multi-Key (Intel® TME-MK) and Intel® Virtualization Technology with Redirect Protection (Intel® VT-rp), Intel vPro Enterprise platforms offer new hardware support for OS virtualization, pending enabling in an expected future OS release.

Chrome Devices

Systems built on the new Intel vPro Enterprise for Chrome platform feature Intel TME-MK to help protect against a physical attack on the device, as well as Intel® Key Locker to help protect encryption keys. These capabilities combined with other platform requirements raise the bar for Chromebooks as businesses consider mobile productivity devices.

Modern Device Management

Workplace trends are driving demand for remote device management. Intel® Standard Manageability is now available on Intel vPro Essentials mobile and desktop devices with support for remote out-of-band management over Wi-Fi, as well as out-of-band management for Windows PCs whether inside or outside the corporate firewall.

Intel vPro Enterprise continues to support a superset of capabilities with Intel® Active Management Technology (Intel® AMT). Intel AMT adds keyboard-video-mouse (KVM) remote control of devices, as well as new life cycle management features for device sanitization and recovery on select OEM PCs.

Intel device management capabilities are supported by the Intel® Endpoint Management Assistant (Intel® EMA) console and any third-party management software that integrates Intel EMA.

Driving Business Continuity

Both Intel vPro Enterprise for Windows and Intel vPro Enterprise for Chrome support the Intel® Stable IT Platform Program (Intel® SIPP), which aims for zero changes to the platform over a five-quarter device deployment window. Intel SIPP covers key Intel hardware and software in the platform, and the program includes enterprise-class platform validation for the supported operating systems. Intel SIPP enables corporations to minimize computing disruptions, simplify device qualification, and employ scheduled device purchase and deployment practices.

For Windows devices, both Intel vPro Essentials and Intel vPro Enterprise support reliable updates with automated restart and recovery of a failed firmware update. This capability spans both UEFI/BIOS and the Intel® Management Engine firmware, and it facilitates conducting firmware updates over the life cycle of a Windows PC.

Built for All Businesses

Intel vPro delivers professional-grade performance with a comprehensive set of capabilities to help protect and manage devices. Now with 12th Gen Intel Core processors, Intel vPro delivers a complete platform portfolio with computing solutions for nearly every type of worker at any business of any size. With increased remote collaboration, multitasking, plus user and IT apps competing for computing resources, Intel vPro is vital for enabling worker productivity and maintaining business continuity.

For more information, please visit www.intel.com/vpro.

Intel vPro® with 12th Gen Intel® Core™ processors

Intel vPro® Enterprise for Windows Eligible Processors			
Mobile			
U9	U15	P28	H45
i7-1260U	i7-1265U	i7-1280P	i9-12900H
i5-1240U	i5-1245U	i7-1270P	i7-12800H
		i5-1250P	i5-12600H
Desktop			
35W	65W	125W	
i9-12900T	i9-12900	i9-12900K	
i7-12700T	i7-12700	i7-12700K	
i5-12600T	i5-12600	i5-12600K	
i5-12500T	i5-12500		

Intel vPro® Essentials Eligible Processors			
Mobile			
U9	U15	P28	H45
i7-1250U	i7-1255U	i7-1260P	i9-12900HK
i5-1230U	i5-1235U	i5-1240P	i7-12700H
			i5-12500H
Desktop			
35W	65W		
i9-12900T	i9-12900		
i7-12700T	i7-12700		
i5-12600T	i5-12600		
i5-12500T	i5-12500		

Intel vPro® Enterprise for Chrome Eligible Processors		
U9	U15	P28
i7-1260U	i7-1265U	i7-1270P
i5-1240U	i5-1245U	i5-1250P

12th Gen Intel vPro® Features at a Glance

Feature	Benefit
Intel® Hardware Shield[4]	A suite of security technologies that helps protect Windows PCs in the Intel vPro® Essentials and Intel vPro® Enterprise platforms
Intel® Virtualization Technology (Intel® VT-x / VT-d)	Accelerates hypervisor and virtual machine switching for OS security services
Intel® Trusted Execution Technology[4]	Provides dynamic root of trust for Windows or other system software
Intel® System Security Report[4]	Communicates low-level security configuration to the Windows operating system
Intel® System Resources Defense[4]	Configurable System Management Mode (SMM) protections required for Microsoft Secured-core PC compliance
Intel® VT-rp[5]	Hardware-enhanced protection for OS virtualization (pending expected enabling)
Intel® Total Memory Encryption-Multi-Key (Intel® TME-MK)[6]	Key 0: Encrypts DRAM to help protect against a physical cold boot attack; Keys 1-15 can encrypt sections of DRAM as directed by OS (pending expected enabling)
Intel® Platform Trust Technology	Integrated Trusted Platform Module within Intel SOCs, supporting TPM 2.0
Intel® Boot Guard	Supports cryptographically-verified boot as recommended by Windows best security practices
Intel® BIOS Guard	Helps protect firmware residing in non-volatile memory
Intel® Threat Detection Technology	Provides a hardware assist for security applications, such as anti-virus software
Intel® Control Flow Enforcement Technology	Hardware-enhanced protection against memory safety attacks, such as malicious code insertion into applications executing in PC memory
Intel® Stable IT Platform Program[6]	Platform validation that aims for zero hardware changes for 15 months from first availability or until the next generational release
Intel® Active Management Technology[5]	Remote out-of-band management for efficient proactive and reactive system maintenance over Ethernet, Wi-Fi, and supporting Thunderbolt™ 4 docks. Supports Keyboard-Video-Mouse (KVM) remote control.
Intel® Standard Manageability	DASH standard-based out-of-band management over Ethernet and Wi-Fi with cloud manageability support for devices outside corporate firewalls. Does not support Keyboard-Video-Mouse (KVM) remote control.
Intel® One Click Recovery[5]	Fast remote recovery of a disabled computing endpoint
Intel® Remote Platform Erase[5]	Method for re-purposing computer systems by erasing the disk, cleaning the TPM, resetting the Intel® Converged Security Management Engine (Intel® CSME), and resetting UEFI/BIOS
Intel® Key Locker[7]	Used in select Chrome devices to help protect keys used by AES-NI encryption

[1] Performance hybrid architecture combines two new core microarchitectures, Performance-cores (P-cores) and Efficient-cores (E-cores), on a single processor die. Select 12th Gen Intel® Core™ processors (certain 12th Gen Intel Core i5 processors and lower) do not support performance hybrid architecture, only P-cores.
[2] Built into the hardware, Intel® Thread Director is provided only in performance hybrid architecture configurations of 12th Gen Intel® Core™ processors; OS enablement is required. Available features and functionality vary by OS.
[3] Intel® Connectivity Performance Suite is available for Windows OS only.
[4] Supported on Intel vPro® Essentials and Intel vPro Enterprise.
[5] Supported on Intel vPro® Enterprise only.
[6] Supported on Intel vPro® Enterprise for Windows and Intel vPro® Enterprise for Chrome only.
[7] Supported on Intel vPro® Enterprise for Chrome only.

All versions of the Intel vPro® platform require an eligible Intel® Core™ processor, a supported operating system, Intel LAN and/or WLAN silicon, firmware enhancements, and other hardware and software necessary to deliver the manageability use cases, security features, system performance, and stability that define the platform. See www.intel.com/PerformanceIndex (platforms) for details.

Performance varies by use, configuration, and other factors. Learn more at www.Intel.com/PerformanceIndex.

Intel technologies may require enabled hardware, software, or service activation.

No product or component can be absolutely secure.

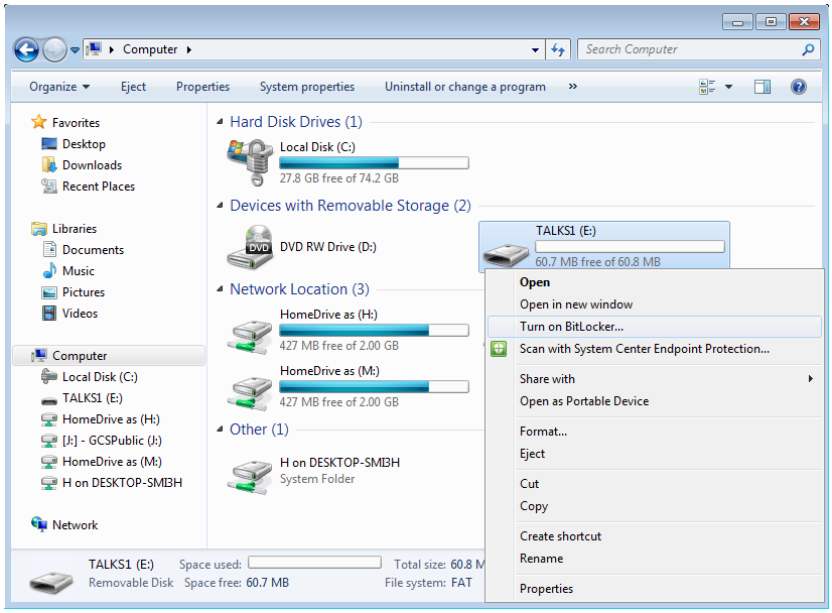
Your costs and results may vary.

Windows USB Storage Device Encryption

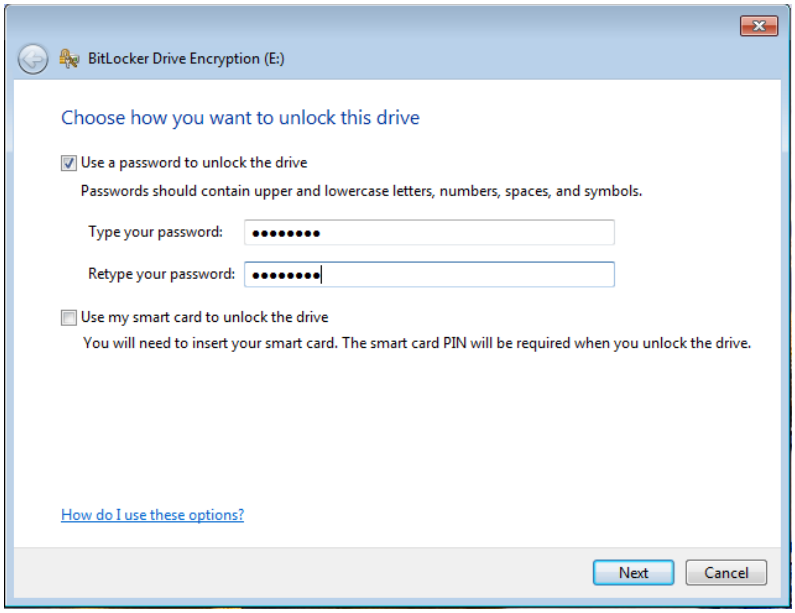
This guide takes you through the process of encrypting a USB storage device (e.g memory stick or external hard drive) using Microsoft BitLocker on a system running Windows 7 or later.

BitLocker

To enable BitLocker, in Windows Explorer right-click on the USB storage device to be encrypted and select ***Turn BitLocker on***.



BitLocker will start to initialize the storage device, then will ask you to provide a password.



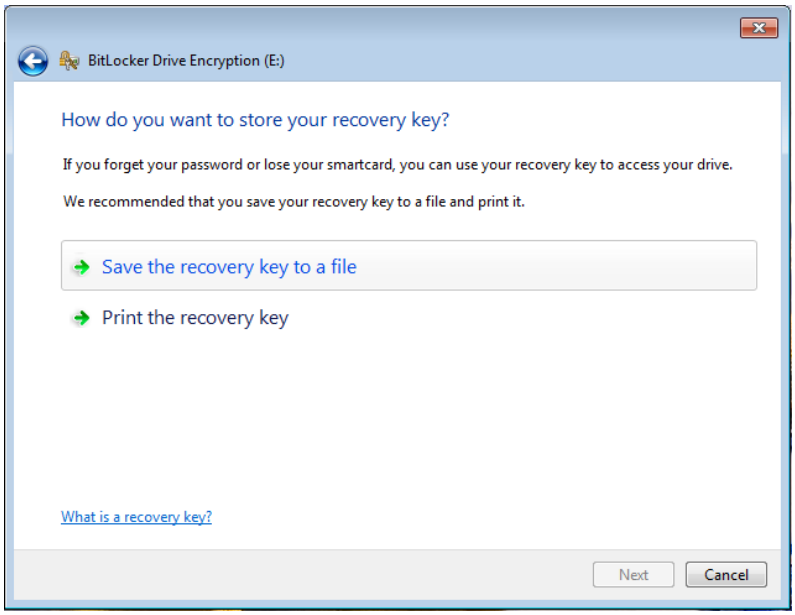
NOTE: For Windows 10 you may be asked how much of the storage device you wish to encrypt. The options are used space only or entire drive. If this is a brand new device, you can select the ***used space*** *option. Otherwise, it's safest to choose* ***entire drive****.*

NOTE: For Windows 10 you may also be asked whether you want to use the newer XTS-AES encryption. If the device may be used on machines running older versions of Windows choose the ***Compatible Mode*** *option.*

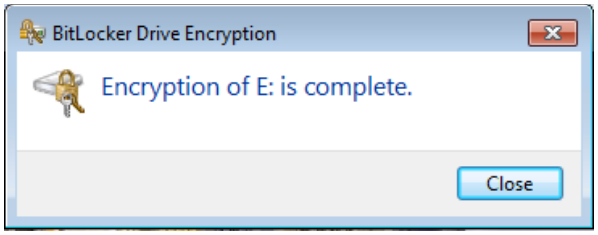
Recovery Key

You will then be asked how you would like to store your recovery key. This is an important step, as the key will be required if you forget the password chosen above.

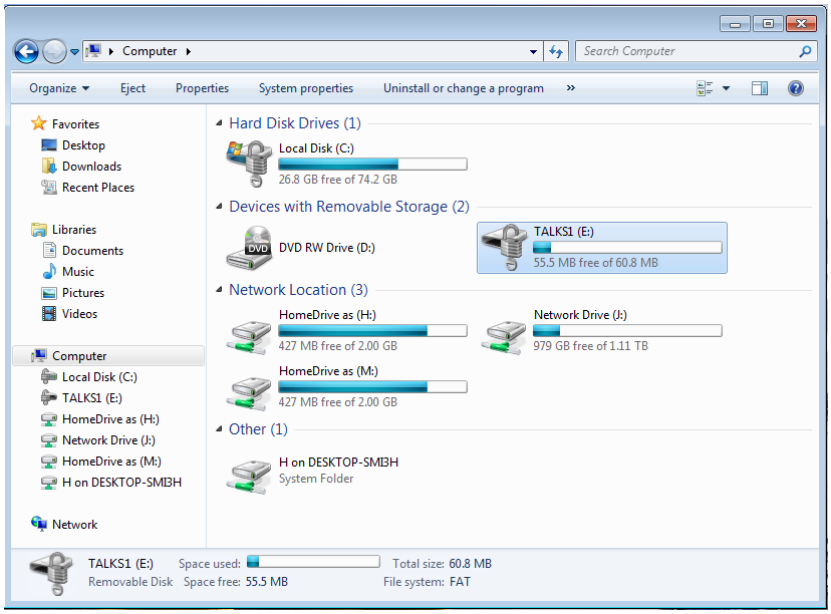
We recommend that you store the recovery key in a secure network drive, on another memory stick, or print a copy and keep it in a safe place. For obvious reasons, the system will not allow storing the key on the device you are encrypting!



Once the recovery key is saved you're ready to encrypt the device. The system will show a progress bar and notify you once complete.

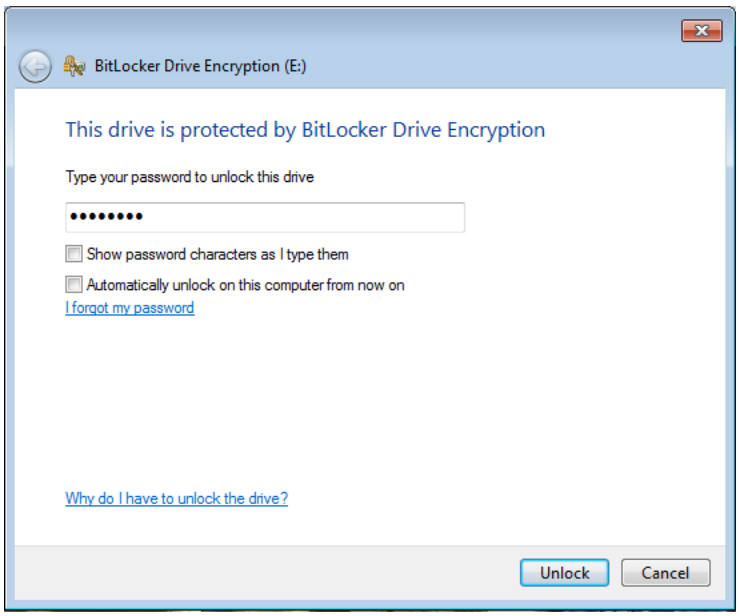


You'll notice in Windows Explorer there's now a padlock on the device - this confirms that BitLocker is enabled for this device.



Using The Device

When you insert or connect the USB storage device, you'll be asked to enter the password to unlock it. You also have the option to allow the computer to automatically unlock the device. Do this only on computers that you own or have an account on, as anyone who can access your account can then access the device.



If you've forgotten your password then you can unlock the device using the recovery key.

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Technical white paper

HP Support Assistant

Table of contents

Solution overview

HP Support Assistant is a one-stop solution for connected, contextual support. Aided with a new user interface and other usability enhancements, HP Support Assistant helps you maintain your HP devices— enabling you to prevent or resolve problems by using automated updates and self-help options. What's more, HP Support Assistant guides you to expert support when you need it.

Requirements and setup

HP Support Assistant is ready to go when you turn on your new HP desktop and notebook models running Microsoft Windows 11 or Windows 10 RS4 (and higher).

Once installed, you can find HP Support Assistant on your PC using one of the following two methods:

1. Access HP Support Assistant by clicking the question mark (?) icon in the taskbar. (If you do not see HP Support Assistant already pinned in your taskbar, please see the 'How do I add the HP Support Assistant icon to my taskbar?' item in the Frequently Asked Questions section of this document.)

2. Use the Windows search function and simply type 'HP Support Assistant'.

You can download the latest version of HP Support Assistant here.

Key features

HP Support Assistant features can be accessed by selecting the various cards on your device's page. The cards allow you to access your updates, messages, diagnostics, specifications, warranty information, contact HP support options, and other useful resources for your HP devices.

HP Services and offers

If available in your region, your HP Services can be found in the left navigation bar of the HP Support Assistant window. HP Services provides relevant service offers based on regional and country business rules as well as your device specifications. You can also find promotional codes, discount offers, coverage remaining and status for the various services here. Some of the services offered include consumer and commercial HP Care Packs, SmartFriend, McAfee, and Instant Ink.

Your devices

Adding devices

You can add more of your HP devices within your environment by clicking on the 'Add device' button in the HP Support Assistant window. After clicking on 'Detect my devices', HP Support Assistant will scan for printers attached to your network. You will be able to select from a list of detected printers and type in a custom name, for example 'My home printer'. You can also manually add a device in the same window by typing the serial number in the appropriate field, then clicking 'Find my device'.

Updates and Messages

HP Support Assistant automatically performs a weekly background scan for new messages and updates. During the scan, HP Support Assistant detects your devices, checks their status, and then populates relevant messages and software updates. The messages and software updates are split into two separate cards on the dashboard and include different priority categories. These categories are *important*, *recommended*, and *optional*. *Important* messages and updates are critical in nature and can address issues, improving overall reliability. *Recommended* messages and updates are less critical in nature but can be useful in improving the performance of your HP PC and printers. *Optional* messages and updates can help to improve your experience. For example, if during the weekly scan HP Support Assistant determines that your Windows firewall is disabled, a *recommended* message will be delivered with information on how to address this condition.

Windows security

The information displayed in the Security card of HP Support Assistant is useful in identifying key settings and options for your device. General security settings include network firewall status, virus protection status, and spyware and unwanted applications protection status.

Troubleshooting

HP Support Assistant includes Fixes & Diagnostics as well as Guided Troubleshooters through our Virtual Agent for a variety of issues including operating system, display, power, performance, audio, and storage. These troubleshooters will work to solve problems automatically or will guide you through steps involved in resolving more complicated issues with our Virtual Agent.

For printers, HP Support Assistant provides troubleshooting tools that can help resolve common problems you might experience when your HP printer is connected to any Windows-based computer.

HP is always working to develop new self-help tools and improve our library of current solutions so be sure to open HP Support Assistant the next time you run into technical issues.

Fixes & Diagnostics

HP Support Assistant offers variety of one-click-fixes which are designed to troubleshoot and automatically fix various issues in PCs.

The Operating System Check tool performs a comprehensive scan to identify common issues within the operating system and auto applies the necessary fixes.

The Performance Tune-up tool analyzes the system to identify areas which may be causing slower performance and can clean up subsequent files and caches.

The Audio Check tool can identify various issues with audio and can apply auto fixes to volume and microphone issues, primary audio devices, re-installation of drivers, and provide virtual support if needed.

The Battery Check tool tests the functionality of the battery and can show both basic or advanced information on the results as well as offering a link to purchase a replacement if needed.

The Network Check tool detects an operating system's common problems with a network and can reset the adapters and apply fixes automatically.

Printer fixes and diagnostics can also be found in the same section. HP Support Assistant provides tools that can help resolve common problems you might experience when your HP printer is connected to any Windows-based computer.

Virtual Agent

The HP Virtual Agent (VA) is an AI-driven bot that allows you to chat using Natural Language Processing (NLP). The VA will discover your intent from your input and direct you to the most relevant solutions, whether it be a knowledge-based document, a guided troubleshooter, or a turn-by-turn solution directly in the VA chat window. Context is passed to the VA to identify specific issues, products, and installed features so you don't have to enter it yourself. The VA can also access HP services such as the Product Content Browser, Warranty Check, and other services to help gather additional context. It is also used to start interactive diagnostics on your devices, such as checking for OS issues. If the Virtual Agent is unable to solve your problem, you also have the option of escalating to a live agent.

Specifications

For PCs, general specifications show information about your operating system version, microprocessor type, system memory configuration, system board, and system basic input/output system (BIOS) revision. The video section shows the graphic device, current resolution, refresh rate, and driver version. The audio section displays a list of configured audio devices, current status, driver name, and version information.

Battery

For devices with batteries, the battery card will be displayed giving you information on overall battery health, useful links, as well as the HP Battery Check tool. The Battery Check tool tests the functionality of the battery and can show both basic or advanced information on the results as well as offering a link to purchase a replacement if needed.

Storage

The storage card also shows the health of your configured storage options as well as displaying model information and storage-related links and tools.

Warranty

Your warranty start and end dates are available under the warranty card. You can also extend your warranty period by purchasing an HP Care Pack or explore other premium services offered by HP.

Support

Support Resources

Contact HP and other support resources will vary based on country, model, and the status of your warranty coverage.

Contact HP Customer Support options: Online Chat, Call Me, and Call HP

If you've tried everything and still can't find the answers, you can always get assistance from an HP Customer Support agent. Relevant options are available from HP Support Assistant to make this quick and easy. You must be signed-in to HP Support Assistant to use this feature and options are displayed based on several factors, including your model, country, and time of day.

HP Support Community

Join the conversation in HP peer-to-peer forums to find solutions, ask questions, and share tips on HP printers, tablets, and computer products including hardware, software, and operating system support topics.

The support card provides access to a wealth of information from the HP support website for your model.

HP SmartFriend (available in select countries)

Providing technical support for computer software, hardware or peripheral, and networking issues over the phone and through online chat for a single designated computer. No more trying to decide which software or hardware vendor to contact for support, or wasting hours spinning your wheels trying to search for answers. SmartFriend technicians can even access your computer remotely to diagnose and resolve issues.

Virtual Repair Center

Looking to repair your printer, laptop, or other HP device? The new Virtual Repair Center is here to help! Learn how to get your HP device repaired and where to check the status online.

HP Service Center Locator

Need to get your HP device serviced? The new HP Service Center Locator allows you to enter a city or zip code then filter by distance and supported products to discover the best place to take your HP device to be repaired or serviced.

HP Support Cases

If a support case is created for you through any of our HP Support Assistant contact methods, you can track the progress and get updates like repair status under the Support Resources section.

General

Application settings

Use the Application Settings page (accessed through the navigation bar) to choose how you would like to receive software updates from HP and set scheduling options for the weekly scan. In addition, you can enable HP Support Assistant to use your registration information, including the serial number and product number of your PC and any attached HP printers to provide you with personalized information about your products. You can also choose whether you'd like to share your usage data that will then be used to help HP improve the features and performance of future releases of HP Support Assistant.

Frequently asked questions

HP Support Assistant basics

What is HP Support Assistant?

HP Support Assistant is a self-help application for your HP devices pre-installed on your Windows PCs. It helps you maintain peak performance and resolve problems through automatic updates, built-in diagnostics, and a variety of assistance options including the Virtual Agent. You can also download and install HP Support Assistant by visiting our website.

How much does HP Support Assistant cost?

HP does not charge for the use of HP Support Assistant but may charge for technician assistance on out-of-warranty products.

How do I use HP Support Assistant?

Clicking on the question mark (?) icon in your taskbar gives you simple instructions on the action you need to take, if any. This icon will change based on various factors such as the priority of pending updates and messages, or the status of other parameters like battery health, security, or storage capacity. If you do not see HP Support Assistant already pinned in your taskbar, please see the 'How do I add the HP Support Assistant icon to my taskbar?' item in the Frequently Asked Questions section of this document.

Do I need to be connected to the Internet to use HP Support Assistant?

You do not need to be connected to the Internet to use HP Support Assistant, but some features such as the Virtual Agent, receiving updates, connecting to hp.com, or contacting HP require an Internet connection.

Finding or installing HP Support Assistant

Is HP Support Assistant available on all computers?

HP Support Assistant is pre-installed on HP computers shipped with Microsoft Windows 11 or Windows 10 RS4 (and higher).

If HP Support Assistant is not installed on your computer, you can download the latest version by visiting our website here. If your PC does not qualify for the latest version, you can download the legacy version of HP Support assistant on the same page.

Note that the HP Support Assistant features may vary depending on the version installed, your computer model, and your location.

Where can I find HP Support Assistant on my computer?

To find HP Support Assistant on your PC, try any of these methods:

• Click on the question mark (?) icon in your taskbar. (If you do not see HP Support Assistant already pinned in your taskbar, please see the 'How do I add the HP Support Assistant icon to my taskbar?' item in the Frequently Asked Questions section of this document.)

• Use the Windows search capability to search for 'HP Support Assistant'.

• If HP Support Assistant is not installed on your computer running Windows 11 or Windows 10 RS4 (and higher), you can download the latest version by clicking here. You can also download the legacy version of HP Support assistant for older devices in the same link.

How do I add the HP Support Assistant icon to my taskbar?

In both Windows 10 and Windows 11 you can use either of the methods below to pin HP Support Assistant to your taskbar.

1. Use the Windows search function to type in 'HP Support Assistant', right-click on HP Support Assistant in the results and select 'Pin to taskbar'.
2. While HP Support Assistant is launched, right-click on the (?) icon in the taskbar and select 'Pin to taskbar'.

If you are in Windows 10 you can also visit the Application Settings section of HP Support Assistant, select the 'More settings' drop-down, and check the 'Display application icon in the taskbar (recommended)' box.

Can I uninstall HP Support Assistant?

You can uninstall HP Support Assistant using the remove program capability in the Apps and Features section of the Windows operating system or by right clicking HP Support Assistant in the start menu and clicking 'Uninstall', but HP does not recommend uninstalling the application. HP Support Assistant allows you to receive updates from HP that keep your PC and printers running smoothly and offers several options whenever you need assistance.

Can I remove the HP Support Assistant icon from my taskbar?

You can remove the HP Support Assistant icon from your taskbar, but HP does not recommend removing the icon. You would no longer receive notifications of pending actions through your taskbar, and not be able to directly access some of the HP Support Assistant capabilities. Remove the icon from your taskbar by right-clicking the HP Support Assistant icon and selecting 'Unpin from taskbar'.

Can I reinstall HP Support Assistant if I have uninstalled the application?

You can download and install the latest version of HP Support Assistant by clicking here.

Where can I find technical information about my PC and printers?

You can find technical information by selecting the PC or printer you want to view from your list of devices in the HP Support Assistant window. If your device is not present, please refer to the 'How do I add a device to HP Support Assistant?' question in this document.

HP Support Assistant features and functions

How do I check the status of my warranty?

Warranty status can be checked by selecting the device you want to view from your device list in the HP Support Assistant window and then clicking on the warranty card.

How do I keep my devices up to date?

By default, important updates are set to automatically install with HP Support Assistant. HP recommends leaving automatic updates turned on to ensure that you receive the latest updates and messages. If needed, this setting can be turned off by visiting the Software Updates Section of HP Support Assistant (accessible by selecting the settings button at the bottom-left corner of the HP Support Assistant window or selecting 'Update settings' in the Updates card). If you choose to turn off automatic updates you will need to visit HP Support Assistant and manually download and install updates yourself.

How do I add a device to HP Support Assistant?

You can add HP devices to HP Support Assistant by selecting the 'Add device' button in the HP Support Assistant window. HP Support Assistant will scan to detect supported devices connected to your computer or on your network.

How do I change the nickname I have given my printer?

You can edit a device nickname by clicking the 'pencil' icon next to the device's current nickname.

How do I remove a device from my list?

To remove a device from your list just click on your name in the top right of the HP Support Assistant window then select 'View profile' from the drop-down. If you are not signed in the button will say 'Create account / Sign in' instead of your name. Once on your profile, you will see a list of your current devices. Click the blue 'x' next to the device you want to remove.

Can I receive printer updates?

HP Support Assistant will periodically check for printer updates and notify you. When a printer update is available, you will need to follow the on-screen instructions to complete the installation.

What happens if I postpone an update or want to find previously installed updates?

Any postponed updates can be launched from the action log. The action log is a history of all the actions that have been performed or postponed on the computer. In the action log, status for items is displayed as installed, installation failed, postponed, or deleted.

What kind of messages will I receive in HP Support Assistant?

Messages in HP Support Assistant include helpful tips and information that HP publishes from time to time. These messages can also be important alerts related to the security or functionalities of your HP devices. These messages can be about anything from cleaning your desktop to computer security.

How can I find diagnostics for my computer?

Relevant diagnostics and one-click-fixes can be found in the Fixes & Diagnostics card on your device's dashboard. For more complex problems, the Virtual Agent can give you step-by-step assistance with guided troubleshooting.

At what point do I contact technical support?

HP Support Assistant is designed to provide as much information as possible to help you diagnose and troubleshoot any issues. If HP Support Assistant does not provide an answer to your query, then it is time to contact support. Charges will apply to out-of-warranty products.

How do I contact technical support?

Select the Support Resources section located at the bottom of HP Support Assistant. There are several options available depending on your location, warranty, and availability of service. You will need to select a country and allow HP to check your warranty status to enable one or more of the support options listed below:

1. **Chat:** If you have an active Internet connection, you can chat online with HP Customer Support. Device information, such as your serial number, is automatically relayed from your computer to HP once you approve of that information to be sent.

2. **Call:** When you call HP Customer Support, you may be asked to provide information such as your model number or serial number. Both numbers can be found easily on the device's dashboard. To speed-up issue resolution, your computer can transfer data to HP Customer Support prior to your conversation, if you approve of this information to be sent.

Can I get help and support if I do not have an Internet connection?

HP Support Assistant can use the information and diagnostics on the local computer even without an Internet connection.

How do I ensure I always have the latest version of HP Support Assistant?

HP Support Assistant will automatically update itself as new versions are released; you do not need to do anything to keep your version up-to-date. If you need to download and install HP Support Assistant you can do so by visiting this link.

Why should I provide feedback to HP?

Providing your feedback allows you to provide input on HP Support Assistant and helps us identify current issues and future improvements for the support application itself.

Where do I get more information about HP Support Assistant?

You can find more information about HP Support Assistant by clicking here.

What are the hardware and software requirements for HP Support Assistant?

HP Support Assistant is pre-installed on HP computers running Microsoft Windows 11 or Windows 10 RS4 (and higher). HP Support Assistant can also be installed on non-HP PCs running Microsoft Windows 11 or Windows 10 RS4 (and higher). Some HP Support Assistant features require an active Internet connection.

Is HP Support Assistant available worldwide in my local language?

The application is available in all countries worldwide and has been translated into the 36 languages listed below.

Languages
Arabic (Saudi Arabia)
Bulgarian
Czech
German (Germany)
Danish
Greek
Spanish (Spain)
English (United States)
Estonian
French (France)
Finnish
Hebrew
Croatian (Croatia)
Hungarian
Italian (Italy)
Japanese
Korean
Lithuanian
Latvian
Norwegian (Bokmål)
Dutch (Netherlands)

Polish
Portuguese (Portugal)
Portugal (Brazil)
Romanian (Romania)
Russian
Slovak
Slovenian
Serbian (Latin, Bosnia and Herzegovina)
Swedish (Sweden)
Thai
Turkish
Ukrainian
Chinese (Simplified)
Chinese (Traditional)
Chinese (Traditional)

Differences between HP Support Assistant and other software and services

Does HP Support Assistant work with my antivirus software?

HP Support Assistant works independently of any antivirus software application.

What are the differences between Microsoft updates and HP updates?

Windows updates are released by Microsoft to fix or repair issues with Windows products. HP updates are more tailored to your specific HP devices. Using HP updates ensures that you have the latest drivers and software tested and approved by HP.

Conclusion

HP Support Assistant can help keep your HP PCs and printers running smoothly with automatic software and driver updates. A wealth of information and support resources for your devices is only a few clicks away and when the time comes to get additional help, HP Support Assistant gives you multiple options to contact skilled technical support agents.

Membership List

The UEFI Forum community of members is represented by industry-leading OEMs, IHVs, chip manufactures, BIOS and firmware vendors and operating system vendors.

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American Megatrends, Inc.
Apple Inc.
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Hewlett Packard Enterprise
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The MITRE Corporation

Ventana Micro Systems Inc.

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Zoom Tecnologia Ltda.

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Advantech Co., Ltd.

AGN Group Suprimentos

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Airdesk Ltd.

Alcor Micro Corp.

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American Arium

AMOI Electronics Co., Ltd.

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AuthenTrend Technology Inc.

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Aver Networks Corp.

Avery Design Systems

Avery Design Systmes

Avid Technology, Inc.

Axiom Electronics, LLC

Axiomtek Co., Ltd.

Japan Digital Laboratory Co., Ltd.

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Jetway Information Security Industry Co., Ltd.

KingTrust Systems Ltd.

Kioxia Corporation

Konsulko Group

Kontron Embedded Modules GmbH

Kraftway Corporation PLC

Kuhrman Technology Solutions LLC

LCC Rubinteh

LCFC

LG Electronics

Lockheed Martin Corporation

Lontium Semiconductor Corporation

LucidLogix

Matrixed Reality Technology Co., Ltd.

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MBDA UK Ltd.

MBM Tecnologia e Industria de Informatica LTDA

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MediCapture, Inc.

Mensys B.V.

Mercury Computer Systems

Micro-Star Int'l Co., Ltd

Microchip Technology

Micron Technology, Inc.

Microsemi Corporation

Mitrastar Technology Corp.

MokaFive

Mossbit Technologies

Myricom, Inc.

National Instruments Corporation

National Technical Systems

Naval Postgraduate School

NEC Personal Products Ltd.

Neterion, Inc.

Netlist Inc.

Balance Software Corp.
Basemark Oy
Battelle Memorial Institute, Pacific Northwest Division
BCM Advanced Research
BedRock Systems, Inc.
Beijing AnHeng SecoTech Information Technology Co., Ltd.
BINARLY Inc.
BiTMICRO Networks Inc.
Booz Allen Hamilton
Brown's Operating System Services Limited
BSQUARE Corporation
CalDigit, Inc.
Calxeda, Inc.
Canon Inc.
Captec Ltd.
Centerm Information Co., Ltd.
CenterTools Software GmbH
Central South University
Check Point Software
Chelsio Communications, Inc.
China Greatwall Computer Shenzhen Co., Ltd.
CHUNGHSIN INDUSTRY GROUP
CircleSoft LLC
Circuitco
Cisc Systems
Cix Technology (Shanghai) Co., Ltd.
Computer Task Group
Concurrent Technologies Plc
congatec A.G.
conpal GmbH
coresystems GmbH
Courtyard Electronics Ltd.
Cray, Inc.
CrossInfo Architects
Cryptomill Technologies Ltd.
CSWL, Inc.
Dawning Information Industry (Beijing) Corp., Ltd. (Sugon)
Def-Logix, Inc.
Denali Software
DeviceVM, Inc.
Diablo Technologies, Inc.
Dialogue Technology Corp.
Diskeeper Corporation
Dot Hill
Eclypsium, Inc
Egis Technology Inc.
Elite Group Computer Systems Co., Ltd.
EliteBytes Limited
Eltan B.V.
Embedded Now, Inc
Network 2000 Inc.
NetXen Inc.
Neusoft
New H3C Technologies Co., Ltd.
Newport Enterprises Inc.
Nextiva
NOLO Co., Ltd.
NTI Corporation
NVELO, Inc.
OpenMars Development LLC
Order N Development, LLC
Orion Technologies, LLC
OSBASE, LLC
Panasonic Corporation
Parallels IP Holdings GmbH
Pegatron Corporation
Peppercon AG
PGP Corporation
PixelNext Inc.
PLX Technology, Inc.
Portlock
PQURE Technology AB
Proformatique
Quanta Computer Inc.
Radisys Corporation
Red Flag Software Co., Ltd.
Renesas Electronics Corporation
RPA RusBITech
rubbersoft.com
Ruijie Networks
Sage-Microelectronics
Samsung Electronics Co., Ltd.
Sandia National Laboratories
SanDisk Corporation
Sanmina Corporation d/b/a Viking Technology
SDL Eletro Eletronica Ltda - EPP
SecurStar GmbH
SEMP TOSHIBA INFORMATICA LTDA
Sensics, Inc.
ServerEngines Corp.
Shanghai Advanced Research Institute
Shanghai IP3 Technology Co., Ltd.
Silicon Image, Inc.
Silicon Integrated Systems Corp.
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SoftIron, Inc.
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Etegro Technologies
Eurosoft (UK) Ltd.
EVOC
ExpressLuck Industrial Ltd.
Extreme Engineering Solutions, Inc.
F5 Networks, Inc.
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Freescale Semiconductor, Inc.
Fujitsu Ltd.
Gemalto SA
General Dynamics Canada
Genesi USA Inc.
Gigabyte United Inc.
GIGAPC
GIT Japan Inc.
Glacier Peak Technology, LLC
Grain Media, Inc.
Greencroft Code
Guidance Software, Inc.
HighPoint Technologies, Inc.
Hitachi, Ltd.
Houter Brasil Eireli
HTC Corporation
Hunan New Cloudnet Technology Co., Ltd.
HXT Semitech
IATECAM
ICP Electronics, Inc.
InfoTeCS
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Inphi Corp.
Institute of Physics, Academia Sinica
Integrated Device Technology Inc.
Intellico, LLC
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Inventec Electronic (Tianjin) Co., Ltd.
SSWW
STEC, Inc.
Stonewood Electronics Ltd.
Stream Labs
Super Future Equities, Inc.
SYBERA GmbH
Symantec Corporation
System Fabric Works
System Garden Ltd.
TCORP
Terascala, Inc.
Themis Computer, Inc.
TimeLab Corporation
Tokyo Electron Device Ltd.
Toshiba Samsung Storage Technology Korea Corporation
Trend Micro
Tsinghua Tongfang Co., Ltd.
Tuxera Inc.
TYA
Ubiquitous AI Corporation
ULINK Technology, Inc.
UNH InterOperability Laboratory
Unicompute Technology Co., Ltd
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Unisys Corporation
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VNPT Technology
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Wacom Technology
Wave Systems Corp.
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WinSystems, Inc.
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Individual Adopters

Alex Kunovszky	Karl O. Van Leuven IV
Barry Gian James	Kushal Koolwal
Ben Lee Hughes	Lee Fisher
Benson Lin	Liqiang Ni
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Justin Loo	Xie Tianming (Persmule)
Justin Sligh	ZongQi Li

* temporarily suspended

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Processador Intel® Xeon® W5-2465X
cache de 33,75 M, 3,10 GHz

Processador Intel® Xeon® W5-2465X
cache de 33,75 M, 3,10 GHz

Adicionar para comparar

Especificações

Baixe as especificações ↓

Essenciais

Coleção de produtos	Processador Intel® Xeon® W
Codinome	Produtos com denominação anterior Sapphire Rapids
Segmento vertical	Workstation
Número do processador	w5-2465X
Litografia	Intel 7
Preço recomendado para o cliente	$1389.00 - $1399.00
Condições de uso	Workstation

Especificações da CPU

Número de núcleos	16
Nº de Performance-cores	16
Nº de Efficient-cores	0
Nº de threads	32
Frequência turbo max	4.70 GHz
Frequência da Tecnologia Intel® Turbo Boost Max 3.0 ‡	4.70 GHz
Frequência da Tecnologia Intel® Turbo Boost 2.0‡	4.50 GHz
Frequência base do processador	3.10 GHz

Cache	33.75 MB Intel® Smart Cache
Velocidade do Intel® UPI	0 GT/s
Nº de links de UPI	0
Potência básica do processador	200 W
Energia turbo máxima	240 W

Informações complementares

Status	Launched
Data de introdução	Q1'23
Opções integradas disponíveis	Não

Especificações de memória

Tamanho máximo de memória (de acordo com o tipo de memória)	2 TB
Tipos de memória	DDR5-4800 (MT/s)
Velocidade máxima de memória	4800 MHz
Nº máximo de canais de memória	4
Memória persistente Intel® Optane™ DC com suporte	Não
Compatibilidade com memória ECC ‡	Sim

Opções de expansão

Revisão da Interface de Mídia Direta (DMI)	4.0
Escalabilidade	1S Only
Revisão de PCI Express	5.0
Nº máximo de linhas PCI Express	64

Especificações de encapsulamento

Soquetes suportados	FCLGA4677
Transportadora de pacotes	E1B
Configuração máxima da CPU	1
DTS Max	95 °C
T_{CASE}	78
Tamanho do pacote	77.5mm x 56.5mm

Tecnologias avançadas

Intel® QuickAssist Technology (QAT)	0 default devices
Intel® Dynamic Load Balancer (DLB)	0 default devices

Intel® Data Streaming Accelerator (DSA)	1 default devices
Intel® In-memory Analytics Accelerator (IAA)	0 default devices
Intel® Advanced Matrix Extensions (AMX)	Sim
Intel® Deep Learning Boost (Intel® DL Boost)	Sim
Intel® Resource Director Technology (Intel® RDT)	Não
Tecnologia Intel® Speed Shift	Sim
Tecnologia Intel® Turbo Boost Max 3.0 ‡	Sim
Tecnologia Intel® Turbo Boost ‡	2.0
Tecnologia Hyper-Threading Intel® ‡	Sim
Intel® TSX-NI	Sim
Intel® 64 ‡	Sim
Conjunto de instruções	64-bit
Extensões do conjunto de instruções	Intel® SSE4.1, Intel® AMX, Intel® SSE4.2, Intel® AVX2, Intel® AVX-512
Nº de unidades de FMA de AVX-512	2
Tecnologia Enhanced Intel SpeedStep®	Sim

Segurança e confiabilidade

Elegibilidade Intel vPro® ‡	Intel vPro® Enterprise
Intel® Threat Detection Technology (TDT)	Não
Intel® Active Management Technology (AMT) ‡	Sim
Intel® Remote Platform Erase (RPE) ‡	Não
Intel® One-Click Recovery ‡	Não
Aceleração de software Intel® QuickAssist	Não
Suporte para Resiliência de firmware de plataforma Intel®	Sim
Intel® Control-Flow Enforcement Technology	Sim
Intel® Total Memory Encryption - Multi Key	Não
Intel® Total Memory Encryption	Sim
Novas instruções Intel® AES	Sim
Intel® Software Guard Extensions (Intel®SGX)	Não
Intel® OS Guard	Sim
Intel® Trusted Execution Technology ‡	Sim
Bit de desativação de execução ‡	Sim
Intel® Boot Guard	Sim

Controle de Execução baseado em Modo (MBEC — Mode-based Execute Control)	Sim
Tecnologia de Virtualização Intel® com proteção de redirecionamento (VT-rp) ‡	Sim
Tecnologia de virtualização Intel® (VT-x) ‡	Sim
Tecnologia de virtualização Intel® para E/S dirigida (VT-d) ‡	Sim
Intel® VT-x com Tabelas de páginas estendidas (EPT) ‡	Sim

Todas as informações fornecidas estão sujeitas a alterações a qualquer momento, sem aviso prévio. A Intel pode alterar o ciclo de vida da fabricação, as especificações e as descrições dos produtos a qualquer momento, sem aviso prévio. As informações aqui contidas são fornecidas "no estado em que se encontram" e a Intel não atribui qualquer declaração ou garantias relacionadas à precisão das informações, nem sobre os recursos dos produtos, disponibilidade, funcionalidade ou compatibilidade dos produtos listados. Para obter mais informações sobre os produtos ou sistemas, entre em contato com o fornecedor do sistema.

As classificações da Intel são apenas para fins gerais, educacionais e de planejamento e consistem nos números ECCN (Número de Classificação de Controle de Exportações) e HTS (Programa de Tarifas Harmonizadas). Quaisquer usos das classificações da Intel são sem os recursos da Intel e não devem ser interpretados como uma representação ou garantia relacionada ao ECCN ou HTS apropriado. Como exportadora e/ou importadora, sua empresa é responsável por determinar a classificação correta de sua transação.

Consulte a Ficha técnica para obter definições formais de propriedades e recursos de produtos.

‡ Este recurso pode não estar disponível em todos os sistemas de computação. Verifique com o fornecedor do sistema para determinar se seu sistema oferece este recurso ou consulte as especificações de seu sistema (motherboard, processador, chipset, alimentação, HDD, controle gráfico, memória, BIOS, drivers, monitor de máquina virtual [VMM], software de plataforma e/ou sistema operacional) para saber sobre a compatibilidade do recurso. A funcionalidade, o desempenho e outros benefícios deste recurso podem variar, dependendo das configurações do sistema.

Os números dos processadores Intel não são indicação de desempenho. Os números dos processadores diferenciam recursos dentro de cada família de processador, e não entre famílias diferentes de processadores. Consulte https://www.intel.com.br/content/www/br/pt/processors/processor-numbers.html para obter mais detalhes.

SKUs "anunciados" ainda não estão disponíveis. Favor consultar a data de lançamento para a disponibilidade no mercado.

Frequência máxima de turbo refere-se à frequência máxima do processador de núcleo único que pode ser atingida com a Tecnologia Intel® Turbo Boost. Mais informações estão disponíveis no site https://www.intel.com/content/www/br/pt/architecture-and-technology/turbo-boost/turbo-boost-technology.html .

Consulte https://www.intel.com.br/content/www/br/pt/architecture-and-technology/hyper-threading/hyper-threading-technology.html?wapkw=hyper+threading para obter mais informações, incluindo detalhes sobre quais processadores são compatíveis com a Tecnologia Hyper-Threading Intel®.

Os processadores compatíveis com a computação de 64 bits na arquitetura Intel® requerem BIOS habilitados para arquitetura Intel 64.

Alguns produtos suportam as novas instruções AES com uma atualização da Configuração do processador, em particular, i7-2630QM/i7-2635QM, i7-2670QM/i7-2675QM, i5-2430M/i5-2435M, i5-2410M/i5-2415M. Favor entrar em contato com o OEM para o BIOS que inclui a mais recente atualização da Configuração do processador.




As tecnologias Intel® podem exigir ativação de hardware, software específico ou de serviços. // Nenhum produto ou componente pode ser totalmente seguro. // Os seus custos e resultados podem variar. // O desempenho varia de acordo com o uso, a configuração e outros fatores. // Veja nossos Avisos e isenções de responsabilidade legais completos

. // A Intel está comprometida em respeitar os direitos humanos e evitar cumplicidade com abusos de direitos humanos. Consulte Princípios Globais de Direitos Humanos
da Intel. Os produtos e software da Intel são destinados a serem utilizados apenas em aplicações que não causem ou contribuam com a violação de um direito humano reconhecido internacionalmente.

CPU Benchmarks

Over 1,000,000 CPUs Benchmarked

Intel Xeon w5-2465X

Price and performance details for the Intel Xeon w5-2465X can be found below. This is made using thousands of PerformanceTest benchmark results and is updated daily.

- The first graph shows the relative performance of the CPU compared to the 10 other common (single) CPUs in terms of PassMark CPU Mark.
- The 2nd graph shows the value for money, in terms of the CPUMark per dollar.
- The pricing history data shows the price for a single Processor. For multiple Processors, multiply the price shown by the number of CPUs.

CPUS

High End
High Mid Range
Low Mid Range
Low End

Best Value (On Market)
Best Value XY Scatter
Best Value (All time)

New Desktop
New Laptop

Single Thread
Systems with Multiple CPUs
Overclocked
Power Performance
CPU Mark by Socket Type
Cross-Platform CPU Performance
Top Gaming CPUs

CPU Mega List
Search Model

Intel Xeon w5-2465X

Description:

Class: Server | **Socket:** FCLGA4677

Clockspeed: 3.1 GHz | **Turbo Speed:** 4.7 GHz

Cores: 16 **Threads:** 32 | **Typical TDP:** 200 W

TDP Up: 240 W

Cache Size: L1: 1280 KB, L2: 32.0 MB, L3: 34 MB

Memory Support: Max. Memory Size: 2.0 TB (DDR5-4800, ECC Supported)

Other names: Intel(R) Xeon(R) w5-2465X

CPU First Seen on Charts: Q2 2023

CPUmark/$Price: 34.54

Overall Rank: 92

Last Price Change: $1,389.00 USD (2023-01-01)

Average CPU Mark

47973

Single Thread Rating: 3746
Samples: 8*
*Margin for error: Medium

+ COMPARE

Floating Point Math	125,621 MOps/Sec
Find Prime Numbers	226 Million Primes/Sec

Compare 0

CPU Benchmarks | Video Card Benchmarks | Hard Drive Benchmarks | Memory Benchmarks | PC Benchmarks | Software Marketshare | Database Benchmarks | Android Benchmarks | iOS Benchmarks

AMD vs Intel Market Share

Year on Year Performance

Random String Sorting	63,112 Thousand Strings/Sec
Physics	3,130 Frames/Sec
Extended Instructions	51,369 Million Matrices/Sec
Single Thread	3,746 MOps/Sec

From submitted results to PerformanceTest V10 as of 17th of October 2023.

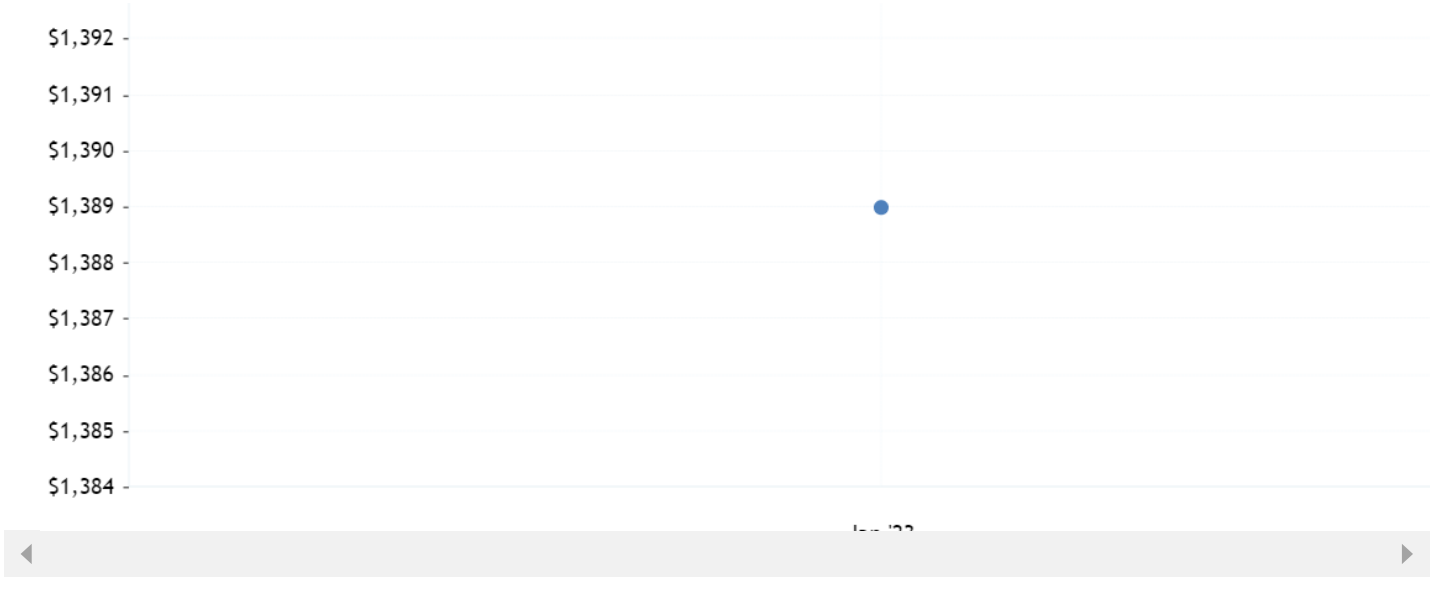
CPU Mark Distribution for Intel Xeon w5-2465X

Submitted Baseline Distribution Graph as of 11th of October 2023

Not Enough Data from Current Version of PerformanceTest to Create Distribution Graph.

From submitted results to PerformanceTest V10 as of 11th of October 2023.

Pricing History



CPU Mark Relative to Top 10 Common Server CPUs

As of 17th of October 2023 - Higher results represent better performance

Processor	Average CPU Mark	
AMD Ryzen Threadripper PRO 3995WX		83,349
AMD Ryzen Threadripper PRO 5975WX		75,798
AMD Ryzen Threadripper PRO 3975WX		62,838
Intel Xeon w5-2465X		47,973
AMD Ryzen Threadripper PRO 3955WX		40,446
AMD Ryzen Threadripper PRO 3945WX		33,515
Intel Xeon E5-1650 v3 @ 3.50GHz		10,405
Intel Xeon E5-2650 v2 @ 2.60GHz		9,942
Intel Xeon E5-1650 v2 @ 3.50GHz		9,336
Intel Xeon E5-2620 v3 @ 2.40GHz		7,808
Intel Xeon E5-1620 v2 @ 3.70GHz		6,548

CPU Value (CPU Mark / $Price)

As of 17th of October 2023 - Higher results represent better value

Processor	CPU Mark / $Price	
Intel Xeon E5-2620 v3 @ 2.40GHz		601.09
Intel Xeon E5-2650 v2 @ 2.60GHz		254.93
Intel Xeon E5-1650 v3 @ 3.50GHz		75.12
AMD Ryzen Threadripper PRO 3955WX		40.82
Intel Xeon E5-1650 v2 @ 3.50GHz		39.22
		4.54
		8.07
Intel Xeon E5-1620 v2 @ 3.70GHz		21.50
AMD Ryzen Threadripper PRO 3975WX		20.97
AMD Ryzen Threadripper PRO 3995WX		12.14

AMD Ryzen Threadripper PRO 3945WX		NA

As of 17th of October 2023 - Higher results represent better performance

Processor	Average Thread Rating	
Intel Xeon w5-2465X		3,746
AMD Ryzen Threadripper PRO 5975WX		3,314
AMD Ryzen Threadripper PRO 3945WX		2,700
AMD Ryzen Threadripper PRO 3955WX		2,685
AMD Ryzen Threadripper PRO 3975WX		2,659
AMD Ryzen Threadripper PRO 3995WX		2,594
Intel Xeon E5-1650 v3 @ 3.50GHz		2,124
Intel Xeon E5-1650 v2 @ 3.50GHz		2,043
Intel Xeon E5-1620 v2 @ 3.70GHz		2,026
Intel Xeon E5-2620 v3 @ 2.40GHz		1,689
Intel Xeon E5-2650 v2 @ 2.60GHz		1,687

Last 5 Baselines for Intel Xeon w5-2465X

Most recent listed first

Baseline	CPU Mark	
BL1919251 - Oct 07 2023		45238
BL1897699 - Sep 05 2023		55943
BL1888245 - Aug 22 2023		47599
BL1883653 - Aug 15 2023		55757
BL1882929 - Aug 14 2023		41434

Additional baselines can be obtained using Windows version of PerformanceTest's Manage Baselines feature.

Popular comparisons for Intel Xeon w5-2465X

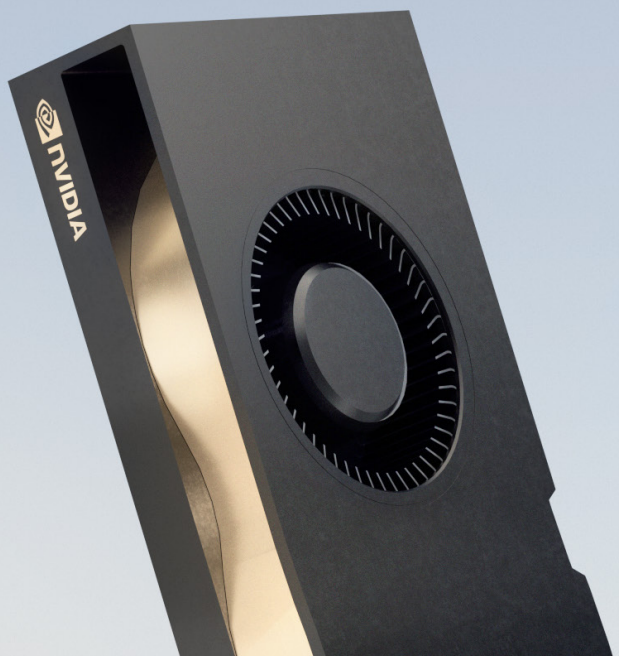
As of 17th of October 2023 - Higher results represent better performance

Processor	Average CPU Mark	
Intel Xeon w5-2465X		47,973
Intel Xeon w5-3435X vs Intel Xeon w5-2465X		47,123 (-1.8%)
AMD Ryzen Threadripper PRO 5955WX vs Intel Xeon w5-2465X		49,921 (+4.1%)
AMD EPYC 7313 vs Intel Xeon w5-2465X		40,605 (-15.4%)
AMD EPYC 7343 vs Intel Xeon w5-2465X		44,189 (-7.9%)
		43,698 (-8.9%)
		37,473 (-21.9%)
AMD EPYC 7443P vs Intel Xeon w5-2465X		57,642 (+20.2%)
Intel Xeon W-3335 @ 3.40GHz vs Intel Xeon w5-2465X		39,293 (-18.1%)

Intel Xeon Gold 6346 @ 3.10GHz vs Intel Xeon w5-2465X		37,722 (-21.4%)
		54,409 (-0.7%)
AMD EPYC 7313P vs Intel Xeon w5-2465X		42,032 (-12.4%)

NVIDIA RTX A5000

PERFECTLY BALANCED. BLAZING PERFORMANCE.



Amplified Performance for Professionals

The NVIDIA RTX™ A5000 delivers the power, performance, capabilities, and reliability professionals need to bring their boldest ideas to life. Built on the NVIDIA Ampere architecture, the RTX A5000 combines 64 second-generation RT Cores, 256 third-generation Tensor Cores, and 8,192 CUDA® cores with 24 GB of graphics memory to supercharge rendering, AI, graphics, and compute tasks. Connect two RTX A5000s with NVIDIA NVLink[1] to scale memory and performance with multi-GPU configurations[2], allowing professionals to work with memory intensive tasks such as large models, ultra-high resolution rendering, and complex compute workloads. Support for NVIDIA virtual GPU software increases the versatility for enterprise deployments.

NVIDIA RTX professional graphics cards are certified with a broad range of professional applications, tested by leading independent software vendors (ISVs) and workstation manufacturers, and backed by a global team of support specialists. Get the peace of mind needed to focus on what matters with the premier visual computing solution for mission-critical business.

Features

- PCI Express Gen 4
- Four DisplayPort 1.4a connectors
- AV1 decode support
- DisplayPort with audio
- 3D stereo support with stereo connector
- NVIDIA GPUDirect® for Video support
- NVIDIA virtual GPU (vGPU) software support
- NVIDIA Quadro® Sync II[3] compatibility
- NVIDIA RTX Experience™
- NVIDIA RTX Desktop Manager software
- NVIDIA RTX IO support
- HDCP 2.2 support
- NVIDIA Mosaic[4] technology

SPECIFICATIONS

Part Number	**VCNRTXA5000-PB**
EAN Code	**3536403383817**
GPU memory	**24 GB GDDR6**
Memory interface	**384-bit**
Memory bandwidth	**768 GB/s**
Error-correcting code (ECC)	**Yes**
NVIDIA Ampere architecture-based CUDA Cores	**8,192**
NVIDIA third-generation Tensor Cores	**256**
NVIDIA second-generation RT Cores	**64**
Single-precision performance	**27.8 TFLOPS[5]**
RT Core performance	**54.2 TFLOPS[5]**
Tensor performance	**222.2 TFLOPS[6]**
NVIDIA NVLink	**Low profile bridges connect two NVIDIA RTX A5000 GPUs[1]**
NVIDIA NVLink bandwidth	**112.5 GB/s (bidirectional)**
System interface	**PCI Express 4.0 x16**
Power consumption	**Total board power: 230 W**
Thermal solution	**Active**
Form factor	**4.4" H x 10.5" L, dual slot, full height**
Display connectors	**4x DisplayPort 1.4a[7]**
Max simultaneous displays	**4x 4096 x 2160 @ 120 Hz, 4x 5120 x 2880 @ 60 Hz, 2x 7680 x 4320 @ 60 Hz**
Power connector	**1x 8-pin PCIe**
Encode/decode engines	**1x encode, 2x decode (+AV1 decode)**
VR ready	**Yes**
vGPU software support[7]	**NVIDIA vPC/vApps, NVIDIA RTX Virtual Workstation, NVIDIA Virtual Compute Server**
vGPU profiles supported	**See the Virtual GPU Licensing Guide**
Graphics APIs	**DirectX 12.0[8], Shader Model 5.1[8], OpenGL 4.6[8], Vulkan 1.2[9]**

To learn more about the NVIDIA RTX A5000, visit **www.nvidia.com/rtx-a5000/**

1 NVIDIA NVLink sold separately. | 2 Connecting two RTX A5000 cards with NVLink to scale performance and memory capacity to 48GB is only possible if your application supports NVLink technology. Please contact your application provider to confirm their support for NVLink. | 3 Quadro Sync II card sold separately. | 4 Windows 10 and Linux. | 5 Peak rates based on GPU Boost Clock. | 6 Effective teraFLOPS (TFLOPS) using the new sparsity feature. | 7 Display ports are on by default for RTX A5000. Display ports are not active when using vGPU software. | 8 GPU supports DX 12.0 API, hardware feature level 12 + 1. | 9 Product is based on a published Khronos specification and is expected to pass the Khronos conformance testing process when available. Current conformance status can be found at **www.khronos.org/conformance**

Videocard Benchmarks

Over 3,900 GPUs Benchmarked

RTX A5000

Price and performance details for the RTX A5000 can be found below. This is made using thousands of PerformanceTest benchmark results and is updated daily.

- The first graph shows the relative performance of the videocard compared to the 10 other common videocards in terms of PassMark G3D Mark.
- The 2nd graph shows the value for money, in terms of the G3DMark per dollar.

VIDEO CARD

High End
High Mid Range
Low Mid Range
Low End

Best Value
Common
Market Share

Compare 0

Video Card Mega List
Search Model

GPU Compute Video Card Chart
Power Performance Video Card Chart
2D Graphics Video Card List

RTX A5000	
Bus Interface: PCIe 4.0 x16	**Max Memory Size:** 24576 MB
Core Clock(s): 1170 MHz	**Memory Clock(s):** 16000 MHz
DirectX: 12_2	**OpenGL:** 4.6
Max TDP: 230 W	
Videocard Category: Workstation	
Other names: NVIDIA RTX A5000	
Videocard First Benchmarked: 2021-05-07	
G3DMark/Price: 10.78	
Overall Rank: 24	
Last Price Change: $2141.99 USD (2022-12-17)	

Average G3D Mark

23089

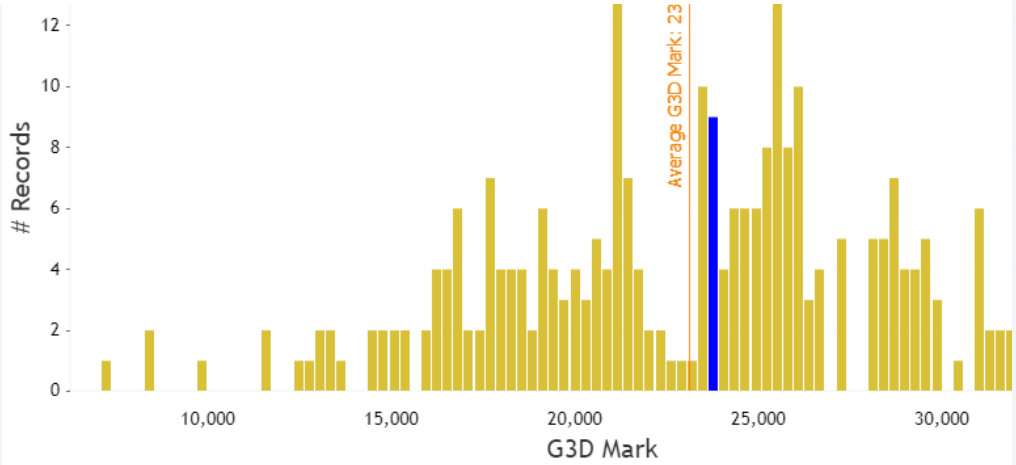
Average G2D Mark: 1040
Samples: 341

+ Compare

Videocard Test Suite Average Results for RTX A5000	
DirectX 9	245 Frames/Sec
DirectX 10	166 Frames/Sec
DirectX 11	186 Frames/Sec

From submitted results to PerformanceTest as of 16th of October 2023.

G3D Mark Distribution for RTX A5000

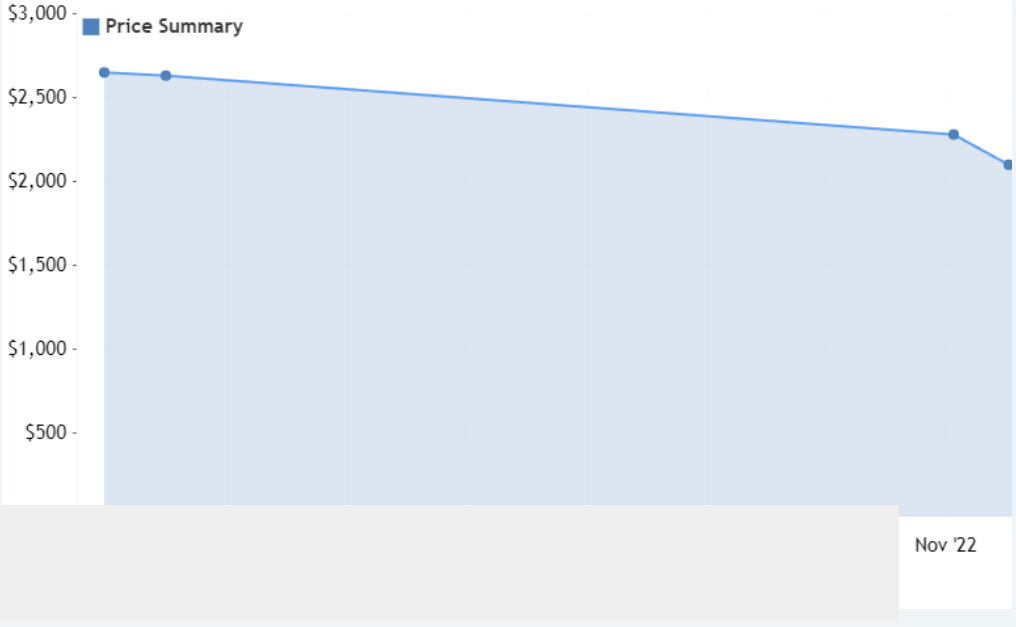


From submitted results to PerformanceTest V10 as of 23rd of May 2023.

Merchant	Price	Purchase
amazon	NA	Videocard Not Available. See Other Models
newegg	NA	Videocard Not Available. See Other Models
BEST BUY	NA	Videocard Not Available. See Other Models

Note: PassMark Software may earn compensation for sales from links on this site through affiliate programs.

Pricing History



Machines with this Videocard (or similar)

G3D Mark Relative to Top 10 Common Server Videocards

As of 16th of October 2023 - Higher results represent better performance

Videocard	Average G3D Mark
RTX A5000	23,089
RTX A4000	19,302
Quadro RTX 4000	15,447
Quadro P4000	11,638
Quadro P2200	9,374
Quadro P2000	6,910
Quadro P1000	4,418
Quadro P620	3,589
Quadro K2200	3,546
Quadro K620	2,239

Videocard Value (G3D Mark / $Price)

As of 16th of October 2023 - Higher results represent better value

Videocard	Average G3D Mark
RTX A4000	25.74
Quadro P4000	20.92
Quadro P2200	20.39
Quadro RTX 4000	17.18
Quadro P2000	15.72
	5.24
	3.22
RTX A5000	10.78
Quadro P620	6.25
Quadro K620	1.10

Most recent listed first

Videocard	Average G3D Mark
BL1924530 - Oct 14 2023	29472
BL1924453 - Oct 14 2023	30786
BL1921580 - Oct 10 2023	27861
BL1919866 - Oct 07 2023	28126
BL1917986 - Oct 05 2023	24622

Popular comparisons for RTX A5000

As of 16th of October 2023 - Higher results represent better performance

Videocard	Average G3D Mark
RTX A5000	23,089
RTX A6000 vs RTX A5000	22,717 (-1.6%)
Quadro GV100 vs RTX A5000	20,600 (-10.8%)
TITAN RTX vs RTX A5000	19,912 (-13.8%)
Quadro RTX 8000 vs RTX A5000	19,402 (-16.0%)
RTX A4000 vs RTX A5000	19,303 (-16.4%)
Quadro RTX 6000 vs RTX A5000	19,240 (-16.7%)
Quadro RTX 5000 vs RTX A5000	16,066 (-30.4%)
RTX A5000 Laptop GPU vs RTX A5000	15,861 (-31.3%)
Quadro GP100 vs RTX A5000	15,608 (-32.4%)
RTX A4000 Laptop GPU vs RTX A5000	15,588 (-32.5%)
Quadro RTX 4000 vs RTX A5000	15,448 (-33.1%)

- OSForensics
- MemTest86
- Zoom Search Engine
- Free Software
- USB2.0 Loopback Plugs
- Serial and Parallel Loopback Plugs
- USB Short Circuit Testers
- Video Card Benchmarks
- PC Systems Benchmarks
- Software Marketshare
- Database Benchmarks
- Android Benchmarks
- iOS Benchmarks
- Internet Bandwidth
- The Press Room

Support

Refunds

Teletronic
CONTROLE E PRECISÃO EM SEGURANÇA

MINI PH 4 MM

Trava SLIM para notebook para encaixe em slot de segurança. Possui cabo de aço 1,80 mt comprimento revestido em pvc preto e 4,0 mm de diâmetro. Acompanha duas chaves 2 chaves micromecânicas. (Segredos iguais)

- Desenvolvido de forma a não obstruir entradas e portas UBS, Ethernet, HDMI entre outros;

- Fixação no slot KENSINGTON de segurança;

- Peso: 0,75 gr

- Cabo de aço 1,80 mt

- Opção de segredos nas chaves: Iguais para o lote

- Material: Zamac]

- Acabamento: Em PVC cor preta

- Não são necessárias ferramentas para instalação ao equipamento

- Marca: Unitlock

- Fabricante: TELETRONIC

Garantia: 12 meses contra defeito de fabricação.

SCIA Quadra 14 Conjunto 08 Lote 8, Guará, Cidade do Automóvel, Brasília - DF CEP: 71250-140 Fone: (61) 3363-9291
CNPJ: 00.717.438/0001-95 I.E. 07.357.882/001-91
www.teletronic.com.br / vendas@teletronic.com.br

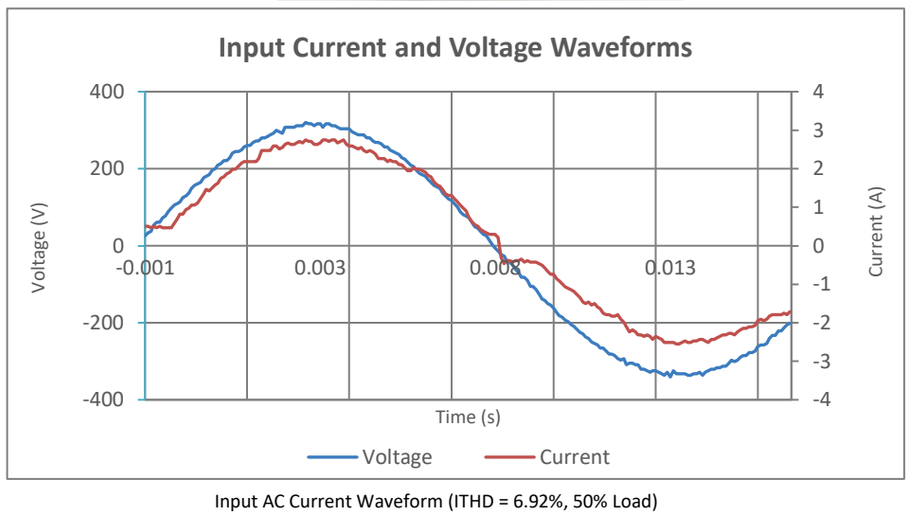
80 PLUS Verification and Testing Report

TYPICAL EFFICIENCY (50% Load):	**92.60%**
AVERAGE EFFICIENCY :	**91.47%**
80 PLUS COMPLIANT:	**Gold**

ID Number	EU-896
Manufacturer	HP, Inc.
Model Number	PS-2771-3
Serial Number	010
Year	2022
Type	CUSTOM
Test Date	5/19/22

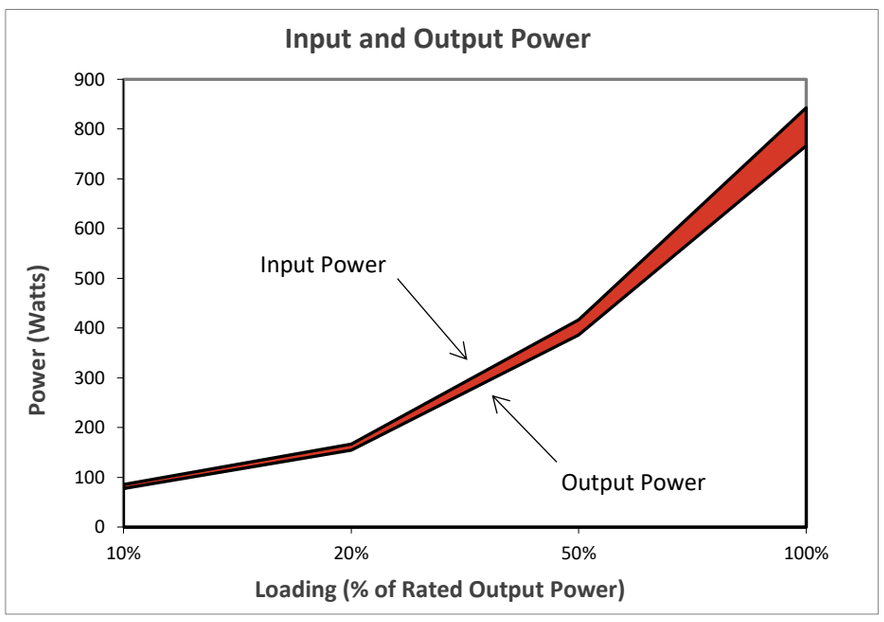
Rated Specifications	Value	Units
Input Voltage	100-240	**Volts**
Input Current	10	**Amps**
Input Frequency	50-60	**Hz**
Rated Output Power	775	**Watts**

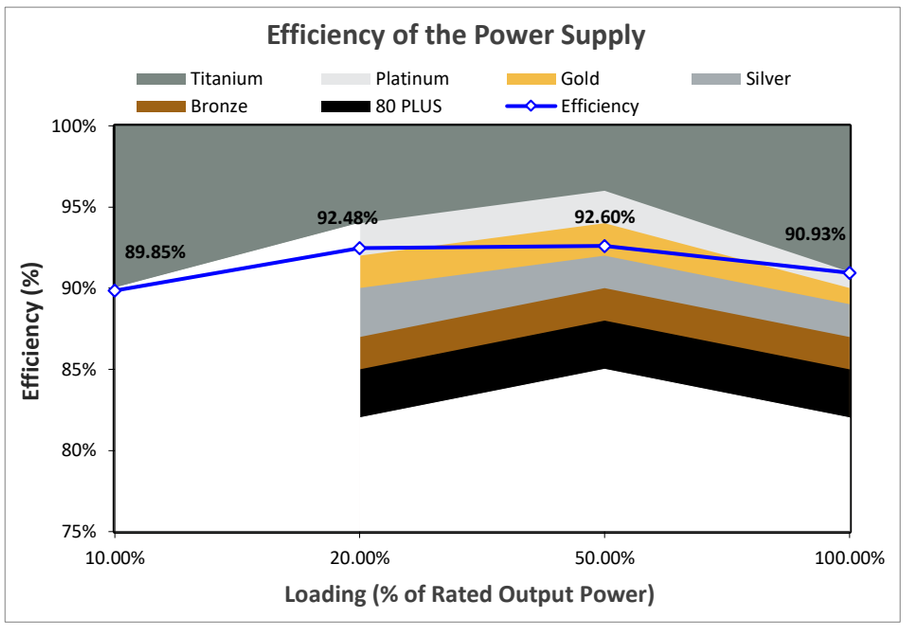
Note: All measurements were taken with input voltage at 230 V nominal at 50 Hz.



Input AC Current Waveform (ITHD = 6.92%, 50% Load)

I_{RMS}	PF	I_{THD}	Load	Input Watts	DC Terminal Voltage (V)/ DC Load Current (A)		Output Watts	Efficiency
					12V (cumulative of 12V1, 12V2, etc.)	12Vstb		
0.402	0.9261	28.31%	10%	**85.66**	11.91/6.06	12.06/0.4	**76.96**	**89.85%**
0.762	0.9537	19.87%	20%	**167.14**	11.9/12.17	12.1/0.81	**154.57**	**92.48%**
1.824	0.9864	6.92%	50%	**416.80**	11.89/30.42	12.08/2.02	**385.96**	**92.60%**
3.691	0.9931	3.21%	100%	**842.90**	11.85/60.58	12/4.05	**766.48**	**90.93%**





These tests were conducted by a third party independent testing firm on behalf of the 80 PLUS Program. 80 PLUS is a certification program to promote highly-efficient power supplies (greater than 80% efficiency in the active mode) in technology applications. *http://www.80plus.org/*

Data sheet

HP Wired Desktop 320K Keyboard

Pro-class productivity for your workspace

Work efficiently and enhance your everyday productivity with the comfortable, reliable HP Wired Desktop 320K Keyboard.

Designed for your comfort

Enjoy a comfortable fit with a reduced-sized keyboard and low-profile quiet keys. The familiar three-zone layout has a number pad and arrow keys, as well as 6° adjustable slope for optimal wrist positioning.

Easy to connect and use

Get plug and play simplicity and essential design features. Connect the keyboard to any available USB port on your laptop. The LED indicator alerts you to locked keys for a quick status while typing.

Safe to clean

Feel good knowing you can safely clean your keyboard with everyday disinfecting wipes as HP keyboards have been tested up to 1,000 wipes.[2]

Designed with the environment in mind

Make a purchase you can feel good about with a keyboard that has 50% post-consumer recycled plastic content and low halogen[1] printed circuit boards.

Maintain high performance

Deploy the keyboard with confidence into industrial settings with a design that undergoes improved fine dust testing versus its predecessor.

1. External power supplies, power cords, cables and peripherals are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.
2. Select household wipes can be safely used to clean HP Elite Presenter Mouse, HP Premium keyboard (wireless and USB) and HP desktop wired 320 KB/Mouse up to 1,000 wipes: See wipe manufacturer's instructions for disinfecting and the HP cleaning guide for HP tested wipe solutions at How to Sanitize Your HP Device Whitepaper

Specifications

HP Wired Desktop 320K Keyboard

Part number	9SR37AA
Dimensions (L x W x H)	16.77 x 4.36 x 0.65 in (426.2 x 110.9 x 16.7 mm)
Weight	14.57 oz (413g)
Cable length	1800 mm
Keys	104, 105, 107, 109 layout (depending on country)
Operating voltage	5V
Power consumption	50mA - 100 mA
Interface	USB
Switch life	10M
Switch type	Plunger
Spill resistant	Yes
Operating temperature	10°C to 50°C
Non-operating temperature	30°C to 65°C
Operating humidity	10% to 90%
Non-operating humidity	0% to 90%
Sustainability	Greater than 50% post-consumer recycled plastic content and low halogen PCBA
System required	Windows 10 (64 and 32 bit), Windows 11
Approvals	FCC ICES CULus CE GS EAC Ukraine India BIS KCC RCM BSMI VCCI
What´s in the box	Keyboard, QSP, Warranty Card, Product Notice

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4AA7-8227ENW, November 2021

Data sheet

HP Wired Desktop 320M Mouse

Pro-class productivity for your workspace

Work efficiently and enhance your everyday productivity with the comfortable, reliable HP Wired Desktop 320M Mouse.

Designed for your comfort
Navigate your documents comfortably with a contoured mouse that fits either hand.

Easy to connect and use
Get plug and play simplicity and essential design features. Connect the mouse to any available USB port on your laptop. The mouse wheel doubles as a third function button.

Safe to clean
Feel good knowing you can safely clean your mouse with everyday disinfecting wipes as HP mice have been tested up to 1,000 wipes.[2]

Designed with the environment in mind
Make a purchase you can feel good about with printed circuit boards that are low halogen.[1]

1. External power supplies, power cords, cables and peripherals are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.
2. Select household wipes can be safely used to clean HP Elite Presenter Mouse, HP Premium keyboard (wireless and USB) and HP desktop wired 320 KB/Mouse up to 1,000 wipes: See wipe manufacturer's instructions for disinfecting and the HP cleaning guide for HP tested wipe solutions at How to Sanitize Your HP Device Whitepaper.

Specifications

HP Wired Desktop 320M Mouse

Part number	9VA80AA
Dimensions (L x W x H)	4.08 x 2.49 x 1.39 in (103.8 x 63.4 x 35.5 mm)
Weight	2.67 oz (75.8 g)
Dots per inch (DPI)	1000
Tracking type	Optical Red Sensor
Connectivity	USB
Cable length	1800 mm
System requirements	Windows 10, Windows 11
Approvals	FCC ICES CULus CE GS EAC Ukraine India BIS KCC RCM BSMI VCCI
Sustainability	Low halogen PCBA.
What´s in the box	Mouse, QSP, Warranty Card, Product Notice

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Série P2

U27P2

27”

Modelo	U27P2
Tamanho do painel	27" Widescreen IPS
Tamanho da imagem visível (diagonal)	68,47 cm
Bordas	Ultrafinas
Proporção de tela	16:9
Curvatura	Não
Iluminação do painel	LED
Tipo de painel	Antirreflexivo
Tecnologia	IPS
Resolução máxima	3840 x 2160 @ 60Hz
Resolução recomendada	3840 x 2160 @ 60Hz
Pixel pitch	0,1554 (H) x 0,1554 mm (V)
Bits	8 bits + FRC
Brilho	350 cd/m²
sRGB	108%
Relação de contraste dinâmico	50.000.000:1
Relação de contraste estático	1.000:1
Frequência nativa do painel	60 Hz
Tempo de resposta	4 ms
Ângulo de visão	H:178° | V:178°
Frequência de varredura horizontal	30-140 KHz (H)
Frequência de varredura vertical	23-75 Hz
Largura de banda	165 MHz
Suporte de cores	1.07 Bilhão de cores
Conectores	2x HDMI 2.0 | 1x Display Port 1.2 | 4x USB 3.2 (1x Fast Charging) e 1x Saída de Áudio
Alto-Falantes	Sim (2 x 2W)
Tecnologia de Sincronização	Adaptive-Sync
Tecnologia Anti Luz Azul	Low Blue Mode
Tecnologia Anti-Cintilação	Flicker Free
Compatibilidade	Windows, MAC, Linux
Plug & Play	DDC/CI
Controles manuais	Source+Auto; Volume+Image Ratio/Right; Clear Vision+Clear Vision Demo/Left; Menu; Power
Função OSD (On Screen Display)	Sim - Português e outros idiomas
VESA	Sim (100 x 100mm)
Base ajustável	Altura: 150 ± 5mm | Giro: 175° ± 5° | Inclinação: -5°/ 35° | Pivô: -90°~90° (Bidirecional)
Dimensões Monitor com base (L x A x P) - mm	613,6 x 394,5 ~ 544,5 x 200,1 mm
Dimensões Monitor sem base (L x A x P) - mm	613,6 X 369,5 X 51,1
Dimensões Embalagem (L x A x P) - mm	690 X 595 X 160 mm
Peso líquido	6,77 kg
Peso bruto	9,3 kg
Itens inclusos na embalagem	Cabo de força, cabo HDMI, cabo DP, certificado de garantia, base e monitor
Fonte	Interna - 100~240V - 50/60 Hz
Consumo	Ligado Maximo: 75 Watts | Ligado Típico: 35 Watts | Stand By/Power Off < 0,3 Watts
Normas/segurança/certificações	EPA, TCO, GS, ISO 9241-307, EU RoHS DOC, Embalagem com material reciclável, CB, CE, FCC, cTUVus, Win 8/8_1, Win 10, EAC (CU), Ukraine Safety.
Cor predominante do produto e base	Preta
Destaque	Resolução 4K UHD | Painel IPS | HUB 4 portas USB 3.2 | Base Ajustável com até 15 cm de altura | HDMI e DisplayPort | Certificações B2B
Sugestão de descrição	Monitor AOC 27” UHD IPS com base ajustável B2B
Garantia	1 ano
Classificação fiscal (NCM)	8528.52.20
CEST	21.068.00
PPB	Não
Local de fabricação	China

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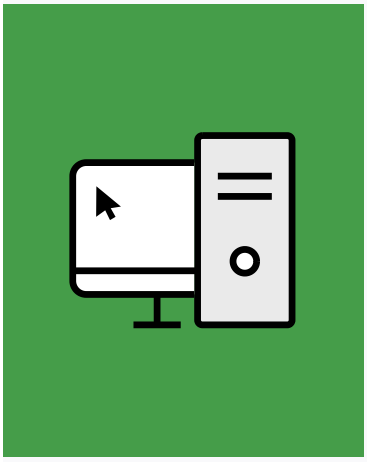
HP Z4 G5 Workstation ENERGY STAR



COMPUTERS & DISPLAYS

Product Summary:

Product Type:	Workstation
Registered In:	Brazil
Manufacturer:	HP
EPEAT Tier:	Gold
Registration Date:	2023-03-09
Product Status:	Active
Exceptions:	Configurations that are not ENERGY STAR qualified do not meet required criterion 4.5.1.1.
Universal Product Code(s):	196337209695, 196337209701, 196337209718

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EXPORT PRODUCT SUMMARY

EPEAT Tier Score Detail

For a product to be listed on the EPEAT Registry, it must, at a minimum, meet the applicable "required" criteria. Click here to see a list of the required criteria for this product category.

This product has met the necessary required criteria.

Along with required criteria, products can also meet optional criteria and score optional points. It is not required for a product to achieve any optional points.

Products that meet all required criteria and achieve **less than 50%** of the optional points are rated at
EPEAT Bronze

Products that meet all required criteria and achieve **50 - 74%** of the optional points are rated at
EPEAT Silver

Products that meet all required criteria and achieve **75 - 100%** of the optional points are rated at
EPEAT Gold

The optional criteria for this product category and optional points achieved by this product are listed below.

Optional Criteria	Scores
+ **4.1 Substance Management**	13 / 16

+	4.2 Materials Selection	3 / 3
+	4.4 Product longevity/life-cycle extension	1 / 2
+	4.5 Energy Conservation	0 / 4
+	4.7 Packaging	2 / 2
+	4.8 Life cycle assessment and carbon footprint	6 / 6
+	4.9 Corporate Environmental Performance	9 / 9
+	4.10 Corporate social responsibility	4 / 6
	TOTAL OPTIONAL CRITERIA SCORE:	**38 / 48**

Please note that it is not required for a product to

Some optional criteria may not be applicable to a product. Optional criteria that are not applicable (N/A)

achieve any optional points.	to the product are not included in the Total Optional Criteria Score, and are not reflected above.

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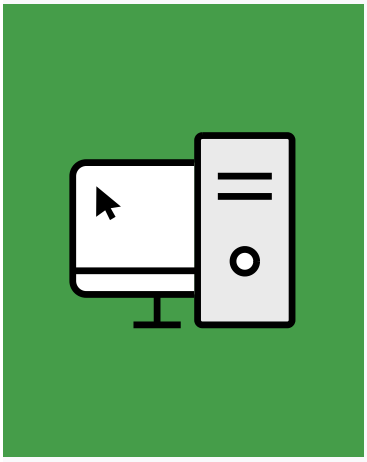

COMPUTERS & DISPLAYS

Product Summary:

Product Type:	Monitors
Registered In:	Brazil
Manufacturer:	AOC International (Europe) B.V.
EPEAT Tier:	Silver
Registration Date:	2021-01-06
Product Status:	Active
Exceptions:	Disassembly instructions, exploded diagram, spare parts to avoid injury to end users.

European Article Number(s): 4038986187343

All unique product identifiers existing for this product may not be listed here. If the unique product identifier you are looking for is not listed, please contact EPEAT at EPEAT@GEC.org.

EXPORT PRODUCT SUMMARY

EPEAT Tier Score Detail

For a product to be listed on the EPEAT Registry, it must, at a minimum, meet the applicable "required" criteria. Click here to see a list of the required criteria for this product category.

This product has met the necessary required criteria.

Along with required criteria, products can also meet optional criteria and score optional points. It is not required for a product to achieve any optional points.

Products that meet all required criteria and achieve **less than 50%** of the optional points are rated at
EPEAT Bronze

Products that meet all required criteria and achieve **50 - 74%** of the optional points are rated at
EPEAT Silver

Products that meet all required criteria and achieve **75 - 100%** of the optional points are rated at
EPEAT Gold

The optional criteria for this product category and optional points achieved by this product are listed below.

Optional Criteria	Scores
+ 4.1 Substance Management	12 / 16
+ 4.2 Materials Selection	3 / 3

+ 4.4 Product longevity/life-cycle extension	2 / 2
+ 4.5 Energy Conservation	0 / 2
+ 4.7 Packaging	0 / 2
+ 4.8 Life cycle assessment and carbon footprint	3 / 6
+ 4.9 Corporate Environmental Performance	4 / 9
+ 4.10 Corporate social responsibility	6 / 6
TOTAL OPTIONAL CRITERIA SCORE:	30 / 46

Please note that it is not required for a product to achieve any optional points.

Some optional criteria may not be applicable to a product. Optional criteria that are not applicable (N/A) to the product are not included in the Total Optional Criteria Score, and are not reflected above.

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Microsoft

Hardware certification report **Approved**

Private product ID:	**13739864393715514**
Shared product ID:	**401207303**
Submission ID:	**1152921505695822389**
Submission date:	**1/25/2023**
Completion date:	**1/25/2023**
Company:	**HP Inc.**
Product name:	**Z4G5 Win10 20H1 Logo**
Category:	**System**
Product type:	**Desktop**
Qualification level:	**Certified for Microsoft Windows 10 Client family version 2004, x64**
Marketing name:	**HP Z4 G5 Workstation Desktop PC**

Microsoft

Hardware certification report **Approved**

Private product ID:	**14400653445221260**
Shared product ID:	**401271530**
Submission ID:	**1152921505696084730**
Submission date:	**3/21/2023**
Completion date:	**3/21/2023**
Company:	**TOP VICTORY ELECTRONICS (TAIWAN) CO., LTD.**
Product name:	**AOC U27P2G6B**
Category:	**Device**
Product type:	**LCD**
Qualification level:	**Certified for Microsoft Windows 10 Client family version 1903, x64** **Certified for Microsoft Windows 10 Client family version 1903, x86** **Certified for Microsoft Windows 8 Client family, x86** **Certified for Microsoft Windows 8 Client family, x64** **Certified for Microsoft Windows 8.1 Client family, x86** **Certified for Microsoft Windows 8.1 Client family, x64** **Certified for Microsoft Windows 11 Client family version 22H2, x64** **Signature Only - Microsoft Windows Vista family, x86** **Signature Only - Microsoft Windows Vista family, x64** **Signature Only - Microsoft Windows XP family, x86** **Signature Only - Microsoft Windows XP family, x64** **Signature Only - Microsoft Windows 2000 family** **Certified as Declarative INF**
Marketing name:	**U27P2** **U27P2C**

HP's Compliance with Restriction of Hazardous Substances (RoHS) Legislation in the EU and other jurisdictions

(Rev 14c September 2019)

HP Inc
1501 Page Mill Road
Palo Alto, CA 94304-1112
www.hp.com

HP is committed to compliance with all applicable laws and regulations, including material restriction requirements under the European Union Recast RoHS Directive 2011/65/EU, otherwise known as EU RoHS 2, as amended by Directive 2015/863/EU and RoHS legislation in other jurisdictions such as China's Management Methods for Restricted Use of Hazardous Substances in Electrical and Electronic Products, otherwise known as China RoHS, and the materials restriction requirements of India's E-Waste Management Rules, 2016.

HP believes that legislation, like EU RoHS 2, plays an important role in promoting industry-wide transition to restrict substances of concern. In general, the restriction of any substance should take into account the following key items:

- Global harmonization of the legislation content and implementation requirements
- Substance risk assessment, including a clear understanding of the environmental impacts of alternative substances
- Clear identification of what substances (vs. broad classes or categories) are to be restricted
- Clear identification of when alternative technologies are proven and readily available
- Appropriate lead time to allow the industry to transition
- Substances that are not used or found in final products should not be included in the restrictions
- Material application exemptions should be allowed for the use of restricted substances in applications where current substitution is not technically feasible
- Inclusion of maximum concentration values setting de minimis levels below which the relevant substances may be present

HP believes other substances should be considered for inclusion in future RoHS legislation. This includes the restriction of polyvinyl chloride (PVC) and brominated flame retardants (BFRs) from electrical and electronic products (EEE). HP believes PVC and BFRs should be the focus for the restriction of chlorine (Cl) and bromine (Br) from electrical and electronic products, where technically feasible. HP's reasons for focusing on PVC and BFRs are:

- PVC and BFRs cover 99% of the uses for Cl and Br in electronics;
- Given the high percentage usage, these substances have the highest impact;
- Restriction of these substances where technically feasible would substantially accomplish the goal to eliminate Cl and Br from electronic products

In order to make these material transitions in all the many types of products in the industry, HP believes restriction under RoHS legislation is possible. However, some critical issues would need to be overcome or addressed by specific exemptions, including technical issues for certain applications, availability of environmentally preferable alternatives, and ability to maintain high recycled content as substances are restricted.

Our continued voluntary goal is to apply the EU RoHS 2 substance and exemption requirements outside the EEA (and other countries that are tracking EU compliance dates) on a worldwide basis within 6 months of each of the EU's various legal compliance dates for virtually all HP branded new products in the scope of EU RoHS 2, except where it is widely recognized that there is no technically feasible alternative (as indicated by an exemption under the EU RoHS Directive).

HP began proactively eliminating substances of concern in the early 1990s. The HP Materials and Chemical Management Policy guides how we specify materials and chemicals for use in products, packaging, and manufacturing processes. For key milestones see our Green Chemistry Timeline.

In early 2003, a company-wide RoHS team was formed to manage all aspects of HP's global response to RoHS legislation around the world. HP's initiative to address RoHS legislation is part of the company's Design for Sustainability program, which includes advancing materials innovation to improve environmental and human health impacts. For more information, see the materials innovation section of HP's Sustainable Impact Report.

HP continues to plan for further "RoHS like" legislations in other jurisdictions and will meet any additional requirements that arise. HP complies with the requirements of all the RoHS legislations currently in effect (including those specifically listed under Compliance Status below). HP's Compliance Verification is based on our risk analysis of restricted substances entering the supply chain and includes technical documentation outlined in the European Union's EN 50581:2012 standard and the International IEC 63000:2018 standard.

More detailed information can be found at: Sustainable Impact at HP

Sustainability Impact Report
Sustainable Design
Compliance Verification
General Specifications for the Environment
Eco Declarations

HP's Compliance Status to EXISTING RoHS Legislation:

Europe, Middle East and Africa

European Union and European Economic Area
- HP products [1] comply with EU Directive 2011/65/EU of 8 June 2011 as amended by EU Directive 2015/863 of 31 March 2015 and including amendments to the exemptions in Annex III.

Switzerland
- HP products [1] comply with the Swiss Ordinance on the Reduction of Risks relating to the Use of Certain Particularly Dangerous Substances, Preparations and Articles, otherwise known as the Swiss Chemical Risk Reduction Ordinance, ORRChem, as of May 18, 2005 (as amended)

Ukraine
- HP products [1] comply with the substance restrictions in Ukraine's "Technical Regulation on Restriction of the use of certain hazardous substances in electrical and electronic equipment, approved by Decree of the Cabinet of Ministers of Ukraine dated 10 March, 2017 No. 139", otherwise known as Ukraine RoHS which came into effect on 22 September 2017 and repealed Technical Regulation on the restriction of the use of certain hazardous substances in electrical and electronic equipment, approved by Decree of the Cabinet of Ministers of Ukraine dated December 3, 2008 No. 1057.

Serbia
- HP products [1] comply with Serbia's WEEE and RoHS "Regulations on the List of Electrical and Electronic Products, Measures Banning and Restricting the Recovery of Electrical and Electronic Equipment Containing Hazardous Materials, and the Methods and Procedures for Managing Waste from Electrical and Electronic Products" that entered into force on January 4, 2011. RoHS restrictions apply to equipment placed on the market on or after July 1, 2011.

Turkey
- HP products [1] comply with Turkey's "Regulation on Waste Electronic and Electrical Equipment" (WEEE) which came into effect on May 22, 2012 and incorporates the rules for the Restriction of Certain Hazardous Substances in Electrical and Electronic Equipment", otherwise known as Turkey RoHS.

Bosnia-Herzegovina
- HP products [1] comply with Bosnia-Herzegovina's "Regulation of Restrictions of Use of Certain Dangerous Substances in Electrical and Electronic Equipment (RoHS Regulation 50/15) was published in Official Gazette of Republic of Srpska 50/15", otherwise known as Bosnia-Herzegovina RoHS which came into effect on June 1, 2016.

UAE
- HP products [1] comply with UAE's "Cabinet Decision No. 10/2017 to control hazardous materials in electrical and electronic devices (RoHS) OG No. 614 of 27.04.2017 (officially published and came to power on 16.05.2017)", otherwise known as UAE RoHS which came into effect on January 1, 2018.

Asia

China

- HP products [1] comply with China's, "Management Methods for Restricted Use of Hazardous Substances in Electrical and Electronic Products", otherwise known as China RoHS which came into effect on July 1, 2016. And comply with "Catalog of Electrical and Electronic Products that have met the standard in Limited Use of Hazardous Substances (Batch one) which comes into effect on Nov 1, 2019.

India

- HP products [1] comply with the material restrictions of India's legislation "E-waste Management Rules, 2016", otherwise known as India RoHS which came into effect on October 1, 2016.

Korea

- HP products [1] comply with Korea's legislation "The Act on Resource Circulation of Electrical and Electronic Equipment and Vehicles", otherwise known as Korea's RoHS which came into effect on January 1, 2008. You can find HP's Korean RoHS declarations at: http://www8.hp.com/us/en/hp-information/environment/msds-specs-more.html.

Vietnam

- HP products [1] comply with Vietnam's legislation "Circular 30/2011/TT-BCT: Temporarily regulating the permitted limits for a number of hazardous substances in electric and electronic products", otherwise known as Vietnam RoHS which came into effect on December 1, 2012. You can find HP's Vietnam RoHS declarations at: http://www8.hp.com/us/en/hp-information/environment/msds-specs-more.html

Japan

- HP products [1] comply with the labeling requirements set out in Japan's "The Marking of Presence of the Specific Chemical Substances for Electrical and Electronic Equipment" (JIS-C-0950), otherwise known as J-MOSS which came into effect on July 1, 2006. You can find HP's J-MOSS declarations at http://www8.hp.com/us/en/hp-information/environment/msds-specs-more.html

Singapore

- HP products [1] comply with Singapore's "Environment Protection and Management Act (Chapter 94A) Environmental Protection and Management Act (Amendment of Second Schedule) Order 2016", otherwise known as Singapore RoHS which came into effect on June 1, 2017.

Taiwan BSMI

- HP products [1] comply with Taiwan's "CNS 15663 Guidance to reduction of the restricted chemical substances in electrical and electronic equipment released by Bureau of Standards, Metrology and Inspection (BSMI), MOEA through notification dated 29 December 2015 added the requirement for RoHS labelling to BSMI certification requirement." Otherwise known as Taiwan BSMI RoHS which came into effect as of July 1, 2017.

Americas

California

- HP products [1] comply with California's, "Electronic Waste Recycling Act of 2003 (Senate Bill 20) substance restrictions", otherwise known as California RoHS which came into effect on January 1, 2007.

New Jersey

- HP products [1] comply with New Jersey's "Electronic Waste Recycling Act" (Senate Bill 2144), otherwise known as New Jersey RoHS which came into effect on 1 January 2011.

Worldwide

- HP continues to achieve its internal voluntary goal to meet the substance restrictions of the EU RoHS legislation on a worldwide basis, except where it is widely recognized that there is no technically feasible alternative (as indicated by an exemption under the EU RoHS Directive), for virtually all HP branded products in scope of EU Directive 2011/65/EU as amended.

Notes:
[1] HP products that are both in scope and put on the market in the given jurisdiction.

DECLARATION FROM MANUFACTURER

We declare that the monitor with below model name produced by our company comply with:

European RoHS DIRECTIVE 2011/65/EU (on the restriction of the use of certain hazardous substances in electrical and electronic equipment) with COMMISSION DELEGATED DIRECTIVE (EU) 2015/863 of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances and all its related exemptions.

European WEEE DIRECTIVE 2012/19/EU (on waste electrical and electronic equipment) and its amendments.

European regulation (EC) No. 1907/2006 (concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH))

Brand Name: **AOC**
Model Name: **U27P2**

Signature: Zen Tseng

Name: Zen Tseng

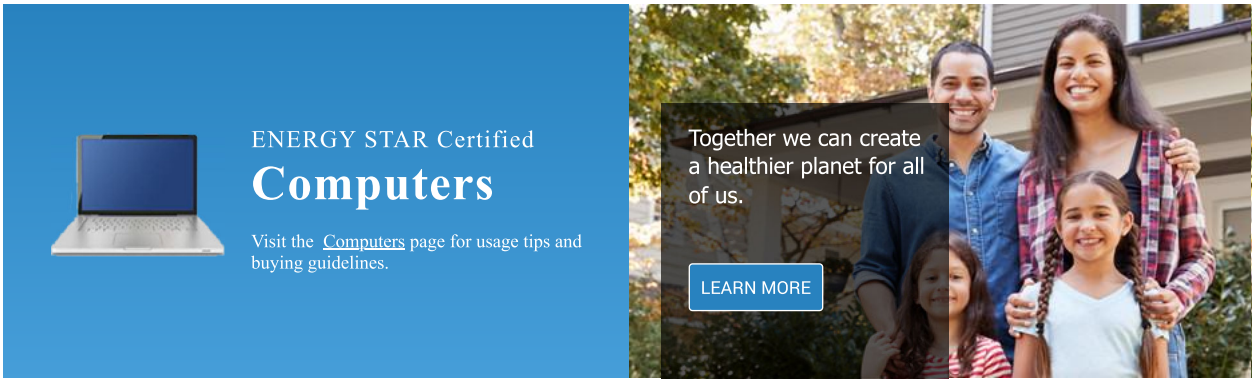
Title: Sr. Project Manager

Company name: TPV Electronics (Fujian) Co., Ltd.

Date: 2021.06.03

Languages: English | Français

Access to ENERGY STAR API, Data Set or Excel File



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Description

Type:	Workstation
Workstations: Processor Brand:	Intel
Workstations: Processor Name:	Intel(R) Xeon(R) W7-2495X
Workstations: Operating System Name:	Windows 11
Workstations: Base Processor Speed Per Core (GHz):	2.5
Workstations: System Memory (GB):	512
Workstations: Hard Drives (count):	1
Sleep Mode Default Time Upon Shipment (min.):	20
Display Sleep Mode Default Time Upon Shipment (min.):	10
WOL (Wake on LAN) From Sleep:	Shipped Enabled Under All Conditions
Will the Speed of Any Active 1 GB/s or Higher Ethernet Network Links be Reduced to Less Than 1 GB/s When Transitioning to Sleep or Off Mode?:	Yes

Efficiency

Workstations: Off Mode (watts):	2.9
Workstations: Sleep Mode (watts):	8.5
Workstations: Long Idle (watts):	74.0
Workstations: Short Idle (watts):	76.4
Workstations: Weighted Power of Model (watts):	44.8

Features

Ethernet Capability:	Yes
ENERGY STAR Certified :	Yes

Market

Date Available On Market:	03/06/2023
Date Certified:	03/06/2023
Markets:	United States, Switzerland, Taiwan, Japan, Canada

Additional Model Identification

ENERGY STAR Unique ID:	2409698
Additional Model Names and/or Numbers:	„HP Z4 G5 Workstation, FCLSA-2201A, FCLSA-2201B, FCLSA-2201C

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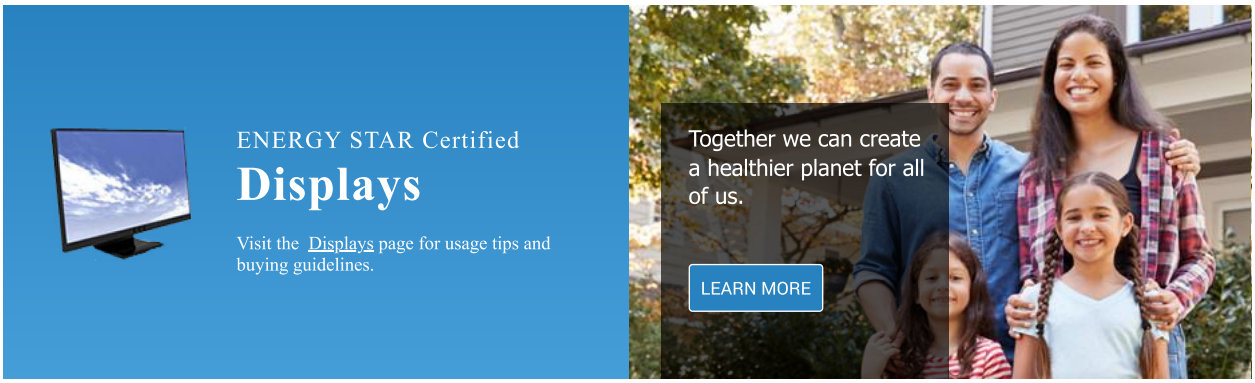

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Description

Product Type:	Monitor
Panel Type:	TFT LCD
Maximum Luminance (candelas per square meter):	350.0
Power Source:	Ac to dc internal power supply

Efficiency

Monitor Total Energy Consumption at 115 Volts (kWh/yr):	80.0
On Mode Power (watts):	25.61
Sleep Mode Power (watts):	0.26
Off Mode Power (watts):	0.2

Size

Screen Size (inches):	27.0
Screen Area (square inches):	310.47
Native Resolution (pixels):	2560 x 1440
Total Native Resolution (megapixels):	3.7

Features

Model Features:	High Dynamic Range,USB-C
Signal or Data Interfaces:	Display,HDMI,USB
ENERGY STAR Certified :	Yes
Most Efficient:	No

Market

Markets:	United States, Taiwan, Japan, Canada

Additional Model Identification

ENERGY STAR Unique ID:	2380643
Additional Model Names and/or Numbers:	U27P2CA,U27P2,

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HP WOLF SECURITY

HP SECURE ERASE FOR SSDS & HDDS

SAFELY AND EFFECTIVELY ERASE SENSITIVE DATA

TECHNICAL WHITEPAPER

HP SECURE ERASE IS A CRITICAL RESOURCE FOR IT

Administrators tasked with protecting sensitive data, and a key component of HP system security. HP Secure Erase[1] makes it easy to sanitize local magnetic hard disk drives (HDD) or solid-state drives (SSDs) to industry standards before disposal or recycling.

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LOCAL STORAGE SANITATION— AN IMPORTANT LAST STEP IN THE PC LIFECYCLE

In an environment where sensitive user information is under attack at every stage of the system lifecycle, ensuring that data can be securely erased from a data storage device is paramount. Information can be vulnerable if left on a storage drive when a system is recycled, disposed of, or reprovisioned for another user. Properly sanitizing storage drives according to industry standards is a critical step in the PC lifecycle.

In addition to meeting industry standards for data erasure in standard magnetic hard disk drives (HDDs), HP has taken the additional step of extending HP Secure Erase to also support industry-standard solid state drives (SSDs). HP Secure Erase is a standard feature in all HP business notebooks, supporting the methods outlined in the National Institute of Standards and Technology Special Publication 800-88. Manufacturers of industry standard SSDs approved for use in HP business notebook products have verified that running HP Secure Erase on their SSDs fully removes all user data so that it cannot be recovered.

ERASING SSDS VS. HDDS

Using HP Secure Erase on standard HDDs, data is overwritten using a data-removal algorithm that writes multiple patterns on every sector, cluster, and bit of the hard drive. This process is documented in the Department of Defense (DOD) 5220.22-M Chapter 8 specification.2 This overwrite-based process is only effective on standard HDDs. Writing a predetermined data pattern to a NAND flash-based SSD does not result in an empty drive. Instead it results in a drive full of data that must be erased before new user data can be written, which massively shortens the service life.

Industry-standard disk sanitation

To securely erase all user data from an SSD and restore the drive to a fresh-out-of-box (FOB) performance state, the National Institute of Standards Technology (NIST) supports the following commands that meets the minimum guideline for media sanitization of SSDs (NIST SP800- 88 Rev. 1).

Block Erase is a function enabled only in SATA SSDs. Using the ATA command BLOCK ERASE EXT. Block Erase will instruct the SSDs controller to apply an erase voltage to all NAND cells of the device (including any cells which form blocks that have been retired, re-allocated, involved in garbage collection or over-provisioning or are part of a reserved pool of spare blocks). This functionality provides a very fast, complete and robust erasure of the SSD.

Crypto Erase is a function enabled only in SATA SED SSDs. Using the ATA command CRYPTO SCRAMBLE EXT, this function removes the encryption key effectively making it impossible to reconstruct any of the data on the storage device. Crypto Scramble is implemented on both HDD and SSD SED devices.

Block Erase and *Crypto Erase* Sanitize Operation is a function enabled only in PCIe NVMe SSDs. NVMe does not follow conventional ATA feature sets. Instead, NVMe devices support a sanitization function, inside their FORMAT NVM command structure that includes BLOCK ERASE SANITIZE and CRYPTO ERASE SANITIZE operation. So, by setting some specific bits in this command structure, a function similar to Secure Erase can be carried out.

What data is not erased?

After deploying HP Secure Erase on an SSD, all data in the user space is completely and irretrievably erased, and every block in the user space is ready to accept new host-written data, which moves the drive to its highest performance state (FOB). However, some data must be left in place, including data required for normal drive operation: SSD firmware copies that reside in the NAND, all SMART data, and retired NAND block mapping tables.

CONCLUSION

Writing or overwriting data to drive is the accepted practice of securely eliminating data from an HDD. However, in the case of NAND flash-based SSDs, overwriting is redundant, unnecessary, and a potentially insecure method of eliminating data. By using HP Secure Erase, users can ensure that SSD drives are completely sanitized and meet the minimum industry standards HP Secure Erase is easily enabled through the standard F10 BIOS setup process on most HP business PCs.

Learn more
hp.com/wolfsecurityforbusiness

[1] For the methods outlined in the National Institute of Standards and Technology Special Publication 800-88 “Clear” sanitation method. Secure Erase does not support platforms with Intel® Optane™. HP Secure Erase does not support platforms with Intel® Optane.

[2] Specification 5220.22-M no longer exists. The DoD has subsequently decided that secure information must be destroyed to remain secure. The NIST guidelines restate in clear terms that a two-person rule (read human verification) shall be implemented but did not establish guidelines on the method of sanitization (it could be a single wipe with dual human verification, or a single destruction with the same).

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HP SURE START WHITEPAPER

FIRMWARE SECURITY AND RESILIENCE

TECHNICAL WHITEPAPER

GOING BEYOND SYSTEM BIOS PROTECTION,

HP Sure Start Gen6 protects against firmware attacks and/or accidental corruption for the majority of boot-critical system firmware.

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INTRODUCTION

HP Sure Start Gen6 is a comprehensive security and advanced resilience firmware solution. Going well beyond system BIOS protection, HP Sure Start Gen6 protects against firmware attacks and/or accidental corruption for the majority of boot-critical system firmware.

With little or no interruption to user productivity, HP Sure Start can automatically detect, stop, and recover from attacks or corruption without IT intervention. Every time the PC powers on, HP Sure Start automatically validates the integrity of the firmware to help ensure that the PC is safeguarded from malicious attacks. Once the PC is operational, runtime intrusion detection constantly monitors memory. In the case of an attack, the PC can self-heal using an isolated "golden copy" of the firmware in minutes.

WHY IS FIRMWARE PROTECTIONIMPORTANT?

As our world becomes more connected, cyber-attacks are targeting client device firmware and hardware with increasing frequency and sophistication. Tools and techniques to attack firmware were once theoretical and thought only to be available to nation-states. Such tools and techniques have since been shown to not only exist, but to be readily available in the public domain.

The critical device firmware (HP BIOS, HP Endpoint Security Controller firmware, Intel Management Engine Firmware, AMD Security Processor Firmware, etc.) is an attractive target for attackers because of the potential advantages a successful breach could provide:

- Persistence: Firmware resides in a nonvolatile memory on the circuit board and can't be removed simply by erasing the hard drive.
- Control: Firmware executes at the highest privilege level—outside of the OS domain—which enables the possibility of OS-independent malware.
- Stealth: Firmware occupies a region of memory that is completely inaccessible to the operating system and system software; since it can't be scanned by antivirus it may never be detected.
- Difficulty of recovery: All these aspects make it extremely difficult to recover from this type of infection without resorting to a service event that includes a system board replacement.

The ideal solution to protect devices against this type of attack is designed from the hardware up using "cyber resiliency" principles. These principles acknowledge that it is extremely difficult, if not impossible, to foresee and prevent every possible attack. The ideal solution not only provides enhanced protection of the firmware, but also includes a hardware rooted ability to both detect a successful attack and recover from it.

HP SURE START PROVIDES SUPERBFIRMWARE PROTECTION

HP Sure Start is HP's unique and groundbreaking approach to provide advanced firmware protection and resiliency to HP PCs. It uses hardware enforcement via the HP Endpoint Security Controller (HP ESC) to provide protection of the BIOS and other critical platform firmware that reaches well beyond the industry standard and ensures that the system will only boot Genuine HP BIOS and other critical firmware. Additionally, if HP Sure Start detects tampering with BIOS, other critical firmware, or runtime System Management Mode (SMM) BIOS code, it can recover using a protected backup copy.

Summary of HP Sure Start features:

- HP platform firmware authenticity enforcement and tamper protection—HP Endpoint Security Controller hardware enforcement of the system boot, so only authentic and unmodified critical firmware and HP BIOS are loaded.
- Firmware health monitoring and compliance—Logging of firmware health-related events via isolated HP Endpoint Security Controller; presents the platform firmware state along with any anomalies that could indicate thwarted attacks.
- Self-healing—Automatic repair of HP BIOS and other critical firmware corruption, using the HP Endpoint Security Controller isolated backup copy of HP BIOS and other critical firmware.
- BIOS setting protection—Extension of the HP Endpoint Security Controller protection of the BIOS code to include HP ESC backup and integrity-checking of all user or admin-configured BIOS settings.
- Runtime Intrusion Detection—Ongoing monitoring of critical BIOS code in runtime memory (SMM) while the OS is running.
- Secure boot keys protection—Significantly enhanced protection of databases and keys stored by the BIOS that are critical to the integrity of the OS secure boot feature versus standard UEFI BIOS implementation.
- Protected storage—Strong cryptographic methods to store BIOS settings, user credentials, and other settings in the HP Endpoint Security Controller hardware to provide integrity protection, tamper detection, and confidentially protection for that data.
- Intel® Management Engine firmware protection—Full backup, integrity monitoring, and recovery services for Intel Management Engine firmware and critical data. Fully compliant with all NIST 800-193 resilience requirements.
- AMD Secure Processor firmware protection—Full backup, integrity monitoring, and recovery services for AMD Secure Processor firmware and critical data. Fully compliant with all NIST 800-193 resilience requirements.
- Manageability—Administrator management of HP Sure Start capabilities with the Manageability Integration Kit (MIK) plug-in for Microsoft® System Center Configuration Manager (SCCM).
- Direct Memory Access (DMA) Protection—Utilizes the I/O Memory Management Unit (IOMMU) to provide hardware protection against attacks to system memory via DMA capable thunderbolt devices. Also enables support for Microsoft. "Kernel DMA Protection for Thunderbolt™ 3" (Win10 RS4 and forward). HP Sure Start Gen6 also extends support for protection against DMA attacks beyond external thunderbolt devices to include DMA attacks via internal slots.

For a summary of capabilities added in each generation of HP Sure Start, see Appendix A.

Third-party security certification

The HP Endpoint Security Controller hardware used in HP Sure Start has undergone third-party security assessment and has been certified to provide hardware enforcement so that only authorized firmware can start on the target PC.[1]

Assurance that a security solution works as stated is a critical piece of any purchase decision related to security products. And because a reputation for quality can only go so far, HP has exposed the HP Endpoint Security Controller inner workings for review and testing by an independent and accredited laboratory to validate that it works as claimed per publicly available criteria, methodology, and processes.

Cyber-resilient design

Not only does HP Sure Start provide enhanced BIOS protection beyond the industry standard approach, but it is designed from the hardware up to provide unmatched platform cyber-resilience to ensure critical device firmware recovery even in the event of a breach or destructive attack.

All HP Sure Start Gen6 systems include the ability to recover from a completely erased system flash. The system flash contains the majority of the boot critical firmware elements that are required to boot the system and have reasonable functionality. Those boot critical elements include system BIOS, HP Endpoint Controller firmware, video BIOS, Intel Descriptor Region firmware, AMD Secure Processor firmware, and Intel Management Engine firmware. If any one of these firmware elements in the system flash becomes corrupted in a manner that renders that subsystem non-functional, the system will be unable to boot. With an HP Sure Start Gen5+ system, all these components are restored from the HP Sure Start private flash in order to ensure that the system does not become non-operational due to firmware attack or corruption.

HP business PCs with HP Sure Start exceed the National Institute of Standards and Technology (NIST) Platform Firmware Resiliency guidelines (Special Publication 800-193) for host processor boot firmware and other critical platform device firmware, as discussed in Appendix C. NIST SP 800-193 is one of the leading public sector efforts to formalize requirements for cyber-resilient platforms. For more details about HP Sure Start and NIST 800-193, see Appendix C.

HP Sure Start–supported models

HP introduced Sure Start in 2013. Since that time, HP has enhanced Sure Start and expanded the number of products that include it. HP Sure Start is provided across the entire 2019 Elite product lineup, including tablets, notebooks, desktops, and all-in-ones (AIOs). HP Sure Start is available on many HP business PCs, including Pro and Elite platforms, Workstations, Thin Clients, and Point of Sale Systems (RPOS). HP Sure Start is available on both Intel and AMD platforms in this lineup.

ARCHITECTURAL OVERVIEWAND CAPABILITIES

HP Sure Start consists of two major architectural components:

- HP Endpoint Security Controller running HP Sure Start firmware.
- HP Sure Start BIOS working in conjunction with the HP Endpoint Security Controller hardware and firmware.

Firmware integrity verification—the core of HP Sure Start

The HP Endpoint Security Controller (HP ESC) is the first device in the system to execute firmware when the system powers on, active well before the system boots. The HP ESC activities include, but are not limited to, monitoring the system power button and power sequencing the start of the host CPU execution when the user presses the power button.

When power is first applied to the platform (before the system is turned on), the HP ESC validates that its own firmware is authentic HP code before loading and executing the code. The HP ESC hardware uses industry-standard, strong cryptographic methods to perform the integrity verification. The method employs a 2048-bit HP RSA public key contained within internal permanent read-only memory. Therefore, the HP ESC is the built-in hardware-based Root of Trust (RoT) for the platform, used to validate its firmware and the HP BIOS before they are executed. This hardware Root of Trust protects against firmware replacement attacks regardless of their deployment method and serves as the foundation upon which HP platform security is built.

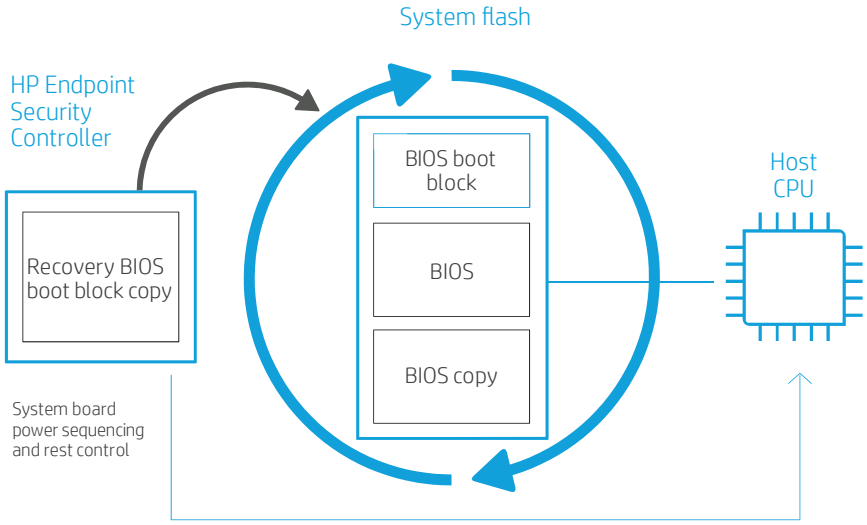

Figure 1: Firmware integrity verification process

Figure 1 illustrates the firmware integrity verification process. Once the HP ESC authenticates and starts executing the HP Sure Start firmware, that firmware uses the same strong cryptographic operations to verify the integrity of the system flash BIOS boot block. If a single bit is invalid, the HP ESC replaces the system flash contents with its own copy of the HP BIOS boot block that is stored within an isolated nonvolatile memory (NVM) dedicated to the HP ESC.

The HP Sure Start design ensures that all the firmware and BIOS code running on both the HP ESC and the host CPU is the code HP intended to be on the device.

Note: The system flash boot block integrity checking, and any needed recovery performed by the HP ESC, take place while the host CPU is off. Therefore, from a user point of view, the entire operation takes place when the system is still off, in sleep mode, or hibernate mode.

The system flash BIOS boot block is the foundation of the HP BIOS. The HP ESC hardware ensures that the BIOS boot block is the first code that the CPU executes after a reset. Once the HP ESC determines that the BIOS boot block contains authentic HP code, it allows the system to boot as it normally would.

The HP ESC also checks the integrity of the system flash boot block code each time the system is turned off or put into a hibernate or sleep mode. Since the CPU is powered off in each of these states and the CPU is therefore required to re-execute BIOS boot block code to resume, it is crucial to re-verify the integrity of the BIOS boot block each time before the CPU starts at power-on to check for tampering.

Additionally, for HP Intel models, HP Sure Start checks the integrity of the system flash BIOS boot block every 15 minutes while the system is running[2].

Machine-unique data integrity

The HP ESC and BIOS work together to provide advanced protection of factory-configured critical variables unique to each machine that are intended to be constant over the life of any specific platform. In the factory, a backup copy of this variable data is saved in the HP ESC nonvolatile memory store. The backup is made available to the HP Sure Start BIOS component on a read-only basis to perform integrity checking of the data on every boot. If any setting in the shared flash is different from the factory settings, the HP Sure Start BIOS components will automatically restore the data in the System Flash from the backup copy provided by the HP ESC.

Descriptor region

For HP Intel models, HP Sure Start protects the descriptor region of the system flash. Unique to Intel architecture, the descriptor region contains critical configuration parameters that are sampled by the Intel Core™ logic at reset and used thereafter to configure the Core logic. The descriptor region also includes partitioning information for the system flash that is used by the Intel Core logic to determine where the BIOS region resides within the flash and therefore where their CPU retrieves code for execution from reset. HP Sure Start monitors the integrity of this region and recovers it to the intended configuration in the event of tampering or corruption.

Network controller protection

In addition, for HP Intel models, HP Sure Start protects the network controller (NIC) settings contained with the system flash. Some HP customers have use cases that require legitimate changes to factory configured NIC settings. Therefore, HP Sure Start does not prevent changes to NIC settings by default. Instead, HP Sure Start provides a feature that, when enabled, warns the user that NIC settings have changed. In addition, HP Sure Start provides a method to restore the NIC settings to factory values. Protected settings include the MAC address, the Pre-boot Execution Environment (PXE) settings, and the remote initial program load (RPL). This restoration is possible via a read-only backup copy protected by the HP ESC.

BIOS setting protection

As previously described, HP Sure Start verifies the integrity and authenticity of the HP BIOS code. Since this code is static after it is created by HP, digital signatures can be used to confirm both attributes of the code. The dynamic and user-configurable nature of BIOS settings, however, create additional challenges to protecting those settings. Digital signatures cannot be generated by HP and used by the HP Sure Start ESC hardware to verify those settings.

HP Sure Start BIOS setting protection provides the capability to configure the system so the HP ESC hardware is used to back up and check the integrity of all the BIOS settings preferred by the user.

When this feature is enabled on the platform, all policy settings used by BIOS are subsequently backed up and an integrity check is performed on each boot to ensure that none of the BIOS policy settings have been modified. If a change is detected, the system uses the backup from the HP Sure Start–protected storage to automatically revert to the user-defined setting.

The HP Sure Start BIOS setting protection feature generates events to the HP Sure Start ESC hardware when an attempt to modify the BIOS settings is detected. The event is logged in the HP Sure Start audit log, and the local user will receive a notification from BIOS during boot.

HP Sure Start–protected storage

Protected storage rooted in the HP Endpoint Security Controller hardware provides the highest level of protection for BIOS/firmware data and settings protected by HP Sure Start. HP Sure Start–protected storage is designed to provide confidentiality, integrity, and tamper detection even if an attacker disassembles the system and establishes a direct connection to the nonvolatile storage device on the circuit board.

Data integrity

The integrity of the dynamic data stored in nonvolatile memory by firmware and used to control the state of various capabilities is critical to the security posture of the overall platform. Dynamic data includes all BIOS settings that can be modified by the end user or administrator of the device. Examples include (but are not limited to) boot options such as the secure boot feature, BIOS administrator password and related policies, Trusted Platform Module–state control, and HP Sure Start policy settings.

Any successful attack that bypasses the existing access restrictions designed to prevent unauthorized modifications to these settings could defeat the platform security. As an example, consider a scenario where an attacker makes an unauthorized modification to the secure boot state to disable it without being detected. In this scenario, the platform would boot the attacker's root kit before the OS starts, without the user's knowledge.

Industry-standard Unified Extensible Firmware Interface (UEFI) BIOS does implement access restrictions that should prevent unauthorized modifications to these variables, and HP implements these just like the rest of the PC industry. However, given the risks a breach of these mechanisms poses to the platform, HP Sure Start provides secondary defenses that are stronger than the baseline industry standard.

BIOS settings and other dynamic data used by firmware to control the state that is protected by HP Sure Start are stored in the isolated nonvolatile memory of the HP Endpoint Security Controller that is not directly accessible to software running on the host CPU.

Additionally, the HP ESC creates and appends unique integrity measurements each time a data element is stored in this nonvolatile memory store. The integrity measurements are based on a strong cryptographic algorithm (hashed-based message authentication code utilizing SHA-256 hashing) that is rooted to a secret contained within the HP ESC. The secret is unique to each HP ESC, such that each controller generates a unique

integrity measurement given an identical element. When the data element is read back from the nonvolatile memory, the HP ESC recalculates the integrity measurement for that data element and compares it to the integrity measurement that is appended to the data. Any unauthorized changes to the data in the nonvolatile memory store result in a mis-compare. Using this approach, the HP ESC can detect tampering with data elements stored in the nonvolatile memory store.

Data confidentiality

For many of the data elements stored by the platform, maintaining confidentiality is critical. Examples include BIOS administrator password hashes, user credentials, and secrets optionally stored by firmware on behalf of the user for firmware-based features such as HP Sure Run and HP Sure Recovery.

Protection of these secrets is challenging when industry-standard UEFI BIOS approaches are used, since the nonvolatile storage is typically readable by software running on the host processor. HP Sure Start–protected storage is intended to provide much greater protection of this confidential data than a standard UEFI BIOS implementation.

In addition to a separate isolated storage, HP Sure Start leverages the Advanced Encryption Standard (AES) hardware block contained within the HP ESC to perform AES-256 encryption on all confidential data elements stored in the HP Sure Start nonvolatile memory, in addition to the data integrity measurements for those elements. The encryption key used is unique to each HP ESC and never leaves that controller, so data encrypted by any individual HP ESC component can only be decrypted by that same HP ESC.

Secure boot keys protection

Compared to the industry-standard UEFI secure boot implementation, HP Sure Start provides enhanced protection of the UEFI secure boot key databases that are stored by the firmware. These variables are critical to proper operation of the UEFI secure boot feature that verifies integrity and authenticity of the OS bootloader before allowing it to start at boot.

HP Sure Start protects UEFI secure boot key databases by maintaining a master copy in HP Sure Start–protected storage.

Any authorized modifications to the UEFI standard secure boot key databases by the OS during runtime are tracked by HP Sure Start and applied to the master copy by the HP ESC. HP Sure Start then uses the master copy in HP Sure Start– protected storage to identify and reject any unauthorized changes to the UEFI standard secure boot keys databases.

This capability, enabled by default, covers the following databases:

- Signature database (db)
- Revoked signatures database (dbx)
- Key Enrollment Key (KEK)
- Platform Key (PEK) updated dynamically at runtime by the OS

Runtime Intrusion Detection (RTID)

On each boot, the BIOS code starts execution from flash memory at a fixed address. This is known as the BIOS boot code and provides capabilities needed before the OS starts. However, a portion of BIOS remains in DRAM that is needed to provide advanced power-management features, OS services, and other OS-independent functions while the OS is running. This BIOS code, referred to as System Management Mode (SMM) code, resides in a special area within the DRAM that is hidden from the OS. We also refer to this code as "runtime" BIOS code in the context of HP Sure Start's Runtime Intrusion Detection feature. (For more details on SMM and how it works, please see Appendix B.)

The integrity of SMM code is critical to the client device security posture. HP Sure Start checks to make sure HP SMM BIOS code is intact at OS start. By adding new protection capabilities and/or providing a means to detect any attack to that code, Runtime Intrusion Detection provides mechanisms to ensure that the SMM BIOS code remains intact while the OS is running.

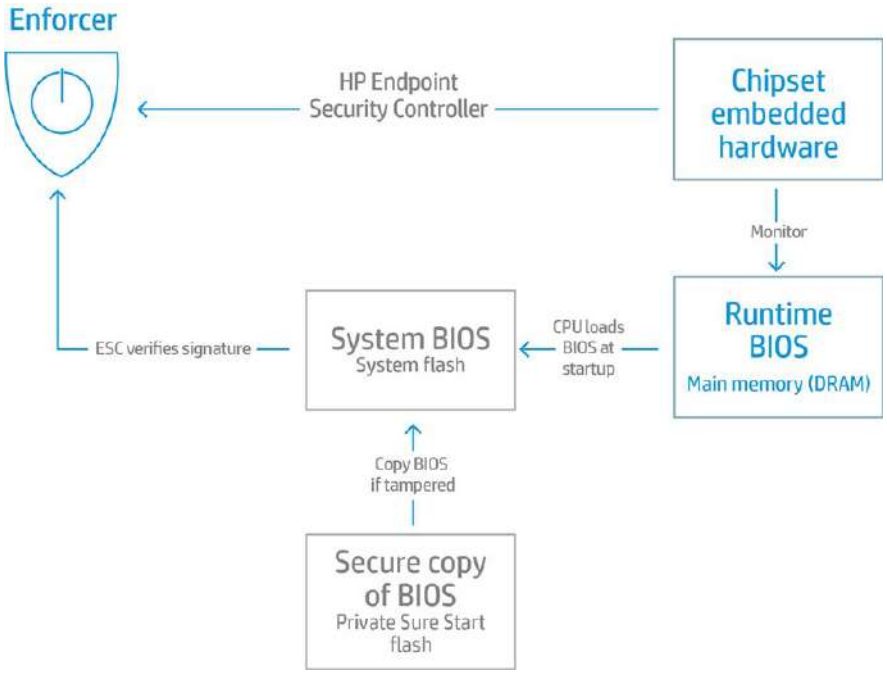

Figure 2: Runtime Intrusion Detection uses specialized hardware embedded within the platform chipset to monitor SMM code for any changes.

Runtime Intrusion Detection architecture

The RTID feature utilizes specialized hardware in the platform chipset to detect anomalies in the Runtime HP SMM BIOS. Detection of any anomalies results in a notification to the HP Endpoint Security Controller, which can take the configured policy action independent of the CPU.

Intel® Management Engine firmware protection

All HP Sure Start Gen6 systems include the ability to fully recover from corrupted Intel Management Engine firmware and/or critical data associated with the Intel Management Engine subsystem.

In those systems that include support for HP Sure Recover with Embedded Reimaging, HP Sure Start Gen6 is able to recover the entire Intel Management Firmware using a copy of Intel Management engine firmware stored on the Embedded Reimaging device on the system board with no additional dependencies.

On HP Sure Start Gen6 systems that do not support Embedded Reimaging, HP Sure Start uses a copy of the Intel Management firmware that is included on the system EFI partition on the primary mass storage device for full recovery.

In the event that the Intel Management Engine firmware update has been removed from the EFI partition, HP Sure Start Gen6 will only perform a partial recovery of the Intel Management Engine firmware and/or critical data from the HP Sure Start private flash that will enable the system to operate with reasonable functionality. In order to fully restore all functionality provided the Intel Management Engine Firmware, it will be necessary to apply an update tothe intel Management Firmware Engine firmware which will restore the full recovery imageto the EFI partition.

Customers that deploy their own OS images need to take some additional steps to ensure that HP Sure Start Gen6 can fully recover the Intel Management Engine Firmware with complete autonomy. Those steps include creating a system EFI partition that is at least 360MB, and applying an HP Intel Management Engine firmware update package.

AMD® Secure Processor protection

All HP Sure Start Gen6 systems include the ability to fully recover from corrupted AMD Secure Processor firmware and/or critical data associated with the AMD Secure Processor subsystem.

HP Sure Start Gen6 is able to recover the entire AMD Secure Processor subsystem using a copy of AMD Secure Processor firmware stored within the HP Endpoint Security Controller isolated non-volatile memory with no additional dependencies.

Smart Flash

HP Sure Start Gen6 adds Smart Flash technology which can dramatically reduce the time required for firmware updates and Sure Start firmware recovery operations. With Smart Flash, the HP Endpoint Security Controller will only modify those portions of the flash are corrupted (recovery) or changed (update) for both the HP Endpoint Security Controller backup copies of firmware and the primary copies of firmware in the primary flash.

HP Endpoint Security Controller runtime intrusion detection

Starting from HP Sure Start Gen6, the HP Endpoint Security Controller firmware utilizes a hardware Memory Protection Unit within the HP Endpoint Security Controller to detect, block, and log an event in the event of any unauthorized attempt to modify the run-time HP Endpoint Security Controller run-time code or critical data.

USER NOTIFICATIONS, EVENT LOGGING,AND POLICY MANAGEMENT

HP Sure Start end user notifications

Under normal operating conditions, HP Sure Start is invisible to the user. When HP Sure Start identifies a problem, recovery operations are automatic, using the default settings with no end user or IT interaction usually required.

Users may see runtime notifications in the event of a BIOS integrity problem detected via the HP Sure Start Dynamic Protection or the Runtime Intrusion Detection features while the OS is running[3]. If any significant event is detected or action is taken, HP Sure Start displays a warning message via Windows® notifications on the next boot. HP Notifications Software is required to enable the viewing of these Windows notifications.

HP Sure Start event logging

The HP Endpoint Security Controller records critical events related to the firmware/BIOS code and data monitored by HP Sure Start. These events are stored within the Sure Start nonvolatile memory store. When HP Notifications software is installed, the events are copied from the HP ESC to the Windows Event Viewer[3] to facilitate access to these events by the local user as well as the customer's preferred manageability agent.

The following events trigger the HP Notifications Software to gather all events from the HP Sure Start subsystem and ensure that the Windows Event Viewer is updated with any events that are not already recorded there:

- Windows Boot
- Windows Resume from Sleep/Hibernate
- HP Sure Start with dynamic protection runtime event notifications
- HP Sure Start Runtime Intrusion Detection (RTID)

HP Notifications Software populates HP Sure Start events into a unique "HP Sure Start" application event log. Only HP Sure Start events will be included in this log. The Windows Event Viewer path to the HP Sure Start events is the following: System Tools/Event Viewer/Applications and Services Logs/HP Sure Start.

The Windows Event Viewer level categories related to HP Sure Start events are defined in Table 1. The events are populated into Windows Event Viewer in the order that they were generated by HP Sure Start. The oldest event in the HP Sure Start subsystem is added to the Windows Event Viewer first and the most recent event is added last.

The timestamp for each Windows Event Viewer entry is the time it was added to that log, NOT the time the event occurred. Each Sure Start Windows Event Viewer entry includes detailed data within the event details, which includes the timestamp of the actual occurrence.

Note: Events are persistent in the HP Endpoint Security Controller even after being copied to the Windows Event Viewer. If the Windows Event Viewer is cleared, the HP Notifications Software application will replace all HP Sure Start entries on the next event that triggers it to check for HP Sure Start event logs.

Table 1: Types of HP Sure Start Windows Event Viewer events protection and resiliency

Event Level	Definition
Info	Events that are expected to occur during the normal course of operation (e.g., updating the BIOS).
Warning	Unexpected events that have occurred but were fully recovered from by HP Sure Start and no user/admin action is required for the platform to be fully operational. These events are anomalous operations that the user/admin may want to investigate further, especially if there is a trend of these events across multiple machines.
Error	Events that require the admin/HP service to act on the platforms to fully recover.

HP Sure Start provides superb firmware protection

Out of the box, the HP system BIOS enables and optimizes HP Sure Start policies for the typical user. Since HP Sure Start is enabled by default, the typical user is protected by HP Sure Start without having to modify the settings. For advanced users, the system BIOS provides some control of HP Sure Start behavior, using policy settings in the (F10) BIOS Setup. Unless otherwise noted, these settings and functions are located under Security/ BIOS Sure Start.

Note: Policies are stored within the HP ESC nonvolatile memory that is not directly accessible by the host CPU; therefore, a reboot is required before any Sure Start settings take effect.

The following HP Sure Start settings and functions are available:

- Verify Boot Block on Every Boot
- BIOS Data Recovery Policy
- Network Controller Configuration Restore (Intel only)
- Prompt on Network Controller Configuration Change (Intel only)
- Dynamic Runtime Scanning of Boot Block (Intel only)
- HP Sure Start BIOS Setting Protection
- HP Sure Start Secure Boot Keys Protection
- Enhanced HP Firmware Runtime Intrusion Prevention and Detection (Intel only)
- HP Firmware Runtime Intrusion Detection (AMD only)
- HP Sure Start Security Event Policy
- HP Sure Start Security Event Boot Notification
- Lock BIOS Version
- Save/Restore MBR of System Hard Drive
- Save/Restore GPT of System Hard Drive
- Boot Sector (MBR/GPT) Recovery Policy
- DMA Protection
- DMA Pre-boot Protection

Verify Boot Block on Every Boot

HP Sure Start always verifies the integrity of the system flash BIOS boot block before resuming from sleep, hibernate, or power-off. When set to enable, HP Sure Start will also verify the integrity of the boot block on each warm boot (Windows restart). The trade-off to consider is faster restart time versus more security. The default setting of this feature is set to “Disable”.

BIOS Data Recovery Policy

When set to Automatic, HP Sure Start automatically repairs the BIOS or the Machine Unique Data when necessary. When set to Manual, HP Sure Start requires a special key sequence to proceed with the repair. In the case of an issue with the boot block code, the system will refuse to boot, and a unique blink sequence will flash on the system LED. The system LED that lights may vary by platform and by instance. In the case of an issue with the Machine Unique Data, the system will display a message on the screen. The key sequence required, and the blink sequence displayed, vary depending whether the system is a notebook, a desktop, or a tablet. Manual mode is useful to users who can perform forensics on the system flash contents before repair. Typical users are not encouraged to use manual mode. The default setting of this feature is set to “Automatic”.

Network Controller Configuration Restore (Intel only)

When selected, HP Sure Start immediately restores the network controller configuration to factory defaults.

Prompt on Network Controller Configuration Change (Intel only)

HP provides a factory-defined network controller configuration which includes the MAC address. When this setting is set to enable, the system monitors the state of the network controller configuration and prompts the user in the event of a change from the factory-configured state. The default setting of this feature is set to “Disable”.

Dynamic Runtime Scanning of Boot Block (Intel only)

When in the default setting of enable, HP Sure Start periodically checks the integrity of the BIOS boot block while the OS is running. When in the disable setting, HP Sure Start only checks the integrity before a boot or resume from sleep or hibernate.

HP Sure Start BIOS Setting Protection

The BIOS setting protection policy is disabled by default. To enable the feature, the owner/administrator of the client device should first configure all BIOS policies to the preferred setting. The owner/administrator also must configure a BIOS setup administrator password.

Once that is completed, the BIOS setting protection policy should be changed to “Enable.” At this point, a backup copy of all BIOS settings is created in the HP Sure Start–protected storage. Going forward, none of the BIOS settings can be modified locally or remotely. On each boot, the BIOS policy settings are verified to be in the desired state, and if there is any discrepancy, the BIOS settings are restored from the HP Sure Start–protected storage.

To modify a BIOS setting, the BIOS administrator password must be provided and BIOS setting protection subsequently disabled, at which point changes can be made to the BIOS settings.

HP Sure Start Secure Boot Keys Protection

With this setting at the factory default of enable, HP Sure Start provides enhanced protection of the secure boot databases and keys used by BIOS to verify the integrity and authenticity of the OS bootloader before launching it at boot. When set to "Disable", only standard UEFI secure boot variable protection is used, and no backup copy is kept by the HP Sure Start subsystem.

HP Firmware Runtime Intrusion Prevention and Detection (RTID)

The RTID feature is enabled by default for all platforms shipped from the HP factory. There is no need for the end customer/administrator to enable or otherwise deploy the feature to take advantage of HP Sure Start RTID. The RTID feature can be optionally be set to "Disable" by the platform owner/administrator.

HP Sure Start Security Event Policy

This BIOS policy setting controls what action is taken when HP Sure Start detects an attack or attempted attack while the OS is running. There are three possible configurations for this policy:

- Log event only: When this setting is selected, the HP ESC logs detection events, which can be viewed in the Applications and Services Logs/HP Sure Start path of the Microsoft Windows Event Viewer[4].
- Log event and notify user: This is the default setting. When this setting is selected, the HP ESC logs detection events, which can be viewed in the Applications and Services Logs/HP Sure Start path of the Microsoft Windows Event Viewer.
- Additionally, the user is notified within Windows that the event occurred[5].
- Log event and power off system: When this setting is selected, the HP ESC logs detection events, which can be viewed in the Applications and Services Logs/HP Sure Start path of the Microsoft Windows Event Viewer. Additionally, the user is notified within Windows that the event occurred, and that system shutdown is imminent.

HP Sure Start Security Event Boot Notification

This BIOS policy setting controls whether HP Sure Start warnings and error messages that are displayed when the system is booted require the local user to acknowledge the error before the boot continues. With the default Require Acknowledgement setting, the system halts with the error message displayed. The local user must press a key to continue the boot. If changed to Time out after 15 seconds, the message is displayed, but the boot process continues automatically after the message is displayed for 15 seconds.

Lock BIOS Version

In the (F10) BIOS setup, this feature is located in Main/Update System BIOS.

When set to "Disable", you can update the BIOS using any supported process. When the HP ESC detects a valid boot block update in the system flash, it updates the backup copy of the boot block.

When set to "Enable", all HP BIOS update tools refuse to update the BIOS. In addition, HP Sure Start protects the BIOS from attempts to change the BIOS version by removing the system flash via an unauthorized method. The HP ESC records the locked-down version of BIOS. When the HP ESC detects that the BIOS in the system flash changed, the HP ESC overwrites the BIOS boot block with the HP ESC copy of the boot block. The HP ESC copy of the boot block executes and recovers the remainder of the correct version of the BIOS. The default setting of this feature is "Disabled".

Save/Restore MBR of System Hard Drive and Save/Restore GPT of System Hard Drive

In the (F10) BIOS setup, this feature is located in Security/Hard Drive Utilities. Only one of these capabilities is available, depending on the partition type of the primary drive (GPT or MBR), as detected by HP Sure Start.

When set to "Enable", HP Sure Start maintains a protected backup copy of the MBR/GPT partition table from the primary drive and compares the backup copy to the primary on each boot. If a difference is detected, the user is prompted and can choose to recover from the backup to the original state, or to update the protected backup copy with the changes. The Boot Sector (MBR/GPT) Recovery Policy can optionally be used to remove the user decision for the action taken in the event of a discrepancy found by HP Sure Start.

When set to "Disable" (default), no MBR/GPT protection is provided by HP Sure Start.

Boot Sector (MBR/GPT) Recovery Policy

When set to Local User Control (default) the user is prompted for the action to take when HP Sure Start detects a change in the MBR/GPT partition table. When set to Recover in the event of corruption, HP Sure Start automatically restores the MBR/GPT to the saved state any time differences are encountered.

DMA Protection

When set to "Enable" (default), HP firmware configures the IO Memory Management Unit (IOMMU) to block DMA (Direct Memory Access) by peripheral devices per the Pre-Boot DMA Protection setting while in the BIOS pre-boot environment. The BIOS will also configure the system appropriately to enable Microsoft Kernel DMA protection for Thunderbolt 3 which takes over management of the IOMMU at OS start time to provide the same protections from DMA attacks in the OS environment.

Pre-boot DMA Protection

When set to "All PCI-e Devices", HP firmware configures the IO Memory Management Unit (IOMMU) to block DMA (Direct Memory Access) by peripheral devices per the Pre-Boot DMA Protection setting while in the BIOS pre-boot environment. Available options and defaults vary as shown in the table below.

Notebook with Thunderbolt support	Notebook without Thunderbolt support	Desktop with Thunderbolt support	Desktop without Thunderbolt support
Thunderbolt Only	Disabled	Thunderbolt Only	Disabled
All PCI-e devices (Default) (Recommended)	All PCI-e devices (Default) (Recommended)	All PCI-e devices (Recommended)	All PCI-e devices (Recommended)
		All PCIe devices with approved exceptions (Default)	All PCIe devices with approved exceptions (Default)

Remote management of HP Sure Start policy controls

Out of the box, HP Sure Start policies are optimized for the typical user. Since HP Sure Start is enabled by default, there is no need for the remote administrator to take any action to enable ("deploy") HP Sure Start. If a remote administrator wants to modify HP Sure Start policy settings, the same Windows Management Instrumentation (WMI) APIs or HP BIOS Configuration Utility scripts that are used to manage other platform BIOS policies can be used to manage HP Sure Start policies. In addition, administrators can remotely manage HP Sure Start capabilities with the Manageability Integration Kit (MIK) plug-in for Microsoft System Center Configuration Manager (SCCM).

Also, administrators can remotely manage HP Sure Start capabilities and view HP Sure Start events with the Manageability Integration Kit (MIK) plug-in for Microsoft System Center Configuration Manager (SCCM).

CONCLUSION

HP Sure Start delivers these key benefits:

- Uninterrupted productivity: HP Sure Start maintains business continuity in the event of an attack or accidental corruption by eliminating downtime waiting for an IT/Service event.
- Lower cost: HP Sure Start's ability to recover automatically reduces calls to the IT Help Desk and enhances productivity, which ultimately helps lower the maintenance cost for the platform.
- Peace of mind: HP Sure Start has multiple security features that run across a wide variety of software and hardware platforms.

Protect critical BIOS firmware from malware with the industry-leading firmware intrusion detection and automatic repair offered by HP Sure Start, *available on many HP business PCs, including Pro and Elite platforms, Workstations, Thin Clients, and Retail Point of Sale (RPOS) PCs.*

Learn more

hp.com/go/computersecurity

Links to technical content

support.hp.com/us-en/topic/goIT

APPENDIX A—HP SURE START, GEN BY GEN

HP introduced Sure Start in 2014. Since that time, HP has enhanced Sure Start and expanded the number of products that use it. The table below provides a summary of the capabilities that were added with each generation.

Table 2: Sure Start, Gen by Gen

Generation	Release Date	Capabilities Added
HP Sure Start	2013	• Firmware and BIOS authenticity enforcement, with the ability to self-heal • Firmware monitoring and compliance
HP Sure Start with Dynamic Protection	2015	• Windows Event Viewer support • Dynamic Protection (for select Intel products)
HP Sure Start Gen3 (select Intel products)[6]	2017	• Runtime Intrusion Detection • BIOS setting protection • Manageability Integration Kit (MIK) plug-in for Microsoft SCCM
HP Sure Start Gen4[7]	2018	• Protected storage—strong cryptographic methods to store BIOS settings, user credentials, and other settings in the HP Endpoint Security Controller hardware to provide integrity protection, tamper detection, and confidentiality protection for that data • Secure boot database protection—enhanced protection of databases and keys stored by BIOS that are critical to the integrity of the OS secure boot feature versus standard UEFI BIOS implementation • On Intel platforms, enhanced protection and recovery of the Intel Management Engine Firmware for any failures that occur across updates or failure of main Intel ME firmware • Third-party security certification of HP Endpoint Security Controller—testing by an independent and accredited laboratory to validate that the • HP ESC hardware core functionality works as claimed per publicly available criteria, methodology, and processes[1] • HP business PCs with HP Sure Start exceed the NIST Platform Firmware Resiliency guidelines (Special Publication 800-193) for host processor • boot firmware and other critical platform device firmware, as discussed in Appendix C.
HP Sure Start Gen5[8]	2019	• Full back-up, integrity monitoring, and recovery services for of Intel Manageability Engine firmware including main firmware and boot critical portions of code and data. • DMA Protection for attacks via Thunderbolt devices
HP Sure Start Gen6[9]	2020	• Smart flash • Enhanced DMA protection for attacks via internal devices slots • HP Endpoint Security Controller run-time Intrusion detection • AMD Secure Processor firmware protection

APPENDIX B—SYSTEM MANAGEMENTMODE (SMM) OVERVIEW

System Management Mode (SMM) is an industry-standard approach used for PC advanced power-management features and other OS-independent functions while the OS is running. While the SMM term and implementation is specific to x86 architectures, many modern computing architectures use a similar architectural concept.

SMM is configured by the BIOS at boot time. The SMM code is populated into the main (DRAM) memory. Then BIOS uses special (lockable) configuration registers within the chipset to block access to this area when the microprocessor is not executing in an SMM context. At runtime, entry into SMM mode is event-driven. The chipset is programmed to recognize many types of events and timeouts. When such an event occurs, the chipset hardware asserts the System Management Interrupt (SMI) input pin. At the next instruction boundary, the microprocessor saves its entire state and enters SMM.

As the microprocessor enters SMM, it asserts a hardware output pin, SMI Active (SMIACT). This pin serves notice to the chipset hardware that the microprocessor is entering SMM. An SMI can be asserted at any time, during any process operating mode, except from within SMM itself. The chipset hardware recognizes the SMIACT signal and redirects all subsequent memory cycles to a protected area of memory (sometimes referred to as the SMRAM area), reserved specifically for SMM. Immediately after receiving the SMI input and asserting the SMIACT output, the microprocessor begins to save its entire internal state to this protected memory area.

After the microprocessor state has been stored to SMRAM memory, the special SMM handler code that also resides in SMRAM (placed there by system BIOS at boot time) begins to execute in a special SMM operation mode. While operating in this mode, most hardware and memory isolation mechanisms are suspended, and the microprocessor can access virtually all resources in the platform to enable it to perform required tasks. The SMM code completes the required task, and then it's time to return the microprocessor to the previous operating mode. At that point, the SMM code executes the Return from System Management Mode (RSM) instruction to exit SMM. The RSM instruction causes the microprocessor to restore its previous internal state data from the copy saved in SMRAM upon SMM entry. Upon completion of RSM, the entire microprocessor state has been restored to the state just prior to the SMI event, and the previous program (OS, applications, hypervisor, etc.) resumes execution right where it left off.

APPENDIX C—NIST SP 800-193: PLATFORM FIRMWARE RESILIENCY GUIDELINES

Released in May 2018, the NIST SP 800-193: Platform Firmware Resiliency Guidelines describe guidelines for security mechanisms to protect platform firmware against unauthorized changes, detect unauthorized changes that occur, and recover from these unauthorized changes.

These guidelines outline three different resiliency properties:

1. Protected: meets all Protection and Secure Update requirements
2. Recoverable: meets all Detection and Recovery requirements
3. Resilient: meets all Protection, Detection, and Recovery requirements

Of these three properties, Resilient is the strongest, providing the most benefit to HP Customers.

HP Sure Start Gen3, Gen4, Gen5 and Gen6 meet and exceed all Resilient guidelines in NIST SP 800-193 for host processor boot firmware, also known as the UEFI BIOS. Further, HP Sure Start Gen3, Gen4, Gen5 and Gen6 progressively expand the number of other firmware based Critical Platform Device Firmware that are protected per NIST 800-193 requirements, as shown in Table 3.

Prior NIST guidelines for BIOS security

NIST SP 800-193 goes beyond NIST SP 800-147, which only addressed protection and the secure update of the platform's UEFI BIOS. HP Sure Start Gen6 and prior generations of HP Sure Start, along with HP BIOSphere Gen6 and prior generations of HP BIOSphere, all support NIST SP 800-147.

NIST SP 800-193 also goes beyond NIST SP 800-155, which outlined security components and guidelines to establish a secure BIOS integrity measurement and reporting chain. Likewise, HP Sure Start Gen6 and prior generations of HP Sure Start, along with HP BIOSphere Gen6 and prior generations of HP BIOSphere, all support NIST SP 800-155.

NIST SP 800-193 Critical Platform Devices in HP Commercial PCs

NIST SP 800-193 acknowledges that the definition of Critical Platform Devices can vary. Critical Platform Devices are defined in section 3.2 (Resiliency Properties):

"For a platform as a whole to claim resiliency to destructive attacks, the set of platform devices necessary to minimally restore operation of the system, and sufficient to restore reasonable functionality, should themselves be resilient. We call this set of devices critical platform devices. The particular resiliency properties may vary from platform-to-platform."

For that reason, it is important to define this set of devices and applicable firmware for HP Commercial PCs. NIST SP 800-193 provides a reference platform architecture in Section 2 along with a list of devices which are "often critical to the normal and secure operation of a platform." The table below provides a mapping to each of those devices/subsystems to the applicable firmware components in the HP Commercial Notebook PCs.

Note that each customer environment should be evaluated to determine whether there are additional peripheral devices that are critical to restore reasonable functionality specific to the customer's deployment.

Table 3: Critical Platform Device Firmware Protected by HP Sure Start or other technology.

NIST SP 800-193 Platform Architecture Reference	HP Commercial PC critical platform device firmware	Protected by
1. Embedded Controller (EC)/ Super I/O (SIO) 4. Host Processor 6. Graphics Processing Unit (GPU) when implemented as Unified Memory Architecture (UMA) 8A. Host Controller (HC) for mass storage device 10. Host Processor Boot Firmware 11. Platform Runtime Firmware 12. Power Supply 14. Fans	HP ESC firmware HP UEFI BIOS firmware	HP Sure Start Gen3, Gen4, Gen5 and Gen6
2. Trusted Platform Module (TPM)	Discrete TPM component firmware[1]	TPM
3. Baseboard Management Controller (BMC)/Management Engine (ME)	Intel Management Engine firmware AMD Secure Processor firmware	HP Sure Start Gen5, Gen6 (Intel) HP Sure Start Gen6 (AMD)
5. Network Interface Controller (NIC)	Intel integrated GbE NIC firmware[2]	HP Sure Start Gen3, Gen4, Gen5 and Gen6
7. Serial Peripheral Interface (SPI) Flash	Intel Descriptor firmware	HP Sure Start Gen3, Gen4, Gen5 and Gen6
8B. Hard Disk Drive (HDD)/Solid State Drive (SSD)	HDD/SSD firmware[3]	
9. Embedded MultiMediaCard (eMMC)/ Universal Flash Storage (UFS)	N/A[4]	N/A[4]
13. Glue Logic (CPLD's, FPGA's)	N/A[4]	N/A[4]

1 This component is not critical to boot of the platform.
2 This component is not critical to minimally restore operation of the system but is required to establish Ethernet connectivity in environments where that connectivity is deemed critical to platform resiliency.
3 Mass storage devices are outside the scope of this document. Resiliency capabilities vary by storage supplier and by storage device. Not all suppliers or devices currently meet all Resiliency requirements in 800-193.
4 No devices of this type are included.

Acronyms

- BIOS – Basic Input/Output System (aka host processor boot firmware)
- CPU – Central processing unit
- ESC – HP Endpoint Security Controller
- Gen3+ – Applies to HP Sure Start Gen3, Gen4, Gen5, and Gen6
- Gen4+ – Applies HP Sure Start Gen4, Gen5, and Gen6
- Gen6 – Applies only to HP Sure Start Gen6
- HMAC – Hash-based message authentication code
- HW – Hardware
- OS – Operating system
- POST – Power-On Self-Test
- RoT – Root of Trust (defined in NIST SP 800-193)
- RTD – Root of Trust for Detection (defined in NIST SP 800-193)
- RTRec – Root of Trust for Recovery (defined in NIST SP 800-193)
- SMM – System Management Mode
- UEFI – Unified Extensible Firmware Interface

Table 4: Required functions for Host Processor Boot Firmware.

The table below provides a summary of each function described by NIST SP 800-193.

NIST SP 800-193	HP Sure Start	
Roots of Trust (Section 4.1)	Meets all Resiliency Requirements	• Gen3+ uses a hardware-based RoT (the HP ESC) with immutable boot firmware, which cryptographically verifies subsequent firmware before launching it, creating a Chain of Trust. • Gen3+ includes a key store and approved digital signing algorithms based on FIPS 186-4 to verify the digital signature of firmware update images. • Gen3+ uses authenticated update, detection, and recovery mechanisms, which are anchored in Gen3+'s HW-based RoT.
Protection and Update of Mutable Code (Section 4.2.1)	Meets all Resiliency Requirements	• Gen3+ uses an authenticated update mechanism anchored in Gen3+'s • HW-based RoT. • Firmware update images are digitally signed by HP's code signing service • (HP Secure Sign) and verified by Gen3+ prior to updating. • Gen3+ integrity protects the HP ESC and UEFI flash regions, so that only its authenticated update mechanism or a secure local update through physical presence can modify those flash regions. • Gen3+ has no known authenticated update bypass mechanisms and contains the ability to prevent rollback to earlier authentic firmware images with known security vulnerabilities.
Protection of Immutable Code (Section 4.2.2)	Meets all Resiliency Requirements	• Gen3+ uses a hardware-based RoT (the HP ESC) with immutable boot firmware.
Runtime Protection of Critical Platform FW (Section 4.2.3)	Meets all Resiliency Requirements	• Critical Platform Firmware executing in volatile storage (RAM) runs and: –ceases its operation prior to the loading of system software. That is, it runs during POST and stops before the OS is loaded. –is protected from system software using SMM protections enforced by the CPU.
Protection of Critical Data (Section 4.2.4)	Meets all Resiliency Requirements	• Gen4+ Critical Data, such as Secure Boot authenticated variables, are only modifiable through defined APIs provided by device firmware. These APIs employ a mechanism to authenticate that the data is originating from an authorized source before applying the change. • Gen4+ Critical Data, such as per-platform unique factory configuration settings, are only modifiable through defined APIs provided by device firmware. These APIs employ a mechanism to authenticate that the request is originating from an authorized HP service provider before they allow the change. • Gen4+ Critical Data, such as BIOS settings that can be configured in the field, are only modifiable through defined APIs. These APIs are accessed only via a system administrator who has configured the BIOS administrator password. • Gen3+ factory default settings, which are not per-platform-specific, employ the same protection as the code. This includes integrity and authenticity verification via digital signature. These setting updates are controlled and protected in the same manner as the firmware.

NIST SP 800-193	HP Sure Start	
Detection of Corrupted Code (Section 4.3.1)	Meets all Resiliency Requirements	• A successful attack on the platform firmware will not impact Gen3+'s RTD. The RTD is maintained in a private flash area inaccessible to the system software that might compromise the platform firmware. • Firmware code is validated by Gen3+'s RTD using approved digital signature algorithms and cryptographic hashes.
Detection of Corrupted Critical Data (Section 4.3.2)	Meets all Resiliency Requirements	• A successful attack on the Active Critical Data will not impact Gen3+'s RTD. The RTD is maintained in a private flash area inaccessible to the system software that might compromise Active Critical Data. • Gen3+ can save and validate critical data through use of digest hashes prior to using that critical data, and Gen3+ can initiate a recovery of the critical data if corruption is detected.
Recovery of Mutable Code (Section 4.4.1)	Meets all Resiliency Requirements	• Gen3+'s ESC implements the recovery capability. • A successful attack on the platform firmware will not impact Gen3+'s RTRec. The RTRec is maintained in a private flash area inaccessible to the system software that might compromise the platform firmware. • Gen3+'s RTRec has access to a locally stored copy of the platform's UEFI • image in its private flash area, which is inaccessible to (protected from) system software. • Gen3+ can update the locally stored authentic UEFI image in its private flash area through an Authenticated Update mechanism.
Recovery of Critical Data (Section 4.4.2)	Meets all Resiliency Requirements	• Gen3+'s ESC implements the recovery capability. • A successful attack on Active Critical Data will not impact Gen3+'s RTRec. The RTRec is maintained in a private flash area inaccessible to the system software that might compromise Active Critical Data. • Gen3+ can recover critical data back to factory defaults including per-platform-specific data that is backed up in isolated & protected storage. • Gen3+ can recover non-per-platform-specific defaults from the backup BIOS image stored in isolated and protected storage. • Gen3+ does not use policies included as part of Critical Data to restore critical data.
Logging and notification	Exceeds all Resiliency Requirements	• Gen3+ will notify user of corruption and log the event. • Gen3+'s detection mechanism is capable of logging events when corruption • is detected. • Gen3+ will notify user of a recovery event and log the event. • Gen3+'s detection mechanism is capable of logging events when a recovery action has taken place.
Policy-based controls	Exceeds all Resiliency Requirements	• Gen3+'s detection mechanism has policies which control the action taken by the Runtime Detection.

NIST SP 800-193	HP Sure Start	
Automatic or manual recovery options	Exceeds all Resiliency Requirements	• Gen3+ Runtime Detection can initiate a recovery process automatically or after notification of detection corruptions to the user. • Gen3+ can automatically perform its recovery operations without user interaction or it may require user approval, dependent on policy setting. • Gen3+ gains approval from the user before replacing the current Critical Data, based on recovery policy setting. • Gen3+ can recover Critical Data back to a last-known good state. • Gen3+ gains approval from the user before replacing the current Critical Data, based on recovery policy setting.
Local or remote IT Recovery	Exceeds all Resiliency Requirements	• Gen3+ can automatically perform its recovery operations without user interaction or may require user approval, dependent on policy setting.
Rollback prevention	Exceeds all Resiliency Requirements	• Gen3+ and the UEFI boot block both have controls in place to protect against recovery to an earlier firmware version with security weaknesses.
Runtime intrusion detection	Additional Functionality not required in NISTSP800-193	• NIST SP 800-193 is silent on what happens to firmware once it is loaded from nonvolatile storage (flash) into volatile storage (RAM) for execution. Gen3+ provides runtime intrusion detection of UEFI SMM code loaded into SMM RAM.
Physical attack detection	Additional Functionality not required in NISTSP800-193	• Gen4+ provides protection against physical attacks to the protected backup copy of dynamic critical data. AES encryption is used on a per-component unique key to provide confidentiality of private data. In addition, HMAC integrity measurements provide tamper prevention/detection of those keys.

[1] The HP Sure Start controller hardware has been certified per the CSPN certification framework.

[2] HP Sure Start with Dynamic Protection is available on HP Elite products equipped with 6th generation Intel Core processors and higher.

[3] HP Sure Start end user notifications and pushing of HP Sure Start events to OS event viewer support is limited to Windows Operating system. These features are not supported in Linux.

[4] HP Notification Software must be installed to view HP Sure Start events in the Windows Event Viewer.

[5] HP Notification Software must be installed to receive notifications.

[6] HP Sure Start Gen3 is available on HP Elite products equipped with Intel 7th generation processors.

[7] HP Sure Start Gen4 is available on HP Elite and HP Pro 600 products equipped with 8th generation Intel or AMD processors.

[8] HP Sure Start Gen5 is available on select HP PCs with Intel processors. See product specifications for availability.

[9] HP Sure Start Gen6 is available on select HP PCs.

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HP WOLF SECURITY

4AA7-6645ENW, June 2021

Technical white paper

Configuration of Remote HP PC Hardware Diagnostics UEFI

Table of contents

Executive summary

Remote HP PC Hardware Diagnostics UEFI is a firmware (BIOS) feature, present on some HP Workstation models, to download and execute HP PC Hardware Diagnostics UEFI, and to upload results.

Overview of Remote HP PC Hardware Diagnostics UEFI

The Remote HP PC Hardware Diagnostics UEFI feature consists in a BIOS wrapper that initializes the network interface, sets up a RAM disk, downloads the HP PC Hardware Diagnostics UEFI package from a pre-configured server, verifies its digital signature, executes it, optionally uploads the diagnostics logs to a separate pre-configured server, and reboots.

The diagnostics package can be downloaded from hp.com or from a customer server. Results can be uploaded to a customer-defined repository. No local storage (such as a disk drive or USB stick) is required to run the diagnostics from the network.

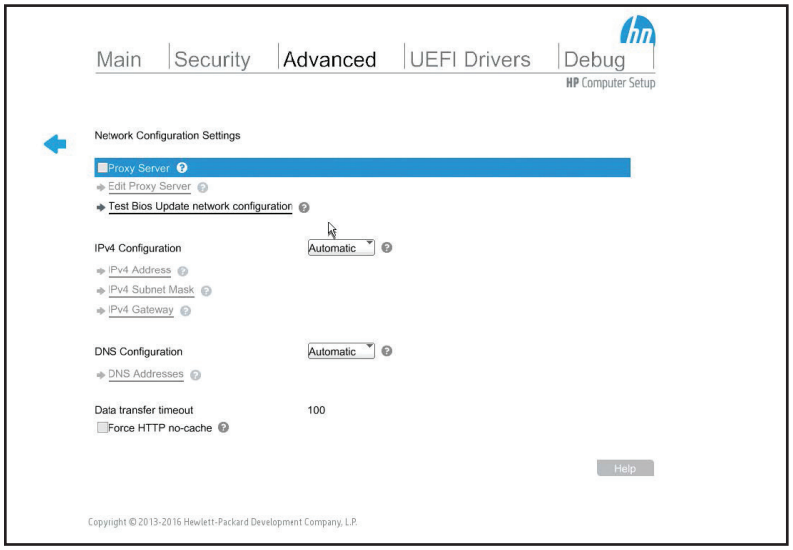
Diagnostics can be run on demand in interactive mode, from the BIOS Startup menu (Esc) or from Computer Setup (F10), and can also be run unattended, following a schedule. The actual set of diagnostics to run is also configurable.

Notes:

- The ability to execute existing BIOS resident and off-line HP PC Hardware Diagnostics UEFI (from a disk drive or removable media) is not altered.
- Only English is supported in the initial release (October 2016).

Network configuration settings

To connect to the network, download the diagnostics, and upload log files, the network settings must first be configured. To modify network settings, go to **Main > Network Configuration Settings** in HP Computer Setup (F10 Setup). Note that some older models used **Advanced > Network Configuration Settings**.



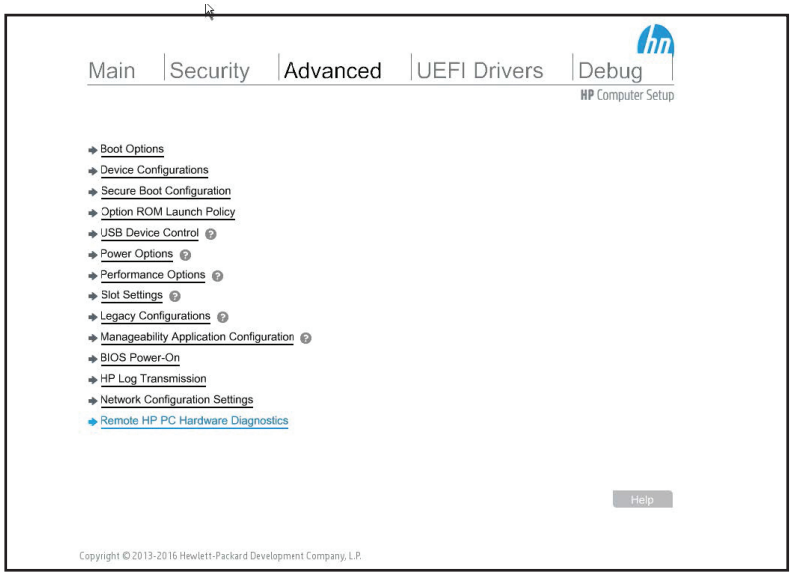
By default, the workstation is set to obtain its configuration automatically via DHCP. Depending on your network configuration, it may be necessary to set a proxy server to download the diagnostics package from hp.com

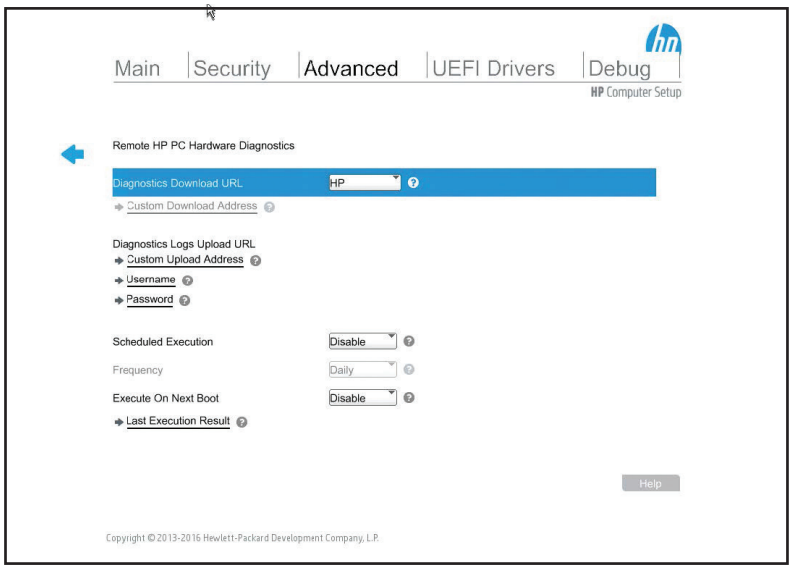
The complete list of network configuration settings is:

Item	Description
Proxy Server	Check box to enable a proxy server
Edit Proxy Server	URL for the proxy server
Test BIOS Update network configuration	Immediate test, trying to reach the BIOS update server (no update occurs)
IPv4 Configuration	Automatic or Manual
IPv4 Address	Static IPv4 address, e.g. 192.168.1.42
IPv4 Subnet Mask	Static IPv4 netmask
IPv4 Gateway	Static IPv4 gateway address
DNS Configuration	Automatic or Manual
DNS Addresses	List of DNS servers
Data transfer timeout	Timeout value in seconds
Force HTTP no-cache	Checkbox to disable HTTP caching

Remote HP PC Hardware Diagnostics UEFI settings

To modify settings for Remote HP PC Hardware Diagnostics UEFI settings, go to **Advanced > Remote HP PC Hardware Diagnostics > Settings** in HP Computer Setup (F10 Setup).





The configurable options are:

Diagnostics Download URL indicates where to download the diagnostics package from: HP or a customer repository. If **Custom URL** is selected, the **Custom Download Address** field lets you enter the actual URL. See Setting up a repository below for details on how to host your own diagnostics package.

Diagnostics logs can only be uploaded to a customer-defined repository. The **Custom Upload Address** field lets you specify where to upload the logs. This can be an FTP server, or an HTTP server that allows uploads. (HTTPS is not supported at this time.) You can also configure an upload username and password, either in the corresponding fields **Username** and **Password**, or directly in the URL defined in **Custom Upload Address** (e.g. http://user:password@server.com/path/to/upload). Note that these are stored in plain text. Logs are uploaded as individual files. The filename format is: *<serial number>_<log name>_<SKU number>_<timestamp>.log*. Note that you can also save the diagnostics logs to local media when running in interactive mode, see Saving the diagnostics logs below for details.

By default, diagnostics are only run on demand. You can set up periodic execution by setting **Scheduled Execution** to **Enable**, and then by setting **Frequency** to the desired value (**Daily**, **Weekly**, or **Monthly**). When the unit reboots, it checks if the elapsed time since the last completed diagnostics run has been long enough, and triggers a new run if that is the case. Note that the BIOS does not trigger a reboot after the specified delay has elapsed, but waits until the next reboot to check if it should run remote diagnostics.

You can also force a one-time diagnostics run on the next reboot by setting **Execute on Next Boot** to **Enable**. The setting automatically resets to **Disable** after diagnostics have run.

Last Execution Result lets you view the date, time, and return value of the last attempted diagnostics run. The BIOS itself does not report how many tests passed or failed, that information is only available from the diagnostics logs.

In **Advanced** > **Remote HP PC Hardware Diagnostics, Execute Remote Diagnostics** starts an immediate diagnostics run in interactive mode. Note that any unsaved BIOS settings are lost (if you modify settings, you must save and restart to apply them).

The complete settings are:

Item	Description
Diagnostics Download URL	HP or Custom URL
Custom Download Address	URL for the diagnostics package
Custom Upload Address	URL for uploading diagnostics logs
Username	Upload username, if necessary. Stored as plain-text
Password	Upload password, if necessary. Stored as plain-text
Scheduled Execution	Enable or Disable
Frequency	Daily, Weekly, or Monthly
Execute on Next Boot	Enable or Disable
Last Execution Result	Displays timestamp and status of last attempt to run diagnostics

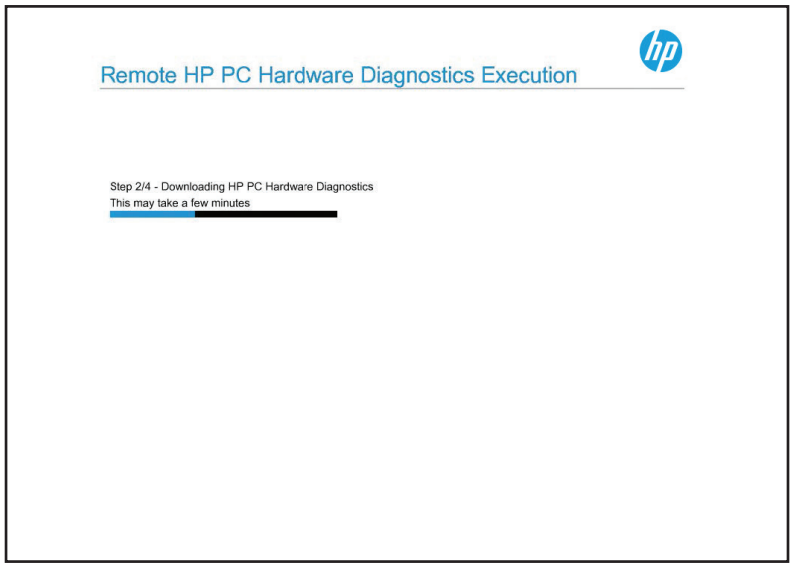
The associated WMI settings are:

```
Remote HP PC Hardware Diagnostics Custom Client Upload Url
Remote HP PC Hardware Use Custom Download Url
    *Disable
    Enable
Remote HP PC Hardware Diagnostics Custom Client Download Url
Remote HP PC Hardware Diagnostics Scheduled Execution Enabled
    *Disable
    Enable
Remote HP PC Hardware Diagnostics Scheduled Execution Frecuency
    Daily
    *Weekly
    Monthly
Remote HP PC Hardware Diagnostics Upload Server Username
Remote HP PC Hardware Diagnostics Upload Server Password
Remote HP PC Hardware Diagnostics Execute On Next Boot
    *Disable
    Enable
```

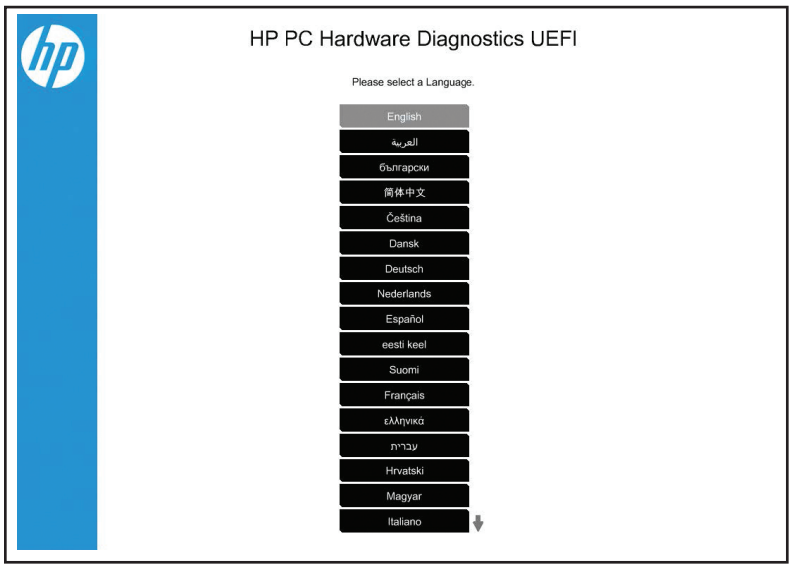
These settings can be modified programmatically using the integrated “Replicated Setup” menu in Computer Setup, using the HP BIOS Configuration Utility (BCU), or using WMI-capable scripting tools such as PowerShell or Windows Script Host.

Running the diagnostics

When running Remote HP PC Hardware Diagnostics, the BIOS first initializes the network interface and sets up its TCP/IP stack. Next, it downloads the diagnostics package:



Once the package is downloaded, the BIOS starts executing it. When downloaded for the first time from the HP URL, the diagnostics application displays its End User License Agreement, which you must accept to use it. From that point on, the user interface is the same as when running HP PC Hardware Diagnostics UEFI from local media.



Saving the diagnostics logs

You can upload the diagnostics logs using the BIOS settings described in the previous section. When you run diagnostics in interactive mode, you can also save the logs to local media by selecting **Test Logs > Save Logs** from the main menu, and then selecting a file system on which to save the logs.

Setting up a repository

If you wish to download the diagnostics package from your own server (unmodified or with your own *factory.xml* file), you can download HP's version from a Softpaq, and then copy it to your server. Check the download section for your model on hp.com.

After setting up an FTP or HTTP server, you should create a subdirectory that will be used to store the diagnostics package. This subdirectory can be a virtual or physical directory that is located anywhere in the directory hierarchy that is accessible via HTTP or FTP. The specific name used for the directory and file is at your discretion; for example, if the server's host name is www.server.com, then a simple approach would be to create a virtual directory at *www.server.com/hpdiagnostics* and the **Diagnostics Download URL** would then be in the form *http://www.server.com/hpdiagnostics/HpSysDiags.tar*.

The domain portion of the URL is not case-sensitive; thus *http://example.com* and *HTTP://EXAMPLE.COM* are treated as being the same.

The path portion of the URL is generally case-sensitive on UNIX or Linux® platforms, regardless of the web server deployed, and is generally not case-sensitive on Windows platforms, again regardless of the web server deployed. Thus, if running Apache on Linux®, for example, http://example.com/bios and http://example.com/BIOS are generally not treated as being the same; however, if running IIS on Windows, http://example.com/bios and http://example.com/BIOS are generally treated as being the same. Any case-sensitivity is determined by the HTTP or FTP server, not by the HP workstation downloading the diagnostics package or uploading the log.

Modifying the diagnostics package

The diagnostics package (HpSysDiags.tar) is generated with the UNIX .tar format. It includes the diagnostics executable (HpSysDiags.efi, which must be the same base name as for the .tar file) and a configuration file (factory.xml) for unattended use.

Diagnostics configuration file

Here is a sample factory.xml configuration file, which runs the memory test once for one minute (`-scmems -scmemtime=1`), and then runs the SMART disk drive check (`-scsmart`):

```
<TEST Name="System Check Test Scenario" Mode= "Sequential" Loop ="1">
    <TEST Name="System Diagnostics"
         Loop="1"
         FileName="HpSysDiags.efi"
         Exception="false"
         Arguments="-scmems -scmetime=1 -scsmart"
    />
</TEST>
```

You can modify this example to define your own set of tests, as follows:

The attributes `FileName="HpSysDiags.efi"` and `Exception="false"` must be present in this exact form.

The `Loop` attribute lets you specify how many times a given test will run.

`Arguments` specifies which tests to run from the following list:

Argument	Description
`-scldst`	Runs the Long DST Test
`-scrawdisk`	Runs the Raw Drive Read Test
`-scsdst`	Runs the Short DST Test
`-scsmart`	Runs the SMART Hard Drive Check
`-sccdst`	Runs the SMART Conveyance Test
`-scdrv=x`	Allows selection of Hard Drives to use during testing `-scdrv=all` Runs on all detected Hard Drives `-scdrv=hhh` Hex bitmask of drives to run (0000000000000001 runs on drive 1)
`-scmeml`	Runs the Extensive Memory Test
`-scmems`	Runs the Quick Memory Test
`-scmemf`	Runs the Fast Memory Test
`-scmemtime=`	Specifies the Memory test maximum time in minutes
`-sccpu`	Runs the Processor Check
`-scpci`	Runs the PCI Device Read Test
`-scusball`	Runs the USB Port Check in field mode
`-scvidf`	Runs the Fast Video Memory Test
`-scvids`	Runs the Quick Video Memory Test
`-scvidl`	Runs the Extensive Video Memory Test
`-scvmemtime=`	Runs the Quick or Extensive Video Memory Test with a defined test time in minutes `-scvidl -scvmemtime=5` Runs the extensive Video Memory Test for 5 minutes
`-lang`	Specify language, see options below

The `-lang` parameter lets you specify the display language in HP PC Hardware Diagnostics UEFI (it does not modify the BIOS language). Options are:

Value	Language
`Eng`	English
`Ara`	Arabic
`Bul`	Bulgarian
`Chs`	Chinese
`Cze`	Czech
`Dan`	Danish
`Deu`	Deutsch
`Dut`	Nederlands
`Esp`	Spanish
`Est`	Estonian
`Fin`	Finnish
`Fra`	French
`Gre`	Greek
`Heb`	Hebrew
`Hrv`	Hrvatski aka. Croatian
`Hun`	Hugarian
`Ita`	Italian
`Jpn`	Japanese
`Kor`	Korean

Value	Language
Lav	Latvian
Lit	Lithuanian
Nor	Norwegian
Pol	Polish
Pop	Portuguese (Portugal)
Por	Portuguese (Brazil)
Ron	Romanian
Rus	Russian
Slk	Slovak
Slv	Slovenian
Srp	Serbian
Swe	Swedish
Tha	Thai
Tur	Turkish
Ukr	Ukranian
Zho	Chinese

Related documents

Technical white paper - HP PC F10 Setup overview, 2012, 2013, and 2014 Business Notebooks, Desktop PCs, and Workstations, http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA5-2078ENW.pdf

HP BIOS Configuration Utility (BCU) – User Guide, https://whp-hou4.cold.extweb.hp.com/pub/capssoftpaq/cmit/whitepapers/BIOS_Configuration_Utility_User_Guide.pdf

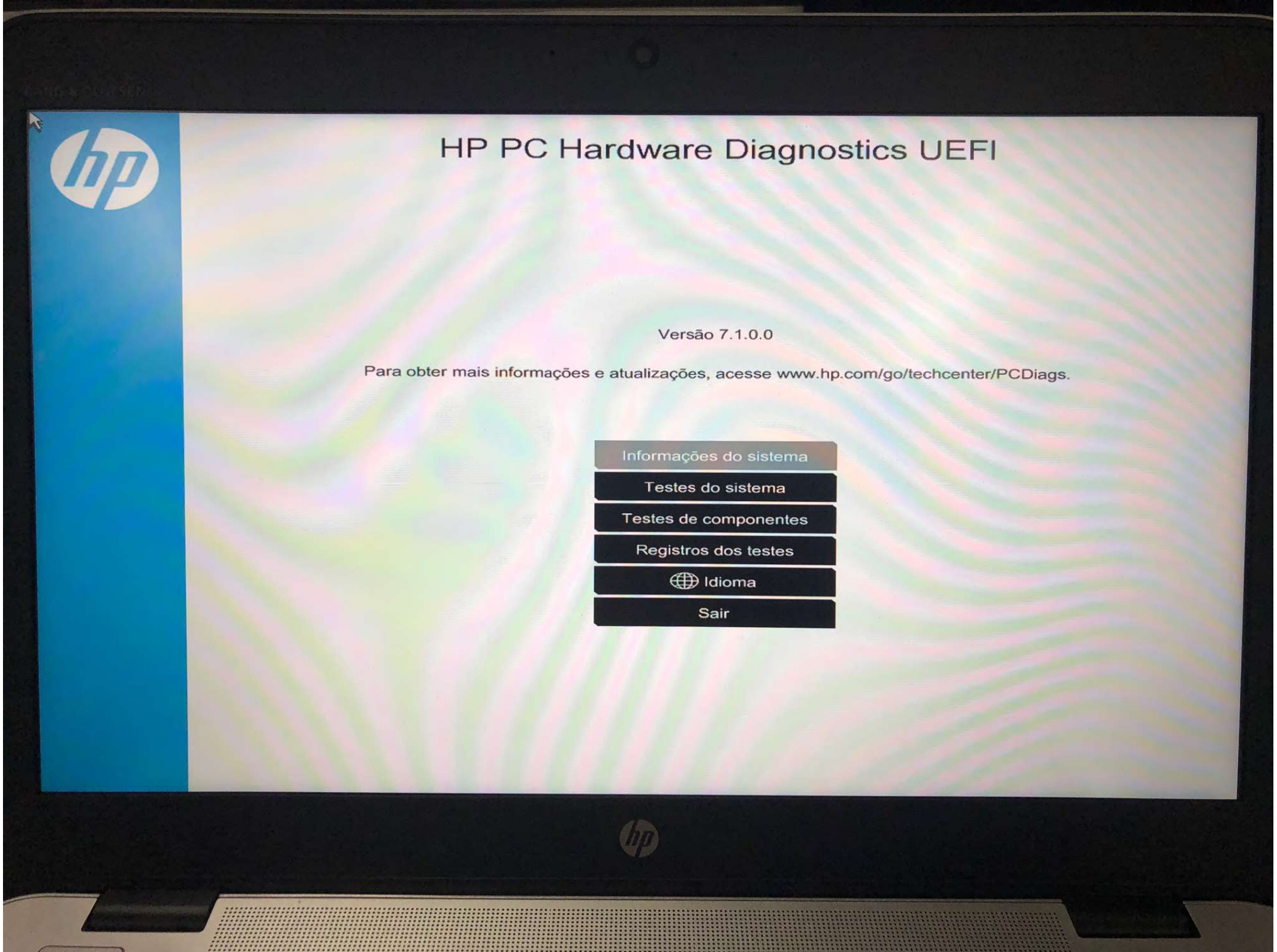
HP PC Hardware Diagnostics home page, http://hp.com/go/techcenter/pcdiags

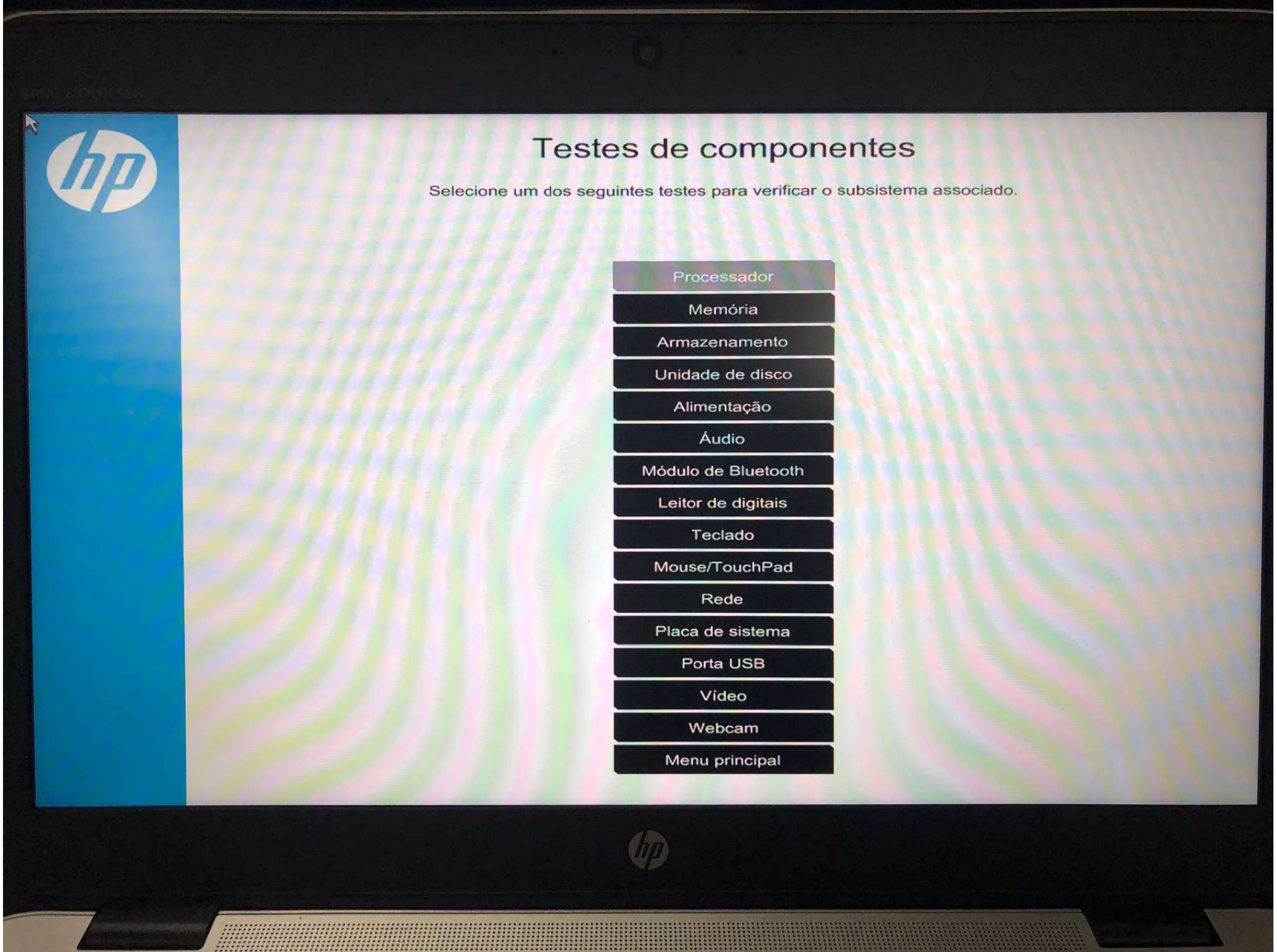
Brief – Reduce your downtime with HP PC Hardware Diagnostics, http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA5-3192ENW.pdf

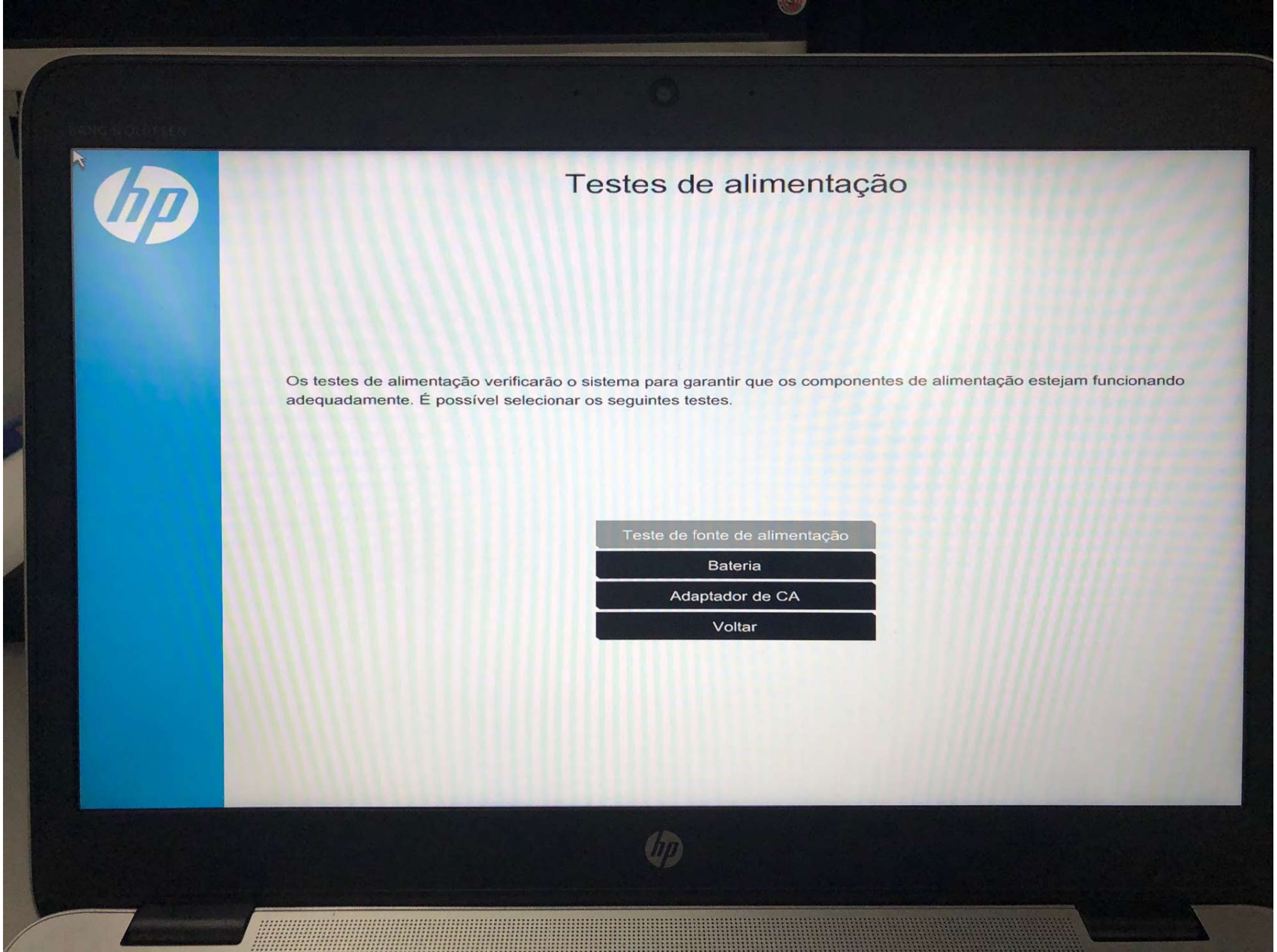
Libarchive copyright notice

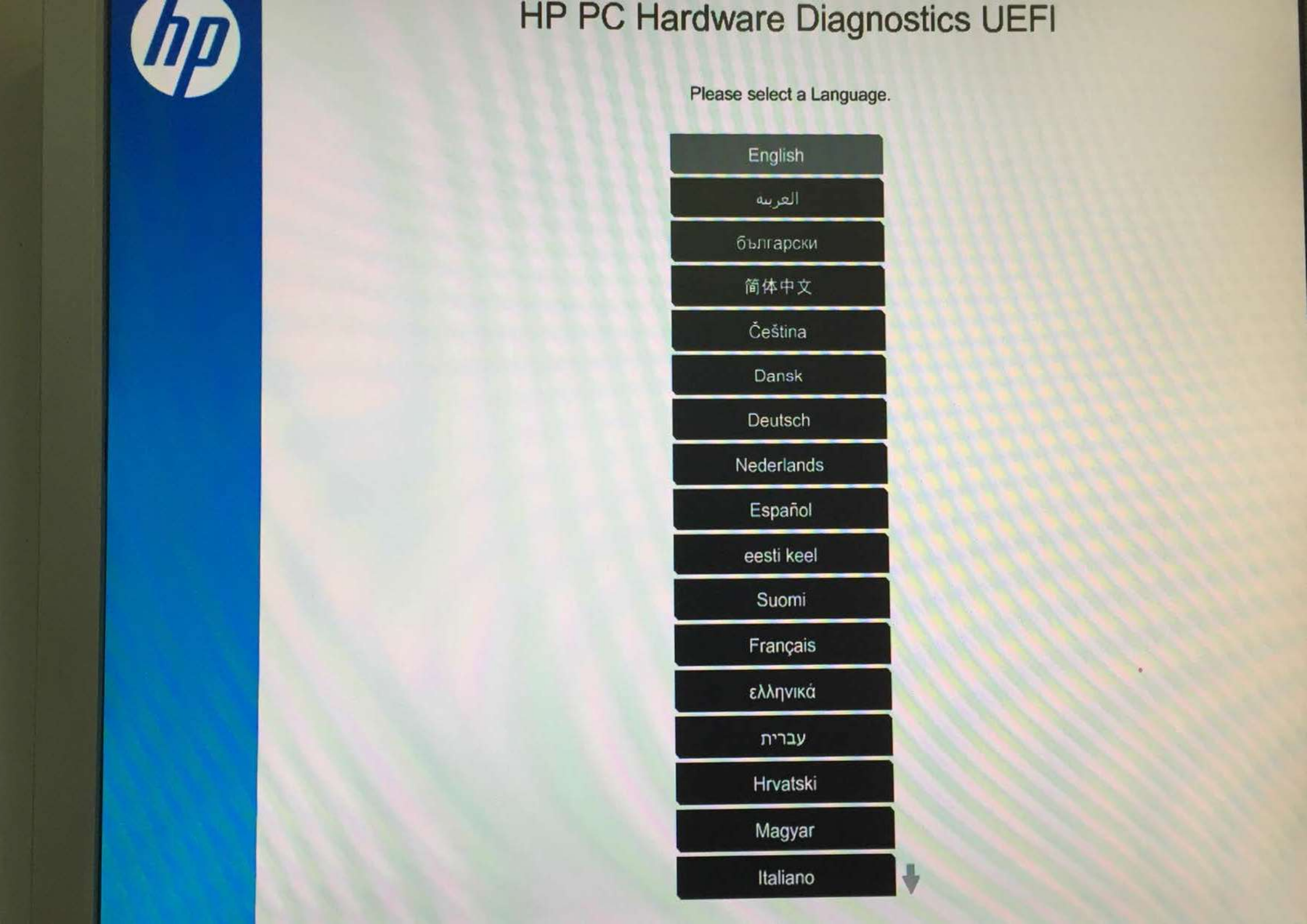
The Remote HP PC Hardware Diagnostics UEFI binary is statically linked to the libarchive library (http://libarchive.org/), which is subject to the following copyright notice:

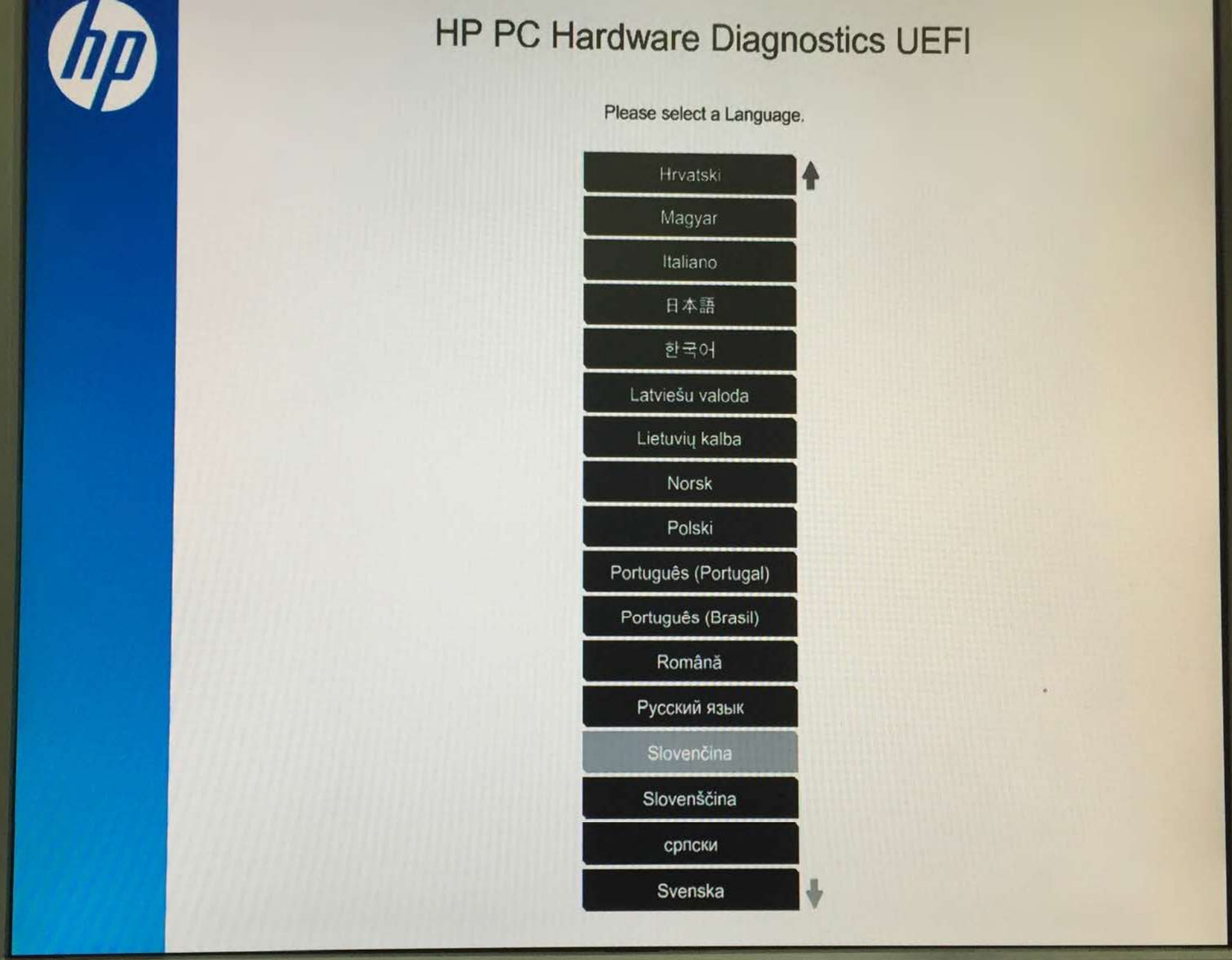
4AA6-9968ENW, August 2017

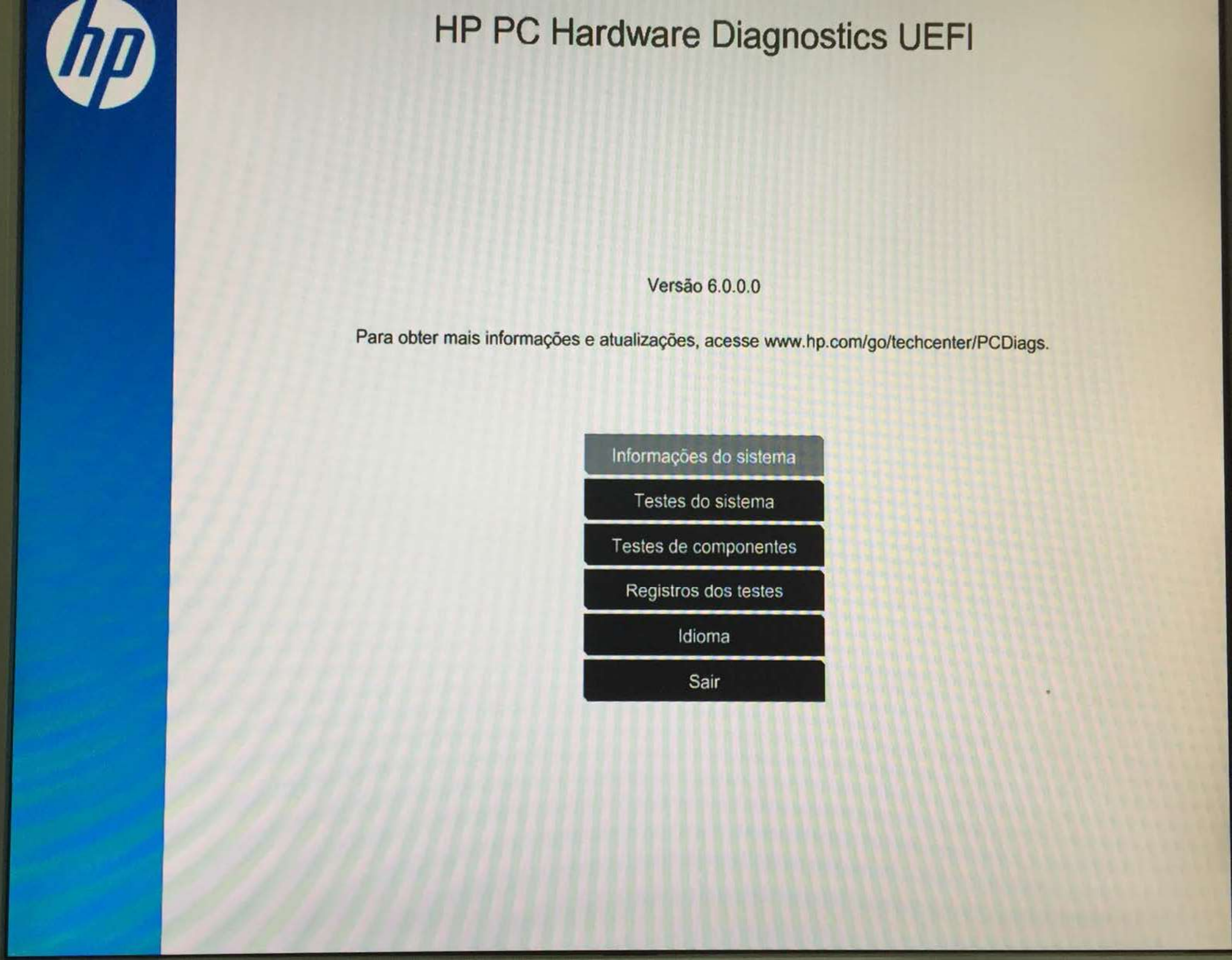

HP PC Hardware Diagnostics UEFI
Versão 7.1.0.0
Para obter mais informações e atualizações, acesse www.hp.com/go/techcenter/PCDiags.
Informações do sistema
Testes do sistema
Testes de componentes
Registros dos testes
Idioma
Sair


Testes de componentes
Selecione um dos seguintes testes para verificar o subsistema associado.
Processador
Memória
Armazenamento
Unidade de disco
Alimentação
Áudio
Módulo de Bluetooth
Leitor de digitais
Teclado
Mouse/TouchPad
Rede
Placa de sistema
Porta USB
Vídeo
Webcam
Menu principal


Testes de alimentação
Os testes de alimentação verificarão o sistema para garantir que os componentes de alimentação estejam funcionando adequadamente. É possível selecionar os seguintes testes.
Teste de fonte de alimentação
Bateria
Adaptador de CA
Voltar


HP PC Hardware Diagnostics UEFI
Please select a Language.
English
العربية
български
简体中文
Čeština
Dansk
Deutsch
Nederlands
Español
eesti keel
Suomi
Français
ελληνικά
עברית
Hrvatski
Magyar
Italiano


HP PC Hardware Diagnostics UEFI
Please select a Language.
Hrvatski
Magyar
Italiano
日本語
한국어
Latviešu valoda
Lietuvių kalba
Norsk
Polski
Português (Portugal)
Português (Brasil)
Română
Русский язык
Slovenčina
Slovenščina
српски
Svenska


HP PC Hardware Diagnostics UEFI
Versão 6.0.0.0
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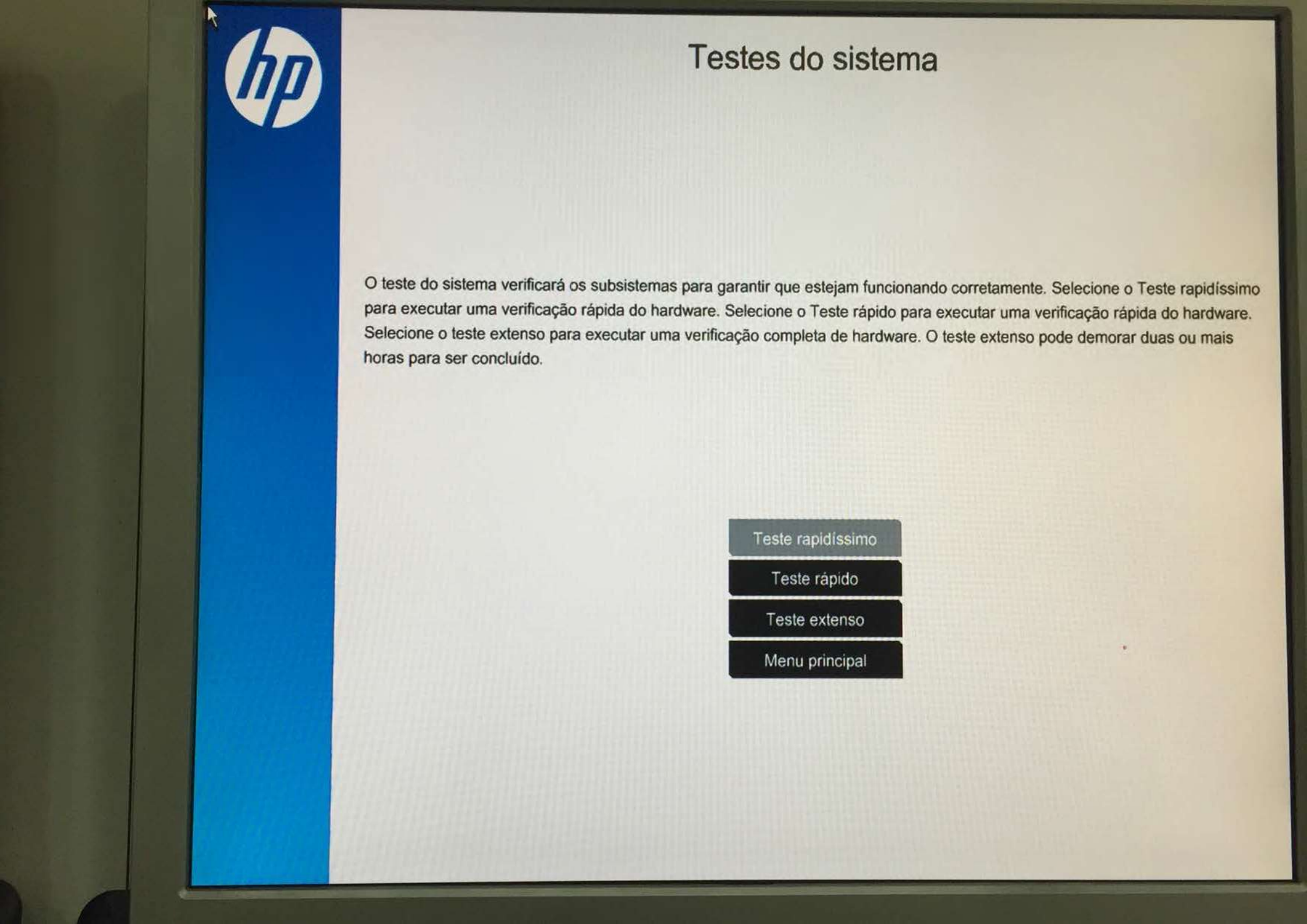
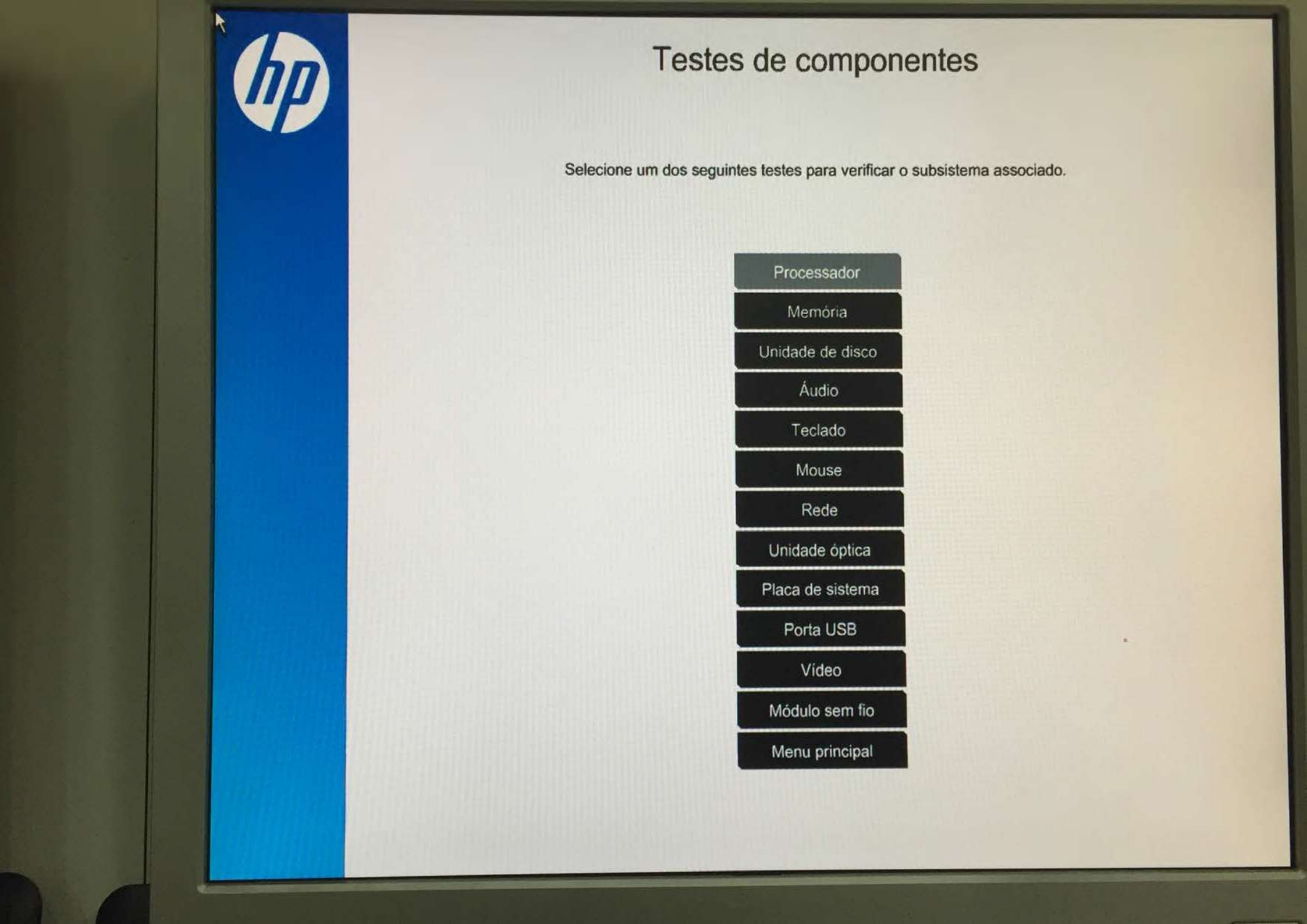
Informações do sistema
Testes do sistema
Testes de componentes
Registros dos testes
Idioma
Sair


Testes do sistema
O teste do sistema verificará os subsistemas para garantir que estejam funcionando corretamente. Selecione o Teste rapidíssimo para executar uma verificação rápida do hardware. Selecione o Teste rápido para executar uma verificação rápida do hardware. Selecione o teste extenso para executar uma verificação completa de hardware. O teste extenso pode demorar duas ou mais horas para ser concluído.
Teste rapidíssimo
Teste rápido
Teste extenso
Menu principal


Testes de componentes
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Processador
Memória
Unidade de disco
Áudio
Teclado
Mouse
Rede
Unidade óptica
Placa de sistema
Porta USB
Vídeo
Módulo sem fio
Menu principal

Produtos e modelos habilitados à fruição dos benefícios fiscais da Lei de Informática

Nome Fantasia:	FLEXTRONICS TECNOLOGIA
Razão Social:	FLEXTRONICS INTERNATIONAL TECNOLOGIA LTDA
CNPJ:	74.404.229/0005-51
Endereço:	Av. Liberdade, 6315 Iporanga Sorocaba / SP - 18087170
Contato:	Jorge Funaro jorge.funaro@flextronics.com (15) 4009-6330 www.flextronics.com

Produto:	Traçador gráfico ("plotter")
Processo MCT/Data:	01200.003114/2013-41 de 22/07/2013
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	531, de 20/05/2014 DOU 21/05/2014 ()
Modelos:	

Produto:	Tradutor (conversor) de protocolo para interconexão de rede ("gateway"), por rádio-freqüência
Processo MCT/Data:	01200.005185/2007-30 de 24/09/2007
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	103, de 26/02/2009 DOU 27/02/2009 ()
Modelos:	WTM552A/CE

Produto:	Unidade de memória de armazenamento de dados em dispositivos à base de semicondutores (SSD) podendo incorporar unidades de discos magnéticos (HDD)
Processo MCT/Data:	01200.001606/2015-63 de 05/05/2015
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	1083, de 07/12/2015 DOU 08/12/2015 (http://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?jornal=1&pagina=29&data=08/12/2015)
Modelos:	(09-12-15: IBM 2834 980) (09-12-15: IBM 2834 981) (09-12-15: IBM 2834 98E) (09-12-15: IBM 2834 980) (09-12-15: IBM 2834 981) (09-12-15: IBM 2834 98E) (23-12-15: IBM 2831 980) (23-12-15: IBM 2831 981) (23-12-15: IBM 2831 982) (23-12-15: IBM 2831 98B) (23-12-15: IBM 2831 98E) (23-12-15: IBM 2831 98F) (23-12-15: IBM 2832 980) (23-12-15: IBM 2832 981) (23-12-15: IBM 2832 982) (23-12-15: IBM 2832 98B) (23-12-15: IBM 2832 98E) (23-12-15: IBM 2832 98F) (23-12-15: IBM 2833 980) (23-12-15: IBM 2833 981) (23-12-15: IBM 2833 982) (23-12-15: IBM 2833 982) (23-12-15: IBM 2833 98B) (23-12-15: IBM 2833 98E) (23-12-15: IBM 2833 98F) (23-12-15: IBM 2834 982) (23-12-15: IBM 2834 98B) (23-12-15: IBM 2834 98F) (14-04-16: IBM 2423 961) (28-04-16: IBM 2421 961) (28-04-16: IBM 2421 96E) (28-04-16: IBM 2422 961) (28-04-16: IBM 2422 96E) (28-04-16: IBM 2423 96E) (28-04-16: IBM 2424 961) (28-04-16: IBM 2424 96E) (25-09-17: IBM 9835 415) (25-09-17: IBM 9837 415) (25-09-17:IBM 9836 415) (25-09-17: IBM 9838 415) (25-09-17: IBM 9840 AE2) (25-09-17: IBM 9843 AE2) (25-09-17: IBM 9846 AE2) (25-09-17: IBM 9848 AE2) (17-08-18: IBM 5331 983)(17-08-18: IBM 5332 983)(17-08-18: IBM 5333 983)(17-08-18: IBM 5334 983)(30-09-19: IBM 5334 E96) (30-09-19: IBM 5333 996) (30-09-19: IBM 5334 996) (30-09-19: IBM 5331 E96) (30-09-19: IBM 5332 E96) (30-09-19: IBM 5333 E96) (30-09-19: IBM 5331 993) (30-09-19: IBM 5332 993) (30-09-19: IBM 5333 993) (30-09-19: IBM 5334 993) (30-09-19: IBM 5331 994) (30-09-19: IBM 5332 994) (30-09-19: IBM 5333 994) (30-09-19: IBM 5334 994) (30-09-19: IBM 5331 996) (30-09-19: IBM 5332 996) (12-08-21: 5331 998) (12-08-21: 5332 998) (12-08-21: 5333 998) (12-08-21: 5334 998) (10-05-22: 5341 993) (10-05-22: 5341 994) (10-05-22: 5341 996) (10-05-22: 5341 998) (10-05-22: 5341 E96) (02-08-22: 4657 U74) (02-08-22: 4657 U7D) (02-08-22: 4657 12G) (02-08-22: 4657 24G) (02-08-22: 4657 92G) (02-08-22: 4657 924) (02-08-22: 4666 AH8) (02-08-22: 4666 UH8) (02-08-22: 4666 AFF) (02-08-22: 4666 A9F) (02-08-22: 4666 AG8) (02-08-22: 4666 UG8)

Produto:	Unidade de memória de armazenamento de dados em dispositivos à base de semicondutores (SSD) podendo incorporar unidades de discos magnéticos (HDD) (Port. 357)
Processo MCT/Data:	01200.004428/2015-22 de 25/09/2015
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	357, de 13/04/2016 DOU 02/05/2016 (http://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?jornal=1&pagina=10&data=02/05/2016)

Modelos:	(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(17-06-16:IBM 2073 720))(17-06-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(17-06-16:IBM 2076 524))(17-06-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(17-06-16:IBM 2076 624))(17-06-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(17-06-16:IBM 2076 12F))(17-06-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 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2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(11-11-16:IBM 2831 984))(11-11-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(11-11-16:IBM 2831 84E))(11-11-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(11-11-16:IBM 2831 985))(11-11-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(11-11-16:IBM 2831 85B))

(11-11-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(11-11-16:IBM 2831 986))(11-11-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(11-11-16:IBM 2831 86E))(11-11-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(11-11-16:IBM 2832 984))(11-11-16:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 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	961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(25-09-17:IBM 2077 112))(25-09-17:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(25-09-17:IBM 2077 124))(25-09-17:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(25-09-17:IBM 2077 212))(25-09-17:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(25-09-17:IBM 2077 224))(25-09-17:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(25-09-17:IBM 2077 312))(25-09-17:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(25-09-17:IBM 2077 324))(25-09-17:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 24(17-08-18:(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(09-12-15:IBM 2834 980)(09-12-15:IBM 2834 981)(09-12-15:IBM 2834 98E)(23-12-15:IBM 2831 980)(23-12-15:IBM 2831 981)(23-12-15:IBM 2831 982)(23-12-15:IBM 2831 98B)(23-12-15:IBM 2831 98E)(23-12-15:IBM 2831 98F)(23-12-15:IBM 2832 980)(23-12-15:IBM 2832 981)(23-12-15:IBM 2832 982)(23-12-15:IBM 2832 98B)(23-12-15:IBM 2832 98E)(23-12-15:IBM 2832 98F)(23-12-15:IBM 2833 980)(23-12-15:IBM 2833 981)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 982)(23-12-15:IBM 2833 98B)(23-12-15:IBM 2833 98E)(23-12-15:IBM 2833 98F)(23-12-15:IBM 2834 982)(23-12-15:IBM 2834 98B)(23-12-15:IBM 2834 98F)(14-04-16:IBM 2423 961)(28-04-16:IBM 2421 961)(28-04-16:IBM 2421 96E)(28-04-16:IBM 2422 961)(28-04-16:IBM 2422 96E)(28-04-16:IBM 2423 96E)(28-04-16:IBM 2424 961)(28-04-16:IBM 2424 96E)(25-09-17:IBM 9835 415)(25-09-17:IBM 9837 415)(25-09-17:IBM 9836 415)(25-09-17:IBM 9838 415)(25-09-17:IBM 9840 AE2)(25-09-17:IBM 9843 AE2)(25-09-17:IBM 9846 AE2)(25-09-17:IBM 9848 AE2)

Produto:	Unidade de processamento digital, de grande capacidade, baseada em microprocessadores
Processo MCT/Data:	01200.006627/2007-65 de 22/11/2007
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	719, de 02/10/2008 DOU 06/10/2008 ()
Modelos:	IBM 9117 570(05-01-09: IBM 9117-MMA)(13-05-09: IBM 8234 EMA - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE)(15-03-10: IBM 9117 MMB - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE)(15-03-10: IBM 9179 MHB - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE)(15-03-10: IBM 8233 E8B - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE)(06-12-11: IBM 9117 MMC GRANDE CAPACIDADE) (06-12-11: IBM 9179 MHC GRANDE CAPACIDADE)(13-09-12: IBM 9117 MMD - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE) (13-09-12: IBM 9179 MHD - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE) (08-11-12: IBM X3850 X5 - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE) (08-11-12: IBM X3950 X5 - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE) (27-02-13: IBM 8408 E8D - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE) (27-02-13: IBM 9109 RMD - UNIDADE DIGITAL DE PROCESSAMENTO DE GRANDE CAPACIDADE)(19-02-14: IBM X3850 X6) (14-03-14: UCSB - B200 M3) (14-03-14: UCSB - B420 M3) (14-03-14: UCSC - C220 M3) (14-03-14: UCSC - C240 M3) (14-03-14: N20 - C6508) (15-09-14: IBM 2828 H06) (15-09-14: IBM 2828 H13) (24-10-14: IBM 9119 MME) (24-10-14: IBM 9119 MHE) (24-12-14: UCSB-5108-AC2-U-BR) (25-03-15: UCSC- C240 M4) (25-03-15: UCSC- C220 M4) (25-03-15: UCSB- B200 M4) (25-03-15: UCSC- C240 M4) (25-03-15: UCSC- C220 M4) (25-03-15: UCSB- B200 M4) (25-05-15: IBM 8408 E8E) (14-09-15: UCSB- B420 M4)(14-03-16: IBM 2965 N10) (14-03-16: IBM 2965 N20) (14-03-16: IBM 2965 L10) (14-03-16: IBM 2965 L20) (16-09-16: IBM 9080 MME) (16-09-16: IBM 9080 MHE) (07-10-16: IBM 8408 44E) (17-10-16: UCS-BR-C240M4-E1) (17-10-16: UCS-BR-C240M4-E2) (17-10-16: UCS-BR-C240M4-V1) (17-10-16: UCS-BR-C240M4-V2) (17-10-16: UCS-BR-C240M4-P1) (18-10-16: HX240C-M4SX-BR) (18-10-16: HX220C-M4S-BR) (27-07-17: HXAF240C-M4SX-BR) (27-07-17: HXAF220C-M4S-BR) (03-11-17: FUSIONCUBE 2000) (29-11-17: UCSB-B200-M5-U-BR) (06-04-18: UCSC-C240-M5) (06-04-18: UCSC-C220-M5) (10-05-18: IBM 3907 ZR1) (10-05-18: IBM 3907 LR1) (31-07-18: GRD DL360) (31-07-18: GRD DL580) (31-07-18: GRD SIMPLIVITY 380) (31-07-18: GRD DL380) (31-07-18: GRD DL560) (31-07-18: GRD CS500) (17-08-18: UCSC-C240-M5L-BR) (17-08-18: UCSC-C220-M5L-BR) (30-08-18: IBM 9080 M9S) (30-08-18: IBM 9222 80H) (30-08-18: IBM 9040 MR9) (30-08-18: IBM 9225 50H) (19-09-18: C240 M5) (19-09-18: C220 M5) (28-08-19: HX-B200-M5-U-BR) (28-08-19: HX-C220-M5SX-BR) (29-08-19: GRD SY660) (29-08-19: GRD SY480) (19-09-19: HX-E-220M5SX-BR) (30-09-19: IBM 9009-42A) (30-10-19: GRD DX360) (30-10-19: GRD DX380) (30-10-19: GRD DX560) (26-12-19: HX-C240-M5SX-BR) (26-12-19: HX-C240-M5L-BR) (26-12-19: HX-C220-M5L-BR) (15-04-20: HX240C-M5L-BR) (01-06-20: IBM 8562 T02) (01-06-20: IBM 8562 LT2) (01-06-20: IBM 8562 GT2) (12-01-21: UCSC-C240-M5SN-BR (5030)) (05-10-21: IBM 9080 HEX) (26-11-21: UCSB-B200-M6-U-BR) (01-08-22: IBM 9043 MRX) (09-05-23: IBM 3932 LA2) (09-05-23: IBM 3932 A02) (09-05-23: IBM 3932 AGZ) (09-05-23: IBM 3932 AGL)

Produto:	Unidade de processamento digital, de média capacidade, baseada em microprocessadores
Processo MCT/Data:	01200.006627/2007-65 de 22/11/2007
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	719, de 02/10/2008 DOU 06/10/2008 ()
Modelos:	IBM 9117 570; (05-01-09: IBM X3950)(05-01-09: IBM 9117-MMA)(08-01-09: IBM X3950 M2 - UNIDADE DE PROCESSAMENTO DIGITAL, DE MÉDIA CAPACIDADE, BASEADA EM MICROPROCESSADOR)(08-01-09: IBM X3850 M2 - UNIDADE DE PROCESSAMENTO DIGITAL, DE MÉDIA CAPACIDADE, BASEADA EM MICROPROCESSADOR)(13-05-09: IBM 8234 EMA - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE)(15-03-10: IBM 9117 MMB - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE)(15-03-10: IBM 9179 MHB - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE)(15-03-10: IBM 8233 E8B - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE) (20-04-10: IBM X3850 X5 - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE)(20-04-10: IBM X3950 X5 - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE)(28-10-11: IBM 9117 MMC) (28-10-11: IBM 9179 MHC) (13-09-12: IBM 9117 MMD - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE) (13-09-12: IBM 9179 MHD - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE) (13-09-12: IBM X3750 M4 - UNIDADE DE PROCESSAMENTO DIGITAL, DE MÉDIA CAPACIDADE, BASEADA EM MICROPROCESSADORES) (13-09-12: IBM FLEX SYSTEM X440 - UNIDADE DE PROCESSAMENTO DIGITAL, DE MÉDIA CAPACIDADE, BASEADA EM MICROPROCESSADORES) (26-02-13: IBM FLEX SYSTEM X240) (26-02-13: IBM FLEX SYSTEM X220) (27-02-13: IBM 9109 RMD - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE) (27-02-13: IBM 8408 E8D - UNIDADE DIGITAL DE PROCESSAMENTO DE MÉDIA CAPACIDADE)(17-02-14: IBM X3650 M4 BD) (19-02-14: IBM X3850 X6) (12-03-14: IBM BLADE HX5) (14-03-14: UCSB -B200 M3) (14-03-14: UCSB - B420 M3) (14-03-14: UCSC - C220 M3) (14-03-14: UCSC - C240 M3) (14-03-14: N20 -C6508) (16-03-14: HP Z230 WORKSTATION) (16-03-14: HP Z420 WORKSTATION) (16-03-14: HP Z620 WORKSTATION) (16-03-14: HP Z820 WORKSTATION) (16-03-14: HP Z230 WORKSTATION) (16-03-14: HP Z420 WORKSTATION) (16-03-14: HP Z620 WORKSTATION) (16-03-14: HP Z820 WORKSTATION) (16-03-14: HP Z230 WORKSTATION) (16-03-14: HP Z420 WORKSTATION) (16-03-14: HP Z620 WORKSTATION) (16-03-14: HP Z820 WORKSTATION) (16-03-14: HP Z230 WORKSTATION) (16-03-14: HP Z420 WORKSTATION) (16-03-14: HP Z620 WORKSTATION) (16-03-14: HP Z820 WORKSTATION)(15-10-14: HP Z440 WORKSTATION) (15-10-14: HP Z640 WORKSTATION) (15-10-14: HP Z840 WORKSTATION)(24-10-14: IBM 9119 MME) (24-10-14: IBM 9119 MHE) (24-12-14: UCSB-5108-AC2-U-BR) (25-03-15: UCSC- C240 M4) (25-03-15: UCSB- B200 M4) (25-03-15: UCSC- C220 M4) (25-03-15: UCSC- C240 M4) (25-03-15: UCSB- B200 M4) (25-03-15: UCSC- C220 M4) (25-05-15: IBM 8408 E8E) (14-09-15: UCSB- B420 M4)(16-09-16: IBM 9080 MME) (16-09-16: IBM 9080 MHE) (07-10-16: IBM 8408 44E) (17-10-16: UCS-BR-C240M4-V2) (17-10-16: UCS-BR-C240M4-E1) (17-10-16: UCS-BR-C240M4-E2) (17-10-16: UCS-BR-C240M4-V1) (17-10-16: UCS-BR-C240M4-P1) (18-10-16: HX220C-M4S-BR) (18-10-16: HX240C-M4SX-BR) (04-01-17: IXION FLASH RACK) (04-01-17: IXION EXTENDED) (04-01-17: IXION RACK) (30-05-17: RH2288H V3) (30-06-17: INDUS FLASH RACK) (30-06-17: PDBB EXTENDED) (30-06-17: INDUS EXTENDED) (30-06-17: INDUS SKYLAKE) (27-07-17: HXAF220C-M4S-BR) (27-07-17: HXAF240C-M4SX-BR) (30-08-17: FUSIONCUBE 2000) (29-11-17: UCSB-B200-M5-U-BR) (22-02-18: RH2288H V5) (06-04-18: UCSC-C220-M5) (06-04-18: UCSC-C240-M5) (31-07-18: MED DL560) (31-07-18: MED BL460C) (31-07-18: MED CS500) (31-07-18: MED DL360) (31-07-18: MED DL380) (31-07-18: MED DL580) (31-07-18: MED ML350) (31-07-18: MED SY480) (31-07-18: MED SY660) (31-07-18: MED SIMPLIVITY 380) (17-08-18: UCSC-C220-M5L-BR) (17-08-18: UCSC-C240-M5L-BR) (30-08-18: IBM 9080 M9S) (30-08-18: IBM 9225 50H) (30-08-18: IBM 9040 MR9) (30-08-18: IBM 9222 80H) (19-09-18: C220 M5) (19-09-18: C240 M5) (08-02-19: INDUS FLASH RACK II) (08-02-19: INDUS FLASH EXTENDED I) (08-02-19: INDUS FLASH EXTENDED II) (08-02-19: INDUS FLASH EXTENDED III) (28-08-19: HP Z8 G4) (28-08-19: HX-B200-M5-U-BR) (28-08-19: HX-C220-M5SX-BR) (19-09-19: HX-E-220M5SX-BR) (30-09-19: IBM 9009-42A) (30-10-19: MED DX360) (30-10-19: MED DX380) (30-10-19: MED DX560) (26-12-19: HX-C240-M5SX-BR) (26-12-19: HX-C240-M5L-BR) (15-04-20: HX240C-M5L-BR) (07-07-20: MED DL20) (07-12-20: UCSC-C240-M5SN-BR (5020)) (05-10-21: IBM 9080 HEX) (26-11-21: UCSB-B200-M6-U-BR) (01-08-22: IBM 9043 MRX) (08-05-23: HP Z8 G5)

Produto:	Unidade de processamento digital, de muito grande capacidade, baseada em microprocessadores
Processo MCT/Data:	01200.006627/2007-65 de 22/11/2007
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	719, de 02/10/2008 DOU 06/10/2008 ()
Modelos:	IBM 9117 570(22-12-08: IBM 9119-FHA)(22-12-08: IBM 9117-MMA)(05-01-09: IBM 2094 S08)(05-01-09: IBM 2094 S18)(05-01-09: IBM 9119 595)(05-01-09: IBM 2094 S28)(05-01-09: IBM 2094 S38)(05-01-09: IBM 2094 S54)(05-01-09: IBM 2096 S07)(05-01-09: IBM 2096 R07)(05-01-09: IBM 9119 590)(05-01-09: IBM 2098 E10 - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(05-01-09: IBM 2097-EXX (E12/E26/E40/E56/E64))(13-05-09: IBM 8234 EMA - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(15-03-10: IBM 9117 MMB - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(15-03-10: IBM 9179 MHB - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(15-03-10: IBM 8233 E8B - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(28-07-10: IBM 2817 - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(31-08-10: IBM 9119 FHB - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (28-10-10: IBM 2817 M15) (28-10-10: IBM 2817 M32) (28-10-10: IBM 2817 M49) (28-10-10: IBM 2817 M66) (28-10-10: IBM 2817 M80) (22-07-11: IBM 2818 M05- UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (22-07-11: IBM 2818 M10- UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (06-12-11: IBM 9179 MHC MUITO GRANDE CAPACIDADE) (06-12-11: IBM 9117 MMC MUITO GRANDE CAPACIDADE) (26-08-12: IBM 2827 H43 - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (26-08-12: IBM 2827 H20 - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (26-08-12: IBM 2827 H66- UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (26-08-12: IBM 2827 H89- UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (26-08-12: IBM 2827 HA1- UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(13-09-12: IBM 9117 MMD - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (13-09-12: IBM 9179 MHD - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (27-02-13: IBM 8408 E8D - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (27-02-13: IBM 9109 RMD - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (09-08-13: IBM 2828 H06 - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE) (09-08-13: IBM 2828 H13 - UNIDADE DIGITAL DE PROCESSAMENTO DE MUITO GRANDE CAPACIDADE)(14-03-14: UCSB-B200 M3) (14-03-14: UCSB-B420 M3) (14-03-14: UCSC-C220 M3) (14-03-14: UCSC-C240 M3) (14-03-14: N20 -C6508) (24-10-14: IBM 9119 MME) (24-10-14: IBM 9119 MHE) (24-12-14: UCSB-5108-AC2-U-BR) (28-01-15: IBM 2964 N30) (28-01-15: IBM 2964 N63) (28-01-15: IBM 2964 N96) (28-01-15: IBM 2964 NC9) (28-01-15: IBM 2964 NE1) (25-03-15: UCSC- C240 M4) (25-03-15: UCSB- B200 M4) (25-03-15: UCSC- C220 M4) (25-03-15: UCSC- C240 M4) (25-03-15: UCSB- B200 M4) (25-03-15: UCSC- C220 M4) (25-05-15: IBM 8408 E8E) (14-09-15: UCSB- B420 M4)(29-02-16: IBM 2964 L30) (29-02-16: IBM 2964 L63) (29-02-16: IBM 2964 L96) (29-02-16: IBM 2964 LC9) (29-02-16: IBM 2964 LE1) (14-03-16: IBM 2965 N10) (14-03-16: IBM 2965 N20) (14-03-16: IBM 2965 L10) (14-03-16: IBM 2965 L20) (16-09-16: IBM 9080 MME) (16-09-16: IBM 9080 MME) (16-09-16: IBM 9080 MHE) (07-10-16: IBM 8408 44E) (17-10-16: UCS-BR-C240M4-P1) (17-10-16: UCS-BR-C240M4-V1) (17-10-16: UCS-BR-C240M4-E2) (17-10-16: UCS-BR-C240M4-V2) (17-10-16: UCS-BR-C240M4-E1) (18-10-16: HX240C-M4SX-BR) (18-10-16: HX220C-M4S-BR) (27-07-17: HXAF240C-M4SX-BR) (27-07-17: HXAF220C-M4S-BR) (02-08-17: IBM 3906 M01) (02-08-17: IBM 3906 M02) (02-08-17: IBM 3906 M03) (02-08-17: IBM 3906 M04) (02-08-17: IBM 3906 M05) (02-08-17: IBM 3906 LM1) (02-08-17: IBM 3906 LM2) (02-08-17: IBM 3906 LM3) (02-08-17: IBM 3906 LM4) (02-08-17: IBM 3906 LM5) (29-11-17: UCSB-B200-M5-U-BR) (20-12-17: FUSIONCUBE 2000) (06-04-18: UCSC-C240-M5) (06-04-18: UCSC-C220-M5) (10-05-18: IBM 3907 ZR1) (10-05-18: IBM 3907 LR1) (17-08-18: UCSC-C240-M5L-BR) (17-08-18: UCSC-C220-M5L-BR) (17-08-18: IBM 3907 ZR1) (17-08-18: IBM 3907 LR1) (30-08-18: IBM 9040 MR9) (30-08-18: IBM 9225 50H) (30-08-18: IBM 9080 M9S) (30-08-18: IBM 9222 80H) (19-09-18: C240 M5) (19-09-18: C220 M5) (23-04-19: MGD DL560) (23-04-19: MGD DL380) (26-08-19: MGD DL580) (28-08-19: HX-C220-M5SX-BR) (28-08-19: HX-B200-M5-U-BR) (19-09-19: HX-E-220M5SX-BR) (30-09-19: IBM 8561 LT1) (30-09-19: IBM 9009-42A) (30-09-19: IBM 8561 T01) (26-12-19: HX-C240-M5SX-BR) (26-12-19: HX-C220-M5L-BR) (26-12-19: HX-C240-M5L-BR) (26-12-19: HX240C-M5L-BR) (01-06-20: IBM 8562 T02) (01-06-20: IBM 8562 LT2) (01-06-20: IBM 8562 GT2) (12-01-21: UCSC-C240-M5SN-BR (5040)) (05-10-21: IBM 9080 HEX) (17-11-21: IBM 8562 T02) (17-11-21: IBM 8562 LT2) (17-11-21: IBM 8562 GT2) (26-11-21: UCSB-B200-M6-U-BR) (20-04-22: IBM3931A01) (14-07-22: IBM 3931 LA1) (01-08-22: IBM 9043 MRX) (10-05-23: IBM 3932 LA2) (10-05-23: IBM 3932 A02) (10-05-23: IBM 3932 AGZ) (10-05-23: IBM 3932 AGL)

Produto:	Unidade de processamento digital, de pequena capacidade, baseada em microprocessador, com unidade de saída por vídeo e de entrada por painel sensível ao toque
Processo MCT/Data:	01200.000847/2014-12 de 25/02/2014
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	620, de 13/06/2014 DOU 16/06/2014 ()
Modelos:	(01-07-14: HP ENVY TS 23-K000BR AIO PC BRZL) (01-07-14: HP PAVILION TS 23-H000BR AIO PC BRZL) (15-09-14: HP ENVY TS 23-K300BR AIO PC BRZL) (15-09-14: HP ENVY TS 23-K301BR AIO PC BRZL) (15-09-14: HP PAVILION 23-P100BR ALL-IN-ONE PC BRZL)

Produto:	Unidade de processamento digital, de pequena capacidade, baseada em microprocessador, com unidade de saída por vídeo incorporada
Processo MCT/Data:	01200.003872/2009-82 de 21/10/2009
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	714, de 14/09/2010 DOU 16/09/2010 ()
Modelos:	LENOVO ALL-IN-ONE IDEACENTRE A300 (SAMUI)(11-02-11: THINKCENTRE A70Z) (07-12-11: THINKCENTRE EDGE 71Z) (22-08-12: TC EDGE 72Z)(22-11-13: HP ELITEONE 800 G1 AIO BUSINESS PC) (17-12-13: HP COMPAQ PRO 4300 AIO BUSINESS PC) (11-03-14: HP 18-5000BR AIO PC BRZL) (11-03-14: HP PAVILION 20-B410BR AIO PC BRZL) (11-03-14: HP PAVILION 23-G000BR ALL-IN-ONE PC BRZL) (11-03-14: HP PAVILION 23-G005BR ALL-IN-ONE PC BRZ) (11-03-14: HP 205 G1 AIO) (11-03-14: HP PROONE 400 G1 AIO) (12-03-14: HP PAVILION 23-G005BR ALL-IN-ONE PC BRZL) (12-03-14: HP PAVILION 23 ALL-IN-ONE PC) (12-03-14: HP PAVILION 20 ALL-IN-ONE PC) (12-03-14: HP 18 ALL-IN-ONE PC) (25-06-14: HP PAVILION 23-G001BR ALL-IN-ONE PC BRZL) (15-09-14: HP 18-5200BR AIO PC BRZL) (05-11-14: HP 19-2200BR ALL-IN-ONE PC BRZL) (05-11-14: HP PAVILION 23-G200BR AIO PC BRZL) (05-11-14: HP PAVILION 23-G205BR AIO PC BRZL) (30-06-15: HP 18-5600BR AIO PC BRZL) (08-09-15: HP 23-R100BR AIO PC BRZL) (08-09-15: HP 23-R101BR AIO PC BRZL) (08-09-15: HP 22-3100BR AIO PC BRZL) (08-09-15: HP 22-3101BR AIO PC BRZL) (01-10-2015 MODELO: HP 20-E001BR AIO PC BRZL) (01-10-15 HP 20-E002BR AIO PC BRZL)(22-10-15: HP 20-E003BR AIO PC BRZL)(11-02-16: HP 22-3104BR AIO PC BRZL) (01-11-19: ALL IN ONE PRESARIO CQ-A1)

Produto:	Unidade de processamento digital, de pequena capacidade, baseada em microprocessadores
Processo MCT/Data:	01200.000731/2003-12 de 19/03/2003
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	279, de 26/05/2003 DOU 28/05/2003 ()

Modelos:	FLX-111; FLX-121; FLX-122; FLX-123; FLX-124; FLX-125; FLX-126; FLX-127; FLX-211; FLX-212; FLX-213; FLX-221; FLX-222; FLX-223; TERMINAL TLX 400 ? WEB; TERMINAL TLX 401 ? WEB; TERMINAL TLX 402 ? WEB; TERMINAL TLX 403 ? WEB; FLX-300; FLX-301; FLX-302; FLX-303; FLX-304; FLX-305; FLX-306; FLX-307; FLX-308.(23-06-08: L3K E100)(10-09-08: IBM X3550 M2)(10-09-08: IBM X3650 M2)(02-10-08: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC A62)(05-01-09: TC M58P)(05-01-09: IBM X3400 M2 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(05-01-09: UNIDADES DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR 5632)(05-01-09: IBM X3800 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(05-01-09: IBM X3850 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(05-01-09: IBM X3500)(05-01-09: IBM X3550)(05-01-09: IBM X3400)(05-01-09: IBM X3650)(05-01-09: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC A61)(05-01-09: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR L3K J200)(05-01-09: TC M57E)(05-01-09: TC A57)(05-01-09: IBM BLADE HS12)(05-01-09: TC M58)(05-01-09: IBM X3500 M2 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: IBM X3655 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: IBM X3455 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC A55)(08-01-09: IBM X3950 M2 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: IBM X3755 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M55E)(08-01-09: IBM BLADE LS41 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: IBM BLADE HS - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: IBM X3850 M2 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: IBM X3200 M2 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(08-01-09: IBM BLADE LS21 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(12-01-09: TC M57)(12-01-09: TC M57P)(14-05-09: LENOVO E200)(14-05-09: IBM BLADE LS)(24-06-09: TC M58E)(09-12-09: IBM X3200 M3)(23-02-10: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M90)(15-03-10: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M90P)(09-04-10: IBM X3550 M3 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(09-04-10: IBM X3650 M3 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(09-04-10: IBM X3400 M3 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(09-04-10: IBM X3500 M3 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(09-04-10: IBM X3950 X5 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(09-04-10: IBM X3850 X5 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(06-05-10: IBM BLADE H5X - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(06-05-10: IBM X3690 X5 - UNIDADE DIGITAL DE PROCESSAMENTO DE MéDIA CAPACIDADE)(28-05-10: IBM BLADE HX5 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR)(28-05-10: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC A63)(22-07-10: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC A70)(23-08-10: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M70E) (22-09-10: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M75) (15-10-10: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M75E) (24-03-11: TC M91P) (24-03-11: TC M91) (26-04-11: TC M76) (06-05-11: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M81) (08-07-11: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR LENOVO H420) (08-07-11: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC EDGE71) (28-10-11: IBM X3100 M4) (28-10-11: THINKCENTRE EGDE 91) (30-03-12: IBM X3500 M4 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (30-03-12: IBM X3650 M4 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (30-03-12: IBM X3550 M4 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (18-05-12: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M92) (18-05-12: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR TC M92P) (11-06-12: IBM X3630 M4 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (11-06-12: IBM X3530 M4 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (12-06-12: IBM BLADE HS23E - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (12-06-12: UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR THINKCENTRE EDGE 92) (25-06-12: IBM X3750 M4 - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (02-08-12: MICROCOMPUTADOR THINKCENTRE M92P) (06-08-12: THINKCENTRE EDGE72) (30-08-12: IBM FLEX SYSTEM X440 - UNIDADE DIGITAL DE PROCESSAMENTO) (30-08-12: IBM FLEX SYSTEM X240 - UNIDADE DIGITAL DE PROCESSAMENTO) (30-08-12: IBM FLEX SYSTEM X220 - UNIDADE DIGITAL DE PROCESSAMENTO) (09-08-13: IBM FLEX SYSTEM X222 - UNIDADE DIGITAL DE PROCESSAMENTO)(30-09-13: IBM X3650 M4 HD - UNIDADE DIGITAL DE PROCESSAMENTO PARA MICROCOMPUTADOR) (22-11-13: HP Z420 WORKSTATION) (22-11-13: HP Z620 WORKSTATION) (22-11-13: HP Z820 WORKSTATION) (22-11-13: HP Z230 WORKSTATION) (22-11-13: HP PRODESK 600 G1 SFF BUSINESS PC) (22-11-13: HP ELITEDESK 800 G1 SFF BUSINESS PC) (17-12-13: HP COMPAQ PRO 4300 SFF BUSINESS PC) (17-12-13: HP COMPAQ PRO 6300 MT BUSINESS PC) (17-12-13: HP COMPAQ PRO 6305 MT BUSINESS PC) (17-12-13: HP COMPAQ PRO 6305 SFF BUSINESS PC) (17-12-13: HP COMPAQ ELITE 8300 SFF BUSINESS PC) (03-02-14: IBM NEXTSCALE NX360 M4) (03-02-14: IBM X3650 M4 BD) (19-02-14: IBM X3850 X6) (12-03-14: HP 402 G1 SFF BUSINESS PC) (14-03-14: UCSB- B200 M3) (14-03-14: UCSB- B420 M3) (14-03-14: UCSC- C220 M3) (14-03-14: UCSC- C240 M3) (14-03-14: N20-C6508) (28-05-14: HP ELITEDESK 800 G1 DM) (28-05-14: HP PRODESK 600 G1 DM)(11-09-14: HP ELITEDESK 700 G1 SFF BUSINESS PC)(13-10-14: HP ELITEDESK 705 G1 SFF BUSINESS PC) (15-10-14: HP Z440 WORKSTATION) (15-10-14: HP Z640 WORKSTATION) (15-10-14: HP Z840 WORKSTATION) (24-12-14: HP ELITEDESK 705 G1 DM) (24-12-14: UCSB-5108-AC2-U-BR) (25-03-15: UCSC- C220 M4) (25-03-15: UCSB- B200 M4) (25-03-15: UCSC- C240 M4) (25-03-15: UCSC- C220 M4) (25-03-15: UCSB- B200 M4) (25-03-15: UCSC- C240 M4) (01-04-15: HP 260 G1 DM) (14-09-15: UCSB- B420 M4) (01-10-15: HP 200 G1 SLIM TOWER BUSINESS PC)(12-11-15: HP PRODESK 600 G2 SFF) (12-11-15: HP ELITEDESK 800 G2 SFF)(23-12-15: HP ELITEDESK 800 G2 DM 65W) (23-12-15: HP ELITEDESK 800 G2 DM 35W) (11-01-16: HP ELITEDESK 705 G2 SFF) (22-01-16: HP ELITEDESK 705 G2 DM) (22-01-16: HP PRODESK 400 G3 SFF) (18-02-16: HP PRODESK 400 G2 DM) (18-03-16: HP WORKSTATION Z240 TOWER BRZL) (10-08-16: HP 260 G1 DM) (11-08-16: HP ELITEDESK 705 G2 DM) (11-08-16: HP ELITEDESK 800 G2 DM 35W) (11-08-16: HP ELITEDESK 800 G2 DM 65W) (24-08-16: HP PRODESK 400 G2 DM) (24-08-16: COMPAQ PRESARIO CQ-14) (17-10-16: UCS-BR-C240M4-P1) (17-10-16: UCS-BR-C240M4-V2) (17-10-16: UCS-BR-C240M4-V1) (17-

	10-16: UCS-BR-C240M4-E2) (17-10-16: UCS-BR-C240M4-E1) (18-10-16: HX240C-M4SX-BR) (18-10-16: HX220C-M4S-BR) (27-10-16: HP WORKSTATION Z240 TOWER BRZL) (27-10-16: HP Z440 WORKSTATION) (11-11-16: HP ELITEDESK 705 G3 DM) (11-11-16: HP ELITEDESK 705 G3 SFF) (17-02-17: HP PRODESK 400 G4 SFF) (03-03-17: HP ELITEDESK 800 G3 SFF) (27-04-17: HP ELITEDESK 800 G3 DM) (27-04-17: HP PRODESK 400 G3 DM) (30-05-17: RH2288H V3) (27-07-17: HXAF240C-M4SX-BR) (27-07-17: HXAF220C-M4S-BR) (02-08-17: COMPAQ PRESARIO CQ-14) (30-08-17: FUSIONCUBE 2000) (20-10-17: HP ELITEDESK 705 G3 SFF) (29-11-17: UCSB-B200-M5-U-BR) (08-02-18: HP Z4 G4 WORKSTATION)(22-02-18: RH2288H V5) (06-04-18: UCSC-C240-M5) (06-04-18: UCSC-C220-M5) (05-07-18: HP PRODESK 285 G3 MT) (31-07-18: HP DESKTOP PRO A MT) (31-07-18: PEQ SY660) (31-07-18: PEQ SY480) (31-07-18: PEQ BL460C) (31-07-18: PEQ DL560) (31-07-18: PEQ DL360) (31-07-18: PEQ DL380) (31-07-18: PEQ ML350) (17-08-18: UCSC-C240-M5L-BR) (17-08-18: UCSC-C220-M5L-BR) (17-08-18: HP ELITEDESK 800 G4 SFF) (17-08-18: HP PRODESK 400 G5 SFF) (17-08-18: HP ELITEDESK 800 G4 DM) (10-09-18: HP PRODESK 400 G4 DM) (10-09-18: HP WORKSTATION Z2G4 TOWER BRZL) (10-09-18: HP ELITEDESK 705 G4 DM) (10-09-18: HP ELITEDESK 705 G4 SFF) (19-09-18: C240 M5) (19-09-18: C220 M5) (26-11-18: PEQ SIMPLIVITY 380) (22-01-19: HP DESKTOP PRO G2) (28-08-19: HP Z8 G4) (28-08-19: ELITEDESK 800 G5 DM) (28-08-19: PRODESK 400 G6 SFF) (28-08-19: HX-B200-M5-U-BR) (28-08-19: HX-C220-M5SX-BR) (05-09-19: ELITEDESK 800 G5 SFF) (05-09-19: PRODESK 400 G5 DM) (19-09-19: HX-E-220M5SX-BR) (15-10-19: HX240C-M5L-BR) (16-10-19: PRODESK 600 G5 SFF) (28-10-19: HP Z8 G4) (30-10-19: PEQ DX380) (30-10-19: PEQ DX560) (30-10-19: PEQ DX360) (08-11-19: HX-C220-M5L-BR) (08-11-19: HX-C240-M5L-BR) (29-11-19: HP DESKTOP PRO A G3) (29-11-19: HP DESKTOP PRO G3) (23-12-19: COMPAQ PRESARIO CQ-11) (26-12-19: HX-C240-M5SX-BR) (07-07-20: PEQ DL20) (13-07-20: HP PRODESK 600 G6 SFF) (13-07-20: HP PRODESK 600 G6 SFF) (06-08-20: HP PRODESK 400 G7 SFF) (10-08-20: HP ELITEDESK 800 G6 DM) (26-08-20: HP PRODESK 400 G6 DM) (09-10-20: HP Z2 TWR G5) (13-11-20: HP ELITEDESK 805 G6 SFF) (20-11-20: HP PRODESK 405 G6 DM) (11-12-20: HP ELITEDESK 800 G6 SFF) (12-01-21: UCSC-C240-M5SN-BR) (29-01-21: HP DESKTOP 280 G5 SFF) (23-06-21: HP Z2 TWR G8) (26-11-21: UCSB-B200-M6-U-BR) (09-03-22: ELITE DESK 800 G9 PACMAN) (09-03-22: ELITEDESK 600 G9 GALAXIAN) (14-04-22: HP ELITEDESK 600 G9 DM) (14-04-22: HP ELITEDESK 800 G9 DM) (29-04-22: HP PRODESK 400 G9 SFF) (29-04-22: HP PRODESK 400 G9 DM) (29-04-22: HP ELITEDESK 600 G9 SFF) (29-04-22: HP ELITEDESK 800 G9 SFF) (14-07-22: HP Z2 TOWER G9 WORKSTATION) (09-09-22: HP PRO 280 G9 SFF) (28-04-23: HP Z4 G5 WORKSTATION) (28-04-23: HP Z4 G5 WORKSTATION) (08-05-23: HP Z8 G5) (21-06-23: HP ELITEDESK 600 G9 DM) (21-06-23: HP PRODESK 400 G9 DM) (21-06-23: HP ELITEDESK 600 G9 SFF) (10-07-23: HP ELITEDESK 800 G9 SFF) (10-07-23: HP ELITEDESK 800 G9 DM) (10-07-23: HP PRODESK 400 G9 SFF) (18-08-23: HP PRO 280 G9 SFF)

Produto:	Unidade de saída por vídeo (Monitor de vídeo a LCD)
Processo MCT/Data:	01250.005332/2018-39 de 31/01/2018
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	4000, de 02/08/2018 DOU 31/08/2018 - Produto Transferido da Portaria: 760, de 13/12/2001 DOU 14/12/2001 (http://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?jornal=515&pagina=15&data=31/08/2018)
Modelos:	7VLR; 5E; 4VN; 7VLRA(11-12-17: MONITOR HP V19B) (24-01-18: MONITOR HP V22B) (24-01-18: MONITOR HP V22H) (24-01-18: MONITOR 21,5") (24-01-18: MONITOR 22") (24-01-18: MONITOR HP V24B) (24-01-18: MONITOR HP V24H) (24-01-18: MONITOR 23,6") (24-01-18: MONITOR 24")

Produto:	Unidade de saída por vídeo (monitor), com tubo de raios catódicos, policromática
Processo MCT/Data:	01200.005251/2003-48 de 25/11/2003
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	215, de 11/04/2005 DOU 12/04/2005 ()
Modelos:	P77; EXCAL; MON FLX 01; MON FLX 02

Produto:	Unidade digital de armazenamento de dados em meio magnético
Processo MCT/Data:	01200.006626/2007-11 de 22/11/2007
CNPJ da Incentivada:	74404229000551
Portaria MCT/MDIC/MF:	890, de 01/12/2008 DOU 03/12/2008 ()
Modelos:	IBM 2421 931; IBM 2421 932; IBM 2421 9B2; IBM 2421 92E; IBM2421 9AE;IBM 2422 931; IBM2422 932; IBM 2422 92E; IBM2422 9AE; IBM 24230931; IBM2423 932; IBM2423 92B2;IBM2423 92E; IBM2424 931; IBM2424 932; IBM 2424 9B2;IBM2424 92E; IBM2424 9AE(05-01-09: 1812-81A)(05-01-09: 1814-72A)(05-01-09: 1814-70A)(08-01-09: IBM 2422 9B2 - OUTRAS UNIDADES DE DISCOS MAGNéTICOS)(08-01-09: IBM 2423 9B2 - OUTRAS UNIDADES DE DISCOS MAGNéTICOS)(08-01-09: IBM 2423 9AE - OUTRAS UNIDADES DE DISCOS MAGNéTICOS)(22-10-10: IBM 2421 951) (22-10-10: IBM 2422 951) (22-10-10: IBM 2423 951) (22-10-10: IBM 2424 951 -) (22-10-10: IBM 2421 95E) (22-10-10: IBM 2422 95E) (22-10-10: IBM 2423 95E) (22-10-10: IBM 2424 95E) (08-04-11: X SERIES) (08-04-11: NL SERIES) (13-09-12: IBM 2421 961) (13-09-12: IBM 2424 961) (13-09-12: IBM 2424 96E) (13-09-12: IBM 2421 96E) (13-09-12: IBM 2422 961) (13-09-12: IBM 2422 96E) (13-09-12: IBM 2423 961) (13-09-12: IBM 2423 96E)(22-10-15: IBM 2831 980) (22-10-15: IBM 2831 981) (22-10-15: IBM 2831 982) (22-10-15: IBM 2831 98B) (22-10-15: IBM 2831 98E) (22-10-15: IBM 2831 98F) (22-10-15: IBM 2832 980) (22-10-15: IBM 2832 981) (22-10-15: IBM 2832 982) (22-10-15: IBM 2832 98B) (22-10-15: IBM 2832 98E) (22-10-15: IBM 2832 98F) (22-10-15: IBM 2833 980) (22-10-15: IBM 2833 981) (22-10-15: IBM 2833 982) (22-10-15: IBM 2833 98B) (22-10-15: IBM 2833 98E) (22-10-15: IBM 2833 98F) (22-10-15: IBM 2834 980) (22-10-15: IBM 2834 981) (22-10-15: IBM 2834 982) (22-10-15: IBM 2834 98B) (22-10-15: IBM 2834 98B) (22-10-15: IBM 2834 98E) (22-10-15: IBM 2834 98F)(17-06-16: IBM 2076 524) (17-06-16: IBM 2076 624) (17-06-16: IBM 2076 12F) (17-06-16: IBM 2076 24F) (17-06-16: IBM 2073 720) (11-11-16: IBM 2831 984) (11-11-16: IBM 2831 84E) (11-11-16: IBM 2831 985) (11-11-16: IBM 2831 85B) (11-11-16: IBM 2831 986) (11-11-16: IBM 2831 86E) (11-11-16: IBM 2832 984) (11-11-16: IBM 2832 84E) (11-11-16: IBM 2832 985) (11-11-16: IBM 2832 85B) (11-11-16: IBM 2832 986) (11-11-16: IBM 2832 86E) (11-11-16: IBM 2833 984) (11-11-16: IBM 2833 84E) (11-11-16: IBM 2833 985) (11-11-16: IBM 2833 85B) (11-11-16: IBM 2833 986) (11-11-16: IBM 2833 86E) (11-11-16: IBM 2834 984) (11-11-16: IBM 2834 84E) (11-11-16: IBM 2834 985) (11-11-16: IBM 2834 85B) (11-11-16: IBM 2834 986) (11-11-16: IBM 2834 86E) (19-01-17: IBM 2831 85E) (19-01-17: IBM 2832 85E) (19-01-17: IBM 2833 85E) (19-01-17: IBM 2834 85E) (25-09-17: IBM 2076 92F) (25-09-17: IBM 2077 124) (25-09-17: IBM 2077 212) (25-09-17: IBM 2077 224) (25-09-17: IBM 2077 312) (25-09-17: IBM 2077 324) (25-09-17: IBM 2077 12E) (25-09-17: IBM 2077 12F) (25-09-17: IBM 2077 92F) (25-09-17: IBM 2077 A9F) (25-09-17: IBM 2077 AF3) (25-09-17: IBM 2077 AFF) (25-09-17: IBM 2077 24E) (25-09-17: IBM 2077 24F) (25-09-17: IBM 2076 A9F) (25-09-17: IBM 2076 AF6) (25-09-17: IBM 2076 AFF) (25-09-17: IBM 2077 112) (02-10-17: IBM 2145 12F) (02-10-17: IBM 2145 92F) (02-10-17: IBM 2145 SV1) (02-10-17: IBM 2145 24F) (02-10-17: IBM 2147 12F) (02-10-17: IBM 2147 92F) (02-10-17: IBM 2147 SV1) (02-10-17: IBM 2147 24F)

Nome Fantasia:	FLEXTRONICS TECNOLOGIA
Razão Social:	FLEXTRONICS INTERNATIONAL TECNOLOGIA LTDA
CNPJ:	74.404.229/0002-09
Endereço:	Rodovia SP 340 Km 128,7 A Tanquinho Jaguariúna / SP - 18087170
Contato:	Jorge Eduardo Suplicy Funaro jorge.funaro@flextronics.com (54) 2108-8012 www.flextronics.com

Produto:	Acumulador elétrico, próprio para microcomputador portátil
Processo MCT/Data:	01200.001273/2016-53 de 22/04/2016
CNPJ da Incentivada:	74404229000209
Portaria MCT/MDIC/MF:	4569, de 20/10/2012 DOU 24/10/2016 (http://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?jornal=1&pagina=2&data=24/10/2016)
Modelos:	

Produto:	Aparelho de controle de estação rádio base, com funções de comutação, controle e supervisão
Processo MCT/Data:	01200.002331/2013-13 de 07/06/2013
CNPJ da Incentivada:	74404229000209
Portaria MCT/MDIC/MF:	1030, de 03/10/2013 DOU 04/10/2013 - Produto Transferido da Portaria: 838, de 14/12/2001 DOU 17/12/2001 ()
Modelos:	BSSC; XCDR; BSSC Office

Produto:	Aparelho emissor com receptor incorporado de tecnologia celular, próprio para comunicação a partir de máquina de processamento de dados
Processo MCT/Data:	01200.002413/2009-81 de 27/07/2009
CNPJ da Incentivada:	74404229000209
Portaria MCT/MDIC/MF:	343, de 03/05/2010 DOU 04/05/2010 ()
Modelos:	E226; E156; E160

Produto:	Aparelho emissor com receptor incorporado, digital, com tela sensível ao toque, próprio para uso como interface de terminal portátil de telefonia celular
Processo MCT/Data:	01200.004327/2014-71 de 17/09/2014
CNPJ da Incentivada:	74404229000209
Portaria MCT/MDIC/MF:	617, de 28/07/2015 DOU 29/07/2015 ()
Modelos:	(01-04-16: MOTO 360 SPORT)

Produto:	Aparelho emissor com receptor incorporado, digital, de frequência superior ou igual a 6 GHz e taxa de transmissão superior a 34 Mbits/s
Processo MCT/Data:	01200.003630/2014-56 de 07/08/2014
CNPJ da Incentivada:	74404229000209
Portaria MCT/MDIC/MF:	552, de 13/07/2015 DOU 14/07/2015 ()
Modelos:	

Produto:	Aparelho emissor/transmissor com receptor incorporado, digital, padrão "WiFi", do tipo estação base (ponto de acesso)
Processo MCT/Data:	01200.005003/2013-79 de 16/10/2013
CNPJ da Incentivada:	74404229000209
Portaria MCT/MDIC/MF:	851, de 18/08/2014 DOU 19/08/2014 ()
Modelos:	

Produto:	Aparelho Gerenciador de Comunicação de voz para telefonia IP (VOIP)
Processo MCT/Data:	01250.050282/2017-63 de 14/08/2017
CNPJ da Incentivada:	74404229000209
Portaria MCT/MDIC/MF:	5387, de 07/11/2019 DOU 31/01/2020 ()
Modelos:	

Voltar