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DEFINITIVO

Otimização de Sistema Automatizado de Descapsulagem de Rolhas de Cortiça Capsuladas

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Otimização de Sistema Automatizado de Descapsulagem de Rolhas de Cortiça Capsuladas

Relatório de Trabalho de Projeto para a obtenção do grau de Mestre em Engenharia Mecânica

Especialização em Construção e Manutenção de Equipamentos Mecânicos

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RESUMO

A indústria corticeira tem uma importância fulcral na economia nacional portuguesa. A partir da cortiça é possível conceber uma imensa diversidade de produtos para vários setores. De todos os produtos, destacam-se as rolhas de cortiça como sendo o mais produzido em Portugal.

A competitividade no sector rolheiro faz com que as empresas que operam neste ramo se redobrem em esforços para aumentar a sua competitividade, estando constantemente a investir em novos métodos produtivos, com o objetivo de diminuir custos de produção e ganhar alguma vantagem sobre a concorrência.

O presente projeto teve como objetivo concluir o desenvolvimento de um sistema automatizado de descapsulagem de rolhas de cortiça capsuladas. Este equipamento, concebido de raiz no ISEC, por solicitação da empresa Beira Correia Lda, tem vindo a ser desenvolvido por vários grupos de alunos, tendo culminando com a entrega de um protótipo à referida empresa, para que começasse a ser utilizado.

Dada a boa base de trabalho que foi deixada pelos grupos anteriores, no decurso do presente projeto foram realizadas otimizações ao nível do sistema elétrico e eletrónico, na programação do autómato programável, na guia de encaminhamento de rolhas no interior do túnel de aquecimento e no batente fixo de prisão das cápsulas do extrator de rolhas, bem como a elaboração dos esquemas elétricos e pneumáticos e de um manual de utilizador. Deste modo os operadores podem começar a utilizar o equipamento sem ser necessária formação específica.

Por outro lado, e no fim de realizadas as devidas otimizações, houve ainda tempo para pensar no que poderia ser melhorado numa eventual segunda versão do sistema, sendo concebido um conceito de protótipo para um novo extrator de rolhas, bem como apontadas as melhorias que podem ser realizadas no túnel de aquecimento, de modo a estabilizar as temperaturas no interior do mesmo.

Palavras-Chave: Rolhas de cortiça capsuladas, indústria corticeira, descapsulagem, aumento de competitividade, automatização, electropneumática, programação de autómatos

ABSTRACT

The cork industry is of extreme importance for the Portuguese national economy. Many by-products can be extracted from raw cork, in order to be used in a great variety of sectors. Of all these by-products, cork stoppers are by far the most produced in Portugal.

The competitiveness in the cork stoppers sector forces companies to double their efforts in order to increase their competitiveness, by constantly investing in new production methods, with the objective of reducing production costs and gaining an edge over competition.

The main objective of this project was to conclude the development of an automated decapsulation system of capsulated cork stops. This equipment, entirely developed in ISEC, was requested by Beira Correia Ltd. company. Several groups of students developed and a prototype, delivered to the referred company for use and testing.

Given the solid work base done by the preceding groups of students, improvements made to the system were mainly focused on the electric and electronic system, PLC programming, cork stops guide inside the heating tunnel, fixed capsule fixation flap on the cork extractor, elaboration of pneumatic and electrical diagrams and user manual.

Thus, the operators can start using the system right away, without any need of specific qualification.

Bearing in mind an eventual second generation of the system, a virtual concept model of a new cork extractor is presented, as well as some ideas for the improvement of the heating tunnel in order to stabilize its inner temperatures.

Keywords: Capsuled cork stoppers, cork industry, decapsulation, increasing competitiveness, automation, electro pneumatics, PLC programming

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SIMBOLOGIA E ABREVIATURAS

2D – Duas dimensões

3D – Três dimensões

APCOR – Associação Portuguesa da Cortiça

CAD – Desenho assistido por computador

DC – Corrente contínua

PTFE – Politetrafluoretileno

1 INTRODUÇÃO

A indústria corticeira tem uma importância estratégica para Portugal, sendo o líder mundial na produção e exportação de produtos derivados da cortiça. Muita dessa exportação deve-se ao facto de a indústria corticeira se ter vindo a reinventar ao longo dos anos, não se cingindo apenas à produção de rolhas de cortiça para a indústria vinícola. Atualmente, além da indústria corticeira, a cortiça é também utilizada na produção de artigos de decoração, artigos de moda, isolamentos de vários níveis, desde aplicações domésticas até aplicações na indústria aeroespacial, passando pela indústria automóvel, entre outras.

Segundo dados da APCOR - Associação Portuguesa da Cortiça, a indústria corticeira representa 1% do total das exportações portuguesas, o que equivale a um saldo de 816 milhões de euros na balança comercial portuguesa. Se compararmos com as exportações de produtos de cortiça dos restantes países, Portugal tem uma quota de exportação 63% de todos os produtos de cortiça exportados em todo o mundo, o que equivale a 986 milhões de euros, o que mostra bem o domínio de Portugal neste setor. De todos os produtos de cortiça exportados em todo o mundo, as rolhas são o principal produto, com 72% de quota de exportações, o que equivale a 710,7 milhões de euros, mostrando assim o claro domínio do subsetor rolheiro na indústria corticeira. De seguida vem o subsetor dos materiais de construção e decoração, que representa 25% da quota de exportações mundiais de cortiça, representando um valor de 246,8 milhões de euros.

Relativamente ao destino dos produtos de cortiça exportados por Portugal, 95% destes têm como destino 130 países diferentes, sendo que, de todos estes produtos, 70% têm como destino o continente europeu.

Os principais clientes da indústria corticeira portuguesa são a França, que representa um saldo anual de 174 milhões de euros em rolhas de cortiça, enquanto a Alemanha é o principal cliente dos produtos de construção e decoração, com um saldo anual de 50 milhões de euros.

Relativamente à posição da indústria corticeira no mercado de trabalho, em Portugal existem 685 empresas doeste setor, criando 8310 postos de trabalho diretos, sendo 49% destes destinados a mão-de-obra qualificada. A esmagadora maioria das empresas deste ramo (80%) situam-se na região entre Douro e Vouga (APCOR, 2020).

As empresas da indústria rolheira – principal subsetor da indústria corticeira – procuram aumentar constantemente a sua competitividade, investindo em equipamentos cada vez mais modernos e com maiores capacidades de produção. Uma das lacunas ainda existente consiste no facto de as rolhas de cortiça capsuladas, que não cumpram com os requisitos de qualidade da empresa, sejam ainda separadas da cápsula de forma manual, para que possam ser reaproveitadas. Esta situação

permitiu identificar um ponto onde se pode ainda aumentar a competitividade, bastando para tal a criação de um novo equipamento capaz de executar este processo de forma autónoma e automatizada.

2 ENQUADRAMENTO

Este capítulo enquadra o projeto desenvolvido, o qual nasceu da necessidade da empresa Beira Correia Lda, que opera no setor rolheiro, aumentar a sua competitividade. Esta empresa solicitou a colaboração do ISEC no desenvolvimento de um sistema automatizado de descapsulagem mecânica de rolhas de cortiça capsuladas, tarefa atualmente desempenhada de forma manual por um funcionário da empresa.

A inovação do sistema consiste na realização, de forma automatizada, de uma tarefa que anteriormente era realizada manualmente por um funcionário da empresa, evitando uma função monótona e rotineira. Esta função seguramente iria causar problemas de saúde ao referido funcionário, devido a várias horas em posturas pouco ergonómicas, nomeadamente doenças inflamatórias e lesões músculo-esqueléticas. A eliminação desta função terá também um efeito positivo na moral do funcionário, pois este passará a desempenhar outras tarefas menos rotineiras.

O sistema desenvolvido permite fazer o pré-aquecimento da cola que une a cápsula à rolha de cortiça capsulada e de seguida efetuar a separação destes dois componentes. Deste modo é possível reutilizar as rolhas de cortiça que tenham sido produzidas, mas que não cumpram os padrões de qualidade.

Este sistema permitirá ainda aumentar a produtividade da empresa através da automatização do processo de separação das rolhas, e a reciclagem das rolhas de cortiças e cápsulas rejeitadas.

Até chegar à fase descrita neste relatório, o projeto passou por diversas etapas, nomeadamente, estudo da temperatura ideal da cola para que ocorresse a separação entre cortiça e cápsula, conceção dos primeiros protótipos, seleção de componentes, construção da estrutura de suporte, instalação do túnel de aquecimento, programação do autómato programável, ligações elétricas e pneumáticos.

O presente relatório diz respeito à etapa final do projeto, que consistiu na resolução de problemas remanescentes de todas as etapas anteriores, que surgiram aquando dos testes de funcionamento, bem como na otimização final do sistema, para que se pudesse considerar pronto a entregar à empresa. As otimizações incluíram a alteração de componentes já existentes, que necessitavam de melhoria, a completa reformulação da parte elétrica e do programa de controlo do sistema inserido no autómato programável, bem como a adição de novos componentes, que estavam em falta, mas que eram importantes para a colocação do sistema em serviço em ambiente industrial.

O sistema foi finalmente enviado para a empresa, onde foi testado em ambiente industrial, tendo o seu funcionamento sido validado. Foi apenas solicitada pela empresa, e já efetuada, uma alteração ao programa de controlo, a qual será descrita em pormenor no Capítulo 5 “Programação do autómato”.

3 CARACTERIZAÇÃO DO SISTEMA AUTOMATIZADO DE DESCAPSULAGEM DE ROLHAS DE CORTIÇA CAPSULADAS

O sistema desenvolvido tem como objetivo efetuar a separação mecânica de ambos os constituintes de rolhas de cortiça capsulada – corpo de cortiça e cápsula – rejeitadas por falta de qualidade, de modo que estes possam ser novamente reaproveitados.

O sistema inclui um tapete rolante responsável pela movimentação das rolhas capsuladas, dispostas em fila e orientadas verticalmente com a cápsula em contacto com a superfície da tela transportadora do tapete rolante, para o interior de um túnel de aquecimento que tem como função derreter a cola termofusível que une a cápsula ao corpo de cortiça. Tem como centro nevrálgico o quadro elétrico, que reúne componentes elétricos do sistema, incluindo ainda um autómato programável responsável pela automatização do mesmo. Deste modo é possível realizar a separação de ambos os componentes de forma automática e semiautónoma, permitindo ao operador realizar outras tarefas enquanto supervisiona o funcionamento do sistema.

Este capítulo caracteriza generalizadamente cada um dos principais constituintes do sistema, nomeadamente, túnel de aquecimento, tapete rolante e respetivo motoredutor, quadro elétrico, extrator de rolhas e estrutura de suporte. Nos capítulos seguintes será feita uma descrição pormenorizada do sistema.

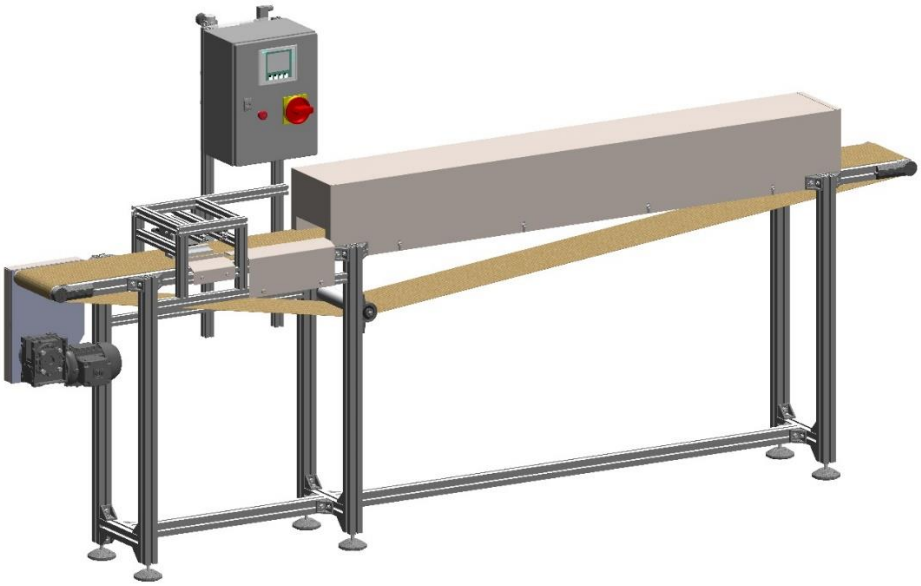

Figura 1 - Sistema automatizado de descapsulagem de rolhas de cortiça capsuladas

3.1 Túnel de aquecimento

O túnel de aquecimento, com um formato paralelepipédico, com um comprimento de 1847mm, largura de 246mm e altura de 200mm, é o responsável por fazer o aquecimento da cola termofusível que une a cápsula à rolha de cortiça, para que, posteriormente, seja possível ao extrator fazer a separação das rolhas. Para isso são utilizadas resistências elétricas de infravermelhos de 750W, colocadas no interior do túnel, que funcionam de forma intermitente, de modo a manterem o túnel à temperatura desejada, ajustável pelo operador mediante um ecrã táctil.

O túnel de aquecimento foi construído em chapa de aço inoxidável AISI 316, com 2mm de espessura, tendo este material sido utilizado nas superfícies exterior e interior do túnel que envolvem o isolamento em manta térmica. A manta térmica feita de lã de rocha envolvida em película de alumínio, normalmente utilizada para envolver condutas de climatização, foi inserida entre a superfície interior e a superfície exterior do túnel. Permite que seja possível tocar na superfície exterior do túnel de aquecimento com este em funcionamento sem provocar queimaduras.

Uma vez que são vários os tipos de rolhas capsuladas a processar, é possível alterar as temperaturas mínima e máxima de funcionamento do túnel de aquecimento, através do ecrã táctil, de modo a permitir que o sistema seja compatível com diferentes tipos de rolhas.

À saída do túnel de aquecimento está colocado um sensor de infravermelhos que faz a contagem das rolhas que saem do túnel. Após saírem 4 rolhas, a saída de mais rolhas é bloqueada através do avanço da haste de um cilindro pneumático de simples efeito, localizado à saída do túnel de aquecimento. Este cilindro permanecerá atuado até que seja feita a separação entre as rolhas e as cápsulas, na zona do extrator de rolhas. Após a separação, a haste do cilindro pneumático da saída do túnel de aquecimento irá recuar para assim permitir a saída de mais 4 rolhas do túnel de aquecimento. Este processo é cíclico.

Figura 2 - Entrada do túnel de aquecimento

3.2 Tapete rolante

O tapete rolante funciona em coordenação com o túnel de aquecimento, pois é a velocidade do tapete rolante que define o tempo que as rolhas estão dentro do túnel de aquecimento.

A velocidade do tapete rolante foi estudada na etapa inicial da conceção do sistema, em função do tempo de exposição necessário para derreter a cola que une a cápsula à rolha de cortiça. Em função da velocidade linear definida para o tapete rolante, foi selecionado um motoredutor com 2,7rpm no veio de saída.

Para o tapete rolante foi selecionada uma tela transportadora com malha em fibra de vidro e revestimento em Politetrafluoretileno (PTFE), comercialmente designado por teflon, capaz de resistir a uma temperatura máxima constante de 260ºC e 300ºC de pico, para resistir às temperaturas do forno. Esta tela é fechada com uma união metálica.

Para acoplar o tapete rolante à estrutura de suporte do sistema foram utilizados diversos elementos, tais como o tambor mandante, o tambor mandado, as chumaceiras e os blocos de tensionamento, por serem facilmente integráveis na estrutura de suporte do sistema.

Figura 3 - Tapete rolante

3.3 Quadro elétrico

O centro nevrálgico de todo o sistema localiza-se no interior do quadro elétrico. É a partir dele que todos os componentes elétricos e electropneumáticos do sistema são alimentados (com uma tensão de 24V DC).

Todos os sinais de entrada são processados pelo autómato programável, situado no interior do quadro, que enviará os sinais de saída para os diversos componentes, de acordo com o programa previamente elaborado e carregado no autómato programável. O programa será descrito de forma mais pormenorizada no Capítulo 5.

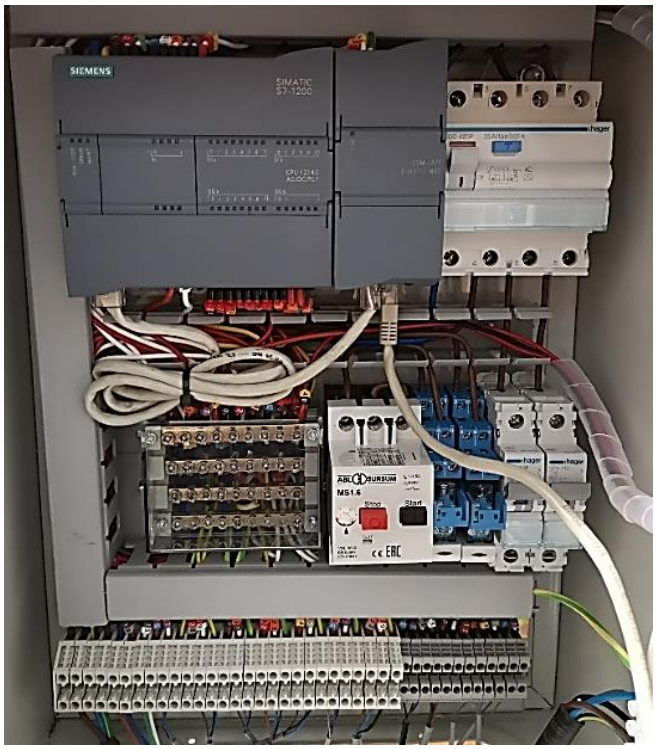

Figura 4 - Quadro elétrico

Tabela 1 - Lista de componentes do quadro elétrico

Descrição	Função	Marca	Quantidade
Autómato programável	Controlo do sistema	Siemens	1
Módulo de sinal	Ligação do termopar	Siemens	1
Módulo de comunicação	Ligação do autómato programável, ecrã táctil e PC	Siemens	1
Ecrã táctil	Monitorização e controlo do sistema	Siemens	1
Disjuntor motor	Proteção do motor elétrico do tapete rolante	ABL Sursum	1
Disjuntor diferencial	Proteção das resistências elétricas	Hager	1
Disjuntor diferencial	Proteção do autómato programável	Hager	1
Relé	Interface comando/potência	Finder	2
Suporte de relé	Interface comando/potência	Finder	2
Módulo de proteção de relé	Proteção do relé	Finder	2
Botão	Botão On/Off	Telergon	1
Botão	Botão de emergência	ABB	1

3.4 Extrator de rolhas

O extrator de rolhas é constituído por dois cilindros pneumáticos de duplo efeito, controlados por duas electroválvulas. Um dos cilindros é responsável pela prisão das

cápsulas, enquanto o outro é responsável pela separação entre as rolhas de cortiça e as cápsulas.

Os cilindros pneumáticos estão equipados com guias lineares que previnem eventuais empenos nas suas hastes, derivados das forças exercidas aquando da prévia prisão das cápsulas e da posterior separação dos dois componentes das rolhas de cortiça capsuladas.

Após a entrada das 4 rolhas capsuladas no extrator de rolhas, é feito o avanço da haste do cilindro de duplo efeito responsável pela prisão de rolhas, prendendo as rolhas capsuladas entre o batente fixo e o batente móvel. De seguida, com o avanço da haste do cilindro de extração, é feita a separação do corpo de cortiça e da cápsula e, para além da extração do corpo de cortiça, os corpos de cortiça extraídos são empurrados para cima do batente fixo. Com o auxílio dos bicos de sopragem de ar comprimido, os corpos de cortiça extraídos caem para o interior de um saco ou caixa de recolha. O recuo da haste do cilindro pneumático de extração coincide com a atuação dos bicos de sopragem de ar comprimido.

Depois de ocorrer a separação, a haste do cilindro pneumático de prisão de cápsulas recua, permitindo assim que, apenas as cápsulas (das quais foi removido o corpo de cortiça) sigam em cima do tapete rolante na direção do tambor mandante, onde irão cair para dentro de um saco ou caixa de recolha. Nesta altura é permitida a saída de mais 4 rolhas de cortiça capsuladas do interior do túnel de aquecimento, para que sejam encaminhadas para dentro do extrator, para a realização de mais uma sequência de extração. Este processo é cíclico.

De referir que a contagem das rolhas que entram no extrator é feita por um conjunto emissor/recetor de infravermelhos, que estão fixos à estrutura de suporte do extrator de rolhas.

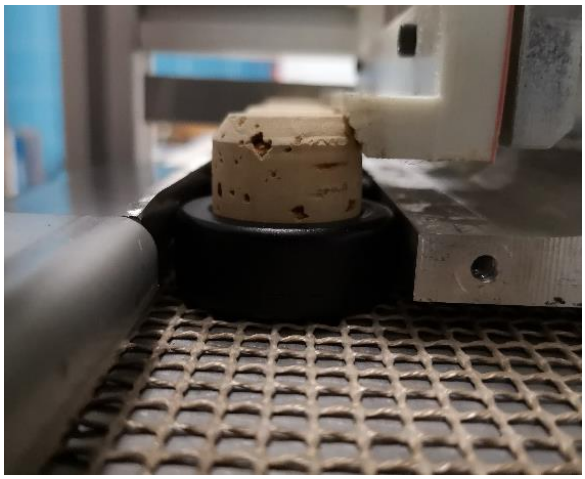

Figura 5 - Pormenor do processo de separação

3.5 Estrutura de suporte

A estrutura de suporte foi construída com perfil de alumínio extrudido de 45mm, tendo também sido utilizados outros acessórios compatíveis, tais como os pés de nivelamento, os fixadores de canto, as porcas quadradas e os parafusos de fixação. Já para a estrutura que envolve o extrator de rolhas foi utilizado perfil extrudido de 30mm.

A estrutura de suporte do sistema automatizado de descapsulagem de rolhas de cortiça capsuladas possui uma altura máxima de 1500mm (incluindo o quadro elétrico e o circuito electropneumático), um comprimento de 3070mm e uma largura de 290mm.

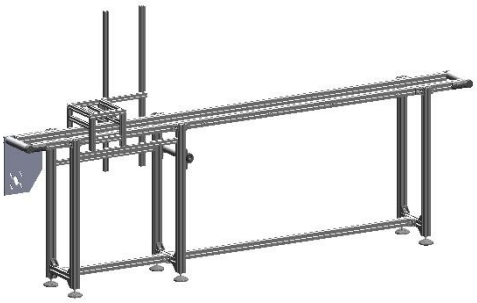

Figura 6 - Estrutura de suporte

4 DESCRIÇÃO DOS COMPONENTES DO SISTEMA AUTOMATIZADO DE DESCAPSULAGEM DE ROLHAS DE CORTIÇA CAPSULADAS

Após a caracterização geral de todo o sistema automatizado de descapsulagem de rolhas de cortiça capsuladas, este capítulo descreve de forma mais pormenorizada todos os seus componentes e suas funções.

As características técnicas dos componentes constam das fichas técnicas, anexas ao presente relatório. Nestas consta uma descrição mais detalhada de cada um dos componentes.

4.1 Circuito de comando e controlo

Este circuito é responsável pela gestão do funcionamento do sistema, seja a monitorização dos diversos parâmetros de entrada, como a pilotagem de todas as electroválvulas, ativação e desativação das resistências de aquecimento e do motor do tapete rolante. A maior parte das funções deste circuito são desempenhadas pelo autómato programável. A parte elétrica incluída neste circuito deve também fazer a proteção, contra eventuais sobrecargas, de todos os componentes que constituem o sistema.

4.1.1 Autómato programável

Para o comando e controlo do sistema automatizado de descapsulagem de rolhas de cortiça capsuladas recorreu-se a um autómato programável Simatic S7-1200 do tipo CPU1214C AC/DC/RLY. Este autómato possui 14 entradas digitais, 2 entradas analógicas e 10 saídas digitais. O autómato é responsável pela receção de todos os sinais de entrada provenientes do ecrã táctil e dos diversos sensores instalados no sistema. Mediante os diferentes estados desses mesmos sinais de entrada e do programa contido na sua memória, o autómato promoverá, nomeadamente, as devidas pilotagens das diversas electroválvulas existentes no circuito pneumático, ativação ou corte das resistências elétricas de aquecimento, bem como o arranque e a paragem do tapete rolante de transporte das rolhas. Será feita uma descrição mais detalhada no Capítulo 5.

Figura 7 - Autómato programável

4.1.2 Ecrã táctil

De modo a permitir a interação do operador com o sistema, foi utilizado o ecrã táctil KTP 400 Basic Mono PN. Este permite ao utilizador navegar pelos vários menus que constituem a interface de comunicação. É possível efetuar o arranque e a paragem do sistema, selecionar entre o modo de funcionamento manual e automático, bem como monitorizar e alterar diversos parâmetros de funcionamento, nomeadamente temperatura mínima e máxima do túnel de aquecimento, estado das pilotagens das electroválvulas associadas aos cilindros pneumáticos e das resistências elétricas do túnel de aquecimento.

Figura 8 - Ecrã táctil

4.1.3 Módulo de sinal para termopar

O autómato programável foi ainda expandido com um módulo de sinal, do tipo SB 1231 TC, especifico para termopares. Este módulo é responsável pela aquisição e posterior conversão dos valores de tensão provenientes do termopar, utilizado para medir a temperatura no interior do túnel de aquecimento. Os valores medidos são posteriormente convertidos para graus Celsius e tratados pelo programa, sendo mostrados no ecrã táctil em graus Celsius.

Figura 9 - Módulo de sinal para termopar

4.1.4 Módulo de comunicação

Recorreu-se a um módulo de comunicação do tipo CSM 1277 para efetuar a comunicação entre o autómato e o ecrã táctil. Este módulo possui 4 portas RJ45, duas das quais são usadas pela configuração atual. Uma terceira é usada para ligar um computador de modo a permitir efetuar alterações ao programa e/ou aos diversos menus do ecrã táctil.

Figura 10 - Módulo de comunicação

4.1.5 Botão On/Off

O botão On/Off tem como função realizar o corte de alimentação do quadro elétrico. Pode ser usado para desligar o equipamento, após o seu arrefecimento, ou para o corte de energia, caso haja necessidade de realizar algum tipo de intervenção no quadro elétrico ou no equipamento em si, sem haver o risco de este arrancar subitamente e provocar lesões ao operador.

Figura 11 - Botão On/Off

4.1.6 Botão de emergência

O botão de emergência provoca a paragem imediata do sistema e a despressurização do circuito electropneumático quando o operador o pressiona, independentemente de estarem ou não reunidas as condições de paragem do sistema. Por isso, este botão serve apenas para paragens de emergência. Para esta função foi selecionado um botão com contacto normalmente aberto.

Figura 12 - Botão de emergência

4.1.7 Interruptor diferencial

O interruptor diferencial funciona como uma proteção inicial a todos os componentes do quadro elétrico. Sendo um interruptor de 30mA, destina-se não só à proteção dos componentes do quadro elétrico, mas também à proteção de pessoas, na eventualidade de o operador tocar em algum dos circuitos antes desligar o sistema no botão On/Off.

Figura 13 - Interruptor diferencial

4.1.8 Interruptor de proteção ao motor elétrico

Este interruptor é responsável pela proteção do motor elétrico, que movimenta o tapete rolante, através da intensidade de corrente que esse motor consome. Caso o motor entre em esforço e o consumo ultrapasse o valor nominal, o interruptor interrompe a corrente elétrica que o alimenta, evitando que este sobreaqueça e se danifique.

Figura 14 - Interruptor de proteção ao motor elétrico

4.1.9 Disjuntores de proteção ao autómato e às resistências

Para proteção do autómato foi utilizado um disjuntor de 4A, que interromperá a sua alimentação caso o consumo ultrapasse os 4A.

De igual forma, para a proteção das resistências elétricas de aquecimento do túnel foi utilizado um disjuntor de 16A, dado que o consumo destas é muito superior ao do autómato programável.

Figura 15 - Disjuntores de proteção ao autómato e às resistências

4.1.10 Relés de controlo do motor e das resistências

Para permitir que o autómato faça o arranque e paragem, quer do motor elétrico que aciona o tapete rolante, quer das resistências elétricas de aquecimento do túnel, foram utilizados dois conjuntos constituídos por duas bases de relé, com bobinas e respetivos módulos de proteção.

Aos relés cabe a função de, mediante a presença de tensão de comando na bobina, permitir a passagem de corrente para o componente a controlar, visto que, neste caso, tanto o motor como as resistências estão ligadas ao contacto normalmente aberto.

Figura 16 - Relé de controlo do motor e das resistências

4.1.11 Sensor de saída do túnel de aquecimento

Para realizar a contagem das rolhas que saem do túnel de aquecimento foi utilizado um sensor fotoelétrico. Este sensor emite luz vermelha visível e, através da reflexão desta, deteta a presença de qualquer corpo que trespasse o feixe de luz por ele emitido.

Figura 17 - Sensor de saída do túnel de aquecimento

4.1.12 Sensores de entrada no descapsulador

Os sensores utilizados para contar as rolhas que entram no descapsulador diferem do sensor de saída do túnel de aquecimento pelo facto de serem um par de sensores (um recetor e um emissor). O emissor emite luz vermelha visível e o recetor recebe essa luz. Com a passagem de um corpo pelo feixe de luz, este é interrompido. Essa informação é enviada ao autómato, que por sua vez faz a contagem das rolhas, tal como será explicado no Capítulo 5.

Figura 18 - Sensores de entrada do descapsulador

4.1.13 Motoredutor de acionamento do tapete rolante

O motoredutor é responsável pelo acionamento do tapete rolante, mediante a ordem de arranque dada pelo autómato programável. Para isso foi selecionado um motoredutor monofásico de 0,18kW e 1,49A com velocidade de entrada de 1390rpm e velocidade de saída de 2,7rpm. Este motoredutor tem a vantagem de não necessitar de manutenção.

Figura 19 - Motoredutor de acionamento do tapete rolante

Para determinar a velocidade de saída requerida, foi necessário saber o tempo para o aquecimento das rolhas, de modo que a separação entre o corpo de cortiça e a cápsula ocorresse em condições ideais. Após diversos estudos experimentais realizados pelo grupo que começou a desenvolver o sistema, chegou-se à conclusão que as rolhas teriam de ser aquecidas durante 5 a 6 minutos (Tomé, Ferreira, & Pereira, 2015).

Como todos os componentes do grupo de comando do tapete rolante já tinham sido selecionados, os cálculos seguintes confirmam a correta seleção do motorredutor.

O comprimento do túnel de aquecimento é de 1847mm, a velocidade de saída do motor redutor selecionado é de 2,7rpm ou 0,282rad/s, o diâmetro do tambor mandante é de 50mm, o número de dentes do pinhão é de 12 e o número de dentes da roda é de15.

A relação da transmissão por corrente pode ser calculada por:

$$\frac{n^{\circ}\ dentes\ roda}{n^{\circ}\ dentes\ pinhão} \tag{1}$$

Sendo de $\frac{15}{12} = 1{,}25$.

A velocidade do tambor mandante pode ser determinada pelo produto entre a velocidade de saída do redutor e a relação da transmissão por corrente calculada anteriormente, ou seja, 0,282 × 1,25 = 0,226 rad/s.

A velocidade periférica do tambor mandante é igual à velocidade linear da tela transportadora, calculada por:

$$v = \varpi \times r \tag{2}$$

Sendo de 0,226 × 0,025 = 0,0057m/s, ou 0,0057 × 60 = 0,339m/min, ou seja, como uma rolha percorre 0,339m num minuto, o tempo necessário para percorrer o interior do túnel de aquecimento será de $\frac{1,847}{0,339}$ = 5,44 minutos.

Convertendo 0,44min em segundos obtém-se $\frac{44\times60}{100}$ = 26,4s.

Logo, com o motoredutor selecionado, o tempo que uma rolha demora a percorrer o interior do túnel de aquecimento é de 5 minutos e 26,4 segundos.

4.2 Circuito electropneumático

O circuito electropneumático é responsável pela separação das rolhas de cortiça das respetivas cápsulas. Para isso é utilizado um conjunto de electroválvulas e de cilindros pneumáticos, cuja função é explicada seguidamente.

4.2.1 Electroválvula de segurança

A electroválvula de segurança é responsável por garantir que todo o circuito electropneumático pode ser despressurizado de imediato, quando solicitado (por exemplo, ao pressionar o botão de emergência). Para esta função foi utilizada uma electroválvula 3/2, normalmente aberta, com pilotagem por solenoide e retorno por mola. Como esta electroválvula é a válvula de segurança de todo o sistema pneumático, foi ligada de modo que alimente, com ar comprimido, o circuito electropneumático somente quando o solenoide recebe 24V DC de tensão, permitindo que uma quebra de energia, acidental ou intencional, faça despressurizar de imediato o circuito electropneumático permitindo, por exemplo o recuo manual das hastes dos cilindros pneumáticos em caso de emergência.

Figura 20 - Electroválvula de segurança

4.2.2 Electroválvula do cilindro de saída do túnel de aquecimento

O cilindro instalado à saída do túnel de aquecimento é um cilindro pneumático de simples efeito com retorno por mola. Para a sua atuação recorreu-se uma electroválvula 3/2, normalmente fechada, com pilotagem por solenoide e retorno por mola semelhante à utilizada como electroválvula de segurança. O facto de esta ser normalmente fechada, faz com que, quando o solenoide recebe 24V DC de tensão, a haste do cilindro avance, inibindo assim a saída de rolhas do túnel de aquecimento. Já quando deixa de haver tensão no solenoide, a electroválvula regressa ao seu

estado inicial, por intermédio de uma mola, provocando o recuo da haste do cilindro por intermédio de uma mola.

Figura 21 - Electroválvula do cilindro de saída do túnel de aquecimento

4.2.3 Electroválvulas dos cilindros de prisão e de separação de rolhas

Os cilindros de prisão e de separação das rolhas são cilindros pneumáticos de duplo efeito. Para a sua atuação recorreu-se, para ambos os cilindros, a uma electroválvula 5/2, de posições estáveis, em que ambas as pilotagens são efetuadas por solenoides. Quando existir tensão de 24V DC em um dos solenoides, a electroválvula permite a passagem de ar comprimido pelo seu interior de tal forma que provoca o avanço da haste do cilindro de prisão de rolhas. Ao existir tensão no solenoide oposto, a electroválvula irá mudar de estado, provocando assim o recuo da haste do cilindro.

Figura 22 - Electroválvula dos cilindros de prisão e de separação de rolhas

4.2.4 Regulador de pressão de prisão de rolhas

De modo a limitar a força exercida pelo cilindro pneumático de prisão sobre as cápsulas das rolhas, foi instalada uma válvula limitadora de pressão para limitar a pressão de avanço do referido cilindro. Esta válvula permite também adaptar essa pressão aos diferentes tipos de rolhas capsuladas, mediante a regulação da pressão através da rotação do comando rotativo da válvula.

Figura 23 - Regulador de pressão de prisão de rolhas

4.2.5 Electroválvula dos bocais de sopragem de ar comprimido

Após a separação entre a rolha de cortiça e a cápsula, realizada pelo cilindro pneumático de separação, é efetuada uma sopragem das rolhas de cortiça, de modo a facilitar a sua saída do sistema automatizado de descapsulagem de rolhas de cortiça capsuladas. Para isso recorre-se a uma electroválvula 2/2, normalmente fechada, com retorno por mola. A electroválvula permite a passagem de ar comprimido para dois bocais de sopragem quando existir uma tensão de 24V DC no solenoide da referida electroválvula. Logo que cessa a tensão no solenoide, a electroválvula regressa ao estado inicial por ação de uma mola, interrompendo a passagem de ar comprimido para os bocais de sopragem de ar comprimido.

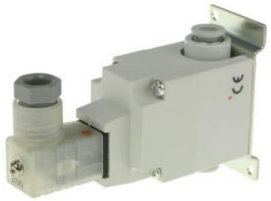

Figura 24 - Electroválvula dos bocais de sopragem de ar comprimido

4.2.6 Cilindro pneumático da saída do túnel de aquecimento

Para permitir a saída de 4 rolhas de cada vez do interior do túnel de aquecimento, foi colocado um cilindro pneumático de simples efeito, com retorno por mola, cuja haste avança sempre que o solenoide da electroválvula responsável pela sua atuação é energizado. Quando o solenoide deixa de receber energia elétrica, a electroválvula retorna à sua posição original por intermédio de uma mola. Consequentemente, o cilindro pneumático é despressurizado e a sua haste recua por ação da mola.

Uma vez que este cilindro pneumático não é responsável por esforços elevados, foi selecionado um cilindro de diâmetro 8mm e 25mm de curso, minimizando assim o consumo de ar comprimido na sua operação.

Figura 25 - Cilindro pneumático da saída do túnel de aquecimento

4.2.7 Cilindro pneumático de prisão de rolhas

Para prender as rolhas durante o processo de separação da rolha de cortiça da cápsula, foi utilizado um cilindro pneumático de duplo efeito com 25mm de diâmetro e 40mm de curso juntamente com uma guia linear, para ajudar a distribuir e suportar as cargas elevadas geradas pela ação do cilindro pneumático ao prender as rolhas, e desse modo evitar empenos na haste do cilindro.

Figura 26 - Cilindro de prisão de rolhas e respetiva guia linear

4.2.8 Cilindro pneumático de separação de rolhas

Este cilindro pneumático é em tudo semelhante ao cilindro de prisão de rolhas, tendo os mesmos 25mm de diâmetro, mas 80mm de curso. Visto que o processo de separação das rolhas também poderá induzir alguma flexão na haste neste cilindro, está também acoplado a um guia linear.

Figura 27 - Cilindro de separação de rolhas e respetiva guia linear

4.2.9 Realização dos esquemas elétrico e electropneumático

Para a realização dos esquemas electropneumático e elétrico do sistema automatizado de descapsulagem de rolhas de cortiça capsuladas, que constam dos anexos do presente relatório, foi utilizado a ferramenta *Solidworks Electrical,* embebida no programa informático *Solidworks*. Esta ferramenta foi bastante útil nesta tarefa, pois possui uma vasta biblioteca de símbolos pneumáticos e elétricos, facilitando assim a realização dos esquemas de todo o sistema.

A realização do esquema pneumático permitirá aos técnicos de manutenção da empresa Beira Correia Lda. compreenderem melhor o circuito electropneumático, permitindo a manutenção ou deteção de problemas, sem que seja necessário desmontar os vários componentes do circuito. Além disso, caso seja necessário efetuar a desmontagem de todo o circuito electropneumático, os técnicos de manutenção poder-se-ão apoiar no esquema realizado para fazerem a remontagem posterior de todos os componentes.

À semelhança do que acontece com o circuito electropneumático, os esquemas elétricos terão a mesma utilidade, mas com todo o circuito de comando e controlo. Este circuito possui a agravante de ser muito mais complexo que o circuito electropneumático, pois tem muitos mais componentes e pontos de ligação.

5 PROGRAMAÇÃO DO AUTÓMATO

Para que todos os componentes que integram o sistema automatizado de descapsulagem de rolhas de cortiça capsuladas desenvolvam a sua função, foi necessário elaborar um programa, que consta dos anexos do presente relatório, responsável pela gestão de todo o sistema, de modo que o autómato programável possa fazer o controlo dos sensores e atuadores, nomeadamente das electroválvulas, entre outros componentes anteriormente descritos.

Durante a elaboração deste programa, que passou por várias versões de teste até chegar à versão final, foi necessário testar o funcionamento do sistema para cada versão, de modo que fossem apontadas as diversas necessidades de melhoria do programa.

Todas estas operações foram realizadas através do programa informático *TIA Portal*, o qual integra todas as vertentes da programação, simulação, monitorização e operação de equipamentos de automação.

Visto que tanto o autómato programável e o ecrã táctil são da mesma marca, esta foi a escolha óbvia para realizar a programação.

No presente projeto, o *TIA Portal* teve a grande vantagem de permitir realizar as diversas tarefas de programação, simulação, monitorização e operação de uma forma integrada, sem que para isso fossem necessários diferentes programas a correr em simultâneo no mesmo computador, otimizando assim os recursos utilizados.

5.1 Autómato programável

Os parágrafos seguintes destinam-se a explicar de forma mais detalhada os diversos blocos e funções que constituem o programa final, em anexo, bem como explicar as diversas linhas que constituem cada um desses blocos e funções.

A programação do autómato programável foi efetuada recorrendo ao programa informático *TIA Portal*. A programação foi feita em linguagem *Ladder*, a qual se caracteriza por ser uma linguagem de compreensão simples, pois utiliza símbolos bastante parecidos com os símbolos dos esquemas elétricos. A simplicidade desta linguagem de programação faz com que esta seja a linguagem mais difundida.

A programação em *Ladder* consiste em criar uma ou mais linhas, nas quais são colocadas as condições (contactos, contadores, operadores lógicos, entre outros) necessárias para a ativação ou desativação de uma ou mais saídas do autómato.

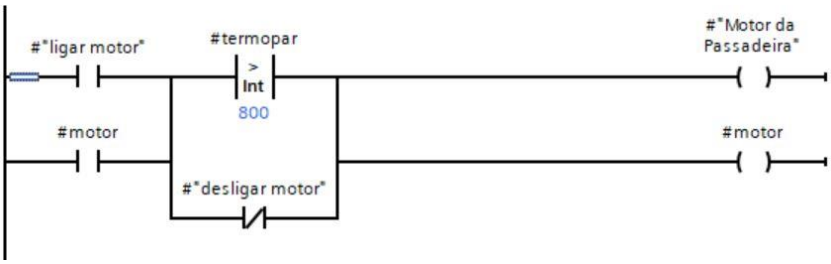

Figura 28 - Exemplo de uma linha programação em linguagem Ladder

5.1.1 Bloco "*Main*"

Parte do programa responsável por, mediante as escolhas do operador, ativar o modo de funcionamento automático ou manual.

Além disso, neste bloco inclui uma operação de conversão de temperatura que consiste na divisão da temperatura lida pelo termopar por 10. Esta divisão deve-se ao facto de o termopar ler as temperaturas em décimo de grau Celsius, fazendo com que, por exemplo, ao ler uma temperatura de 101ºC, o programa receba o valor de 1010 proveniente do módulo de sinal do termopar. Este valor é então dividido por 10 para permitir a comparação do valor recebido e lido pelo programa com os valores das temperaturas inseridas pelo operador no ecrã táctil.

Estão também incluídas neste bloco as diversas condições de arranque e paragem do motor do tapete rolante, bem como a despressurização do sistema pneumático e a desativação das resistências de aquecimento do túnel com o pressionar do botão de emergência.

Posto isto, pode-se afirmar que este bloco reúne as funções transversais, estando as funções mais específicas reservadas para as restantes funções do programa.

5.1.2 Função "Motor do tapete rolante"

Parte do programa responsável pelo arranque do motor elétrico que aciona o tapete rolante em ambos os modos de funcionamento do sistema: manual e automático.

É ainda responsável pela sua paragem, apenas deixando parar o tapete rolante, mediante o desligar do motor elétrico, quando a temperatura lida pelo termopar estiver abaixo dos 80ºC. Esta segurança impede que a mesma superfície da tela transportadora fique exposta às elevadas temperaturas atingidas no interior do túnel de aquecimento por muito tempo, mantendo-a em movimento até que a temperatura no interior do túnel seja suficientemente baixa.

5.1.3 Função "Túnel de aquecimento"

Parte do programa responsável por gerir os diversos parâmetros relacionados com o túnel de aquecimento.

É esta função que recebe e compara os valores de temperatura mínima e máxima definidas pelo operador, no ecrã táctil, para o túnel de aquecimento, ativando e desativando as resistências elétricas de aquecimento em função das temperaturas previamente definidas.

Após o operador inserir no ecrã táctil as temperaturas mínima e máxima desejadas para o túnel de aquecimento, o programa irá ligar as resistências sempre que a temperatura lida pelo termopar seja igual ou inferior à temperatura definida na janela "Tmin". As resistências ficam a aquecer o túnel até a temperatura, lida pelo termopar, ser igual à temperatura definida na janela "Tmax", momento em que as resistências são desligadas até ser novamente atingida a temperatura definida na janela "Tmin". Este funcionamento é cíclico.

Esta função é também responsável por alternar entre o modo intermitente das resistências elétricas de aquecimento, ativado quando a temperatura lida pelo termopar é igual ou superior a 75ºC e o modo permanente, quando a temperatura do termopar é inferior a 75ºC.

De modo a evitar que o isolamento dos cabos das resistências elétricas de aquecimento derreta e provoque curto-circuito no interior do túnel de aquecimento, foi estabelecida uma segurança nesta função, a qual desliga as resistências elétricas assim que a temperatura lida pelo termopar ultrapassar os 131ºC.

5.1.4 Função "Descapsulador"

Parte do programa responsável por gerir os sinais vindos dos diversos sensores fotoelétricos de contagem de rolhas, bem como dos vários sensores fins de curso dos cilindros utilizados no descapsulador.

Em função dos sinais destes componentes, são dadas as respetivas ordens ao circuito electropneumático, tais como o avanço e recuo das hastes dos cilindros de prisão e extração de rolhas e avanço da haste do cilindro de saída do túnel de aquecimento.

5.2 Ecrã táctil

De modo a tornar a interação entre o operador e o sistema mais intuitiva, o manuseamento do sistema é feito através do ecrã táctil.

Recorrendo ao programa informático *TIA Portal* foi necessário criar vários ecrãs que compõem o menu do sistema. Cada um destes ecrãs foi programado de modo que todos eles interajam entre si e ainda com o programa carregado no autómato programável.

A programação dos ecrãs é bastante intuitiva, consistindo maioritariamente em criar diversos objetos, como caixas de texto ou botões e atribuir *tags* a cada um desses objetos. As *tags* serão a interface de comunicação entre o programa carregado no

autómato programável e os diversos objetos interativos presentes em cada um dos ecrãs do menu do sistema. Para isso, após a criação de um objeto, basta clicar nele mesmo e aparecerá o respetivo menu de configuração, em que podem ser definidas as propriedades do objeto, tais como a *tag*, o tipo (entrada ou saída), o formato da numeração (caso se aplique), cor, animações, entre outras.

A ***Figura 29*** mostra um exemplo do menu de propriedades para a caixa de texto que define o *setpoint* da temperatura máxima do túnel de aquecimento.

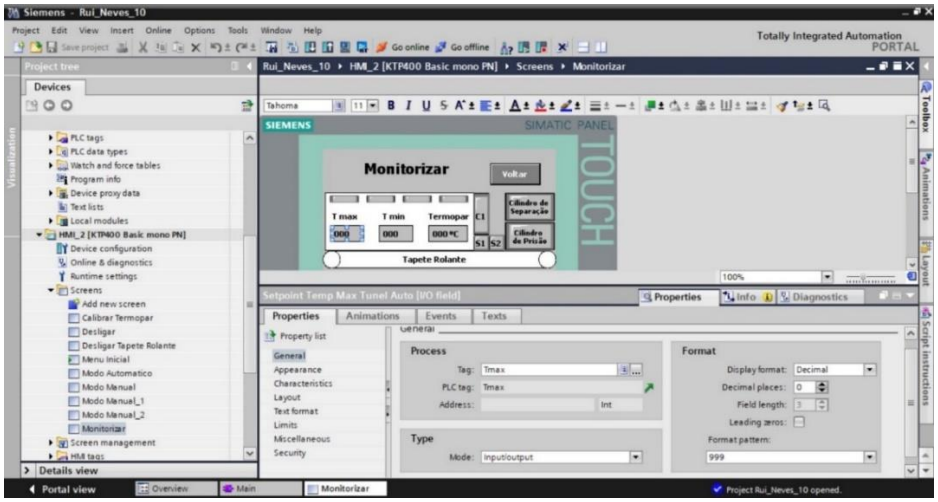

Figura 29 - Menu de propriedades de um objeto

No caso de o objeto a criar ser um botão, será também necessário associar a este um determinado evento, tarefa que o *TIA Portal* permite fazer de forma bastante intuitiva, bastando para isso clicar no botão que se pretende programar e selecionar o separador *Events*. No caso ilustrado na ***Figura 30***, para programar o botão "Voltar", basta selecionar a opção *Release*, nesta selecionar a função *ActivateScreen* e escolher o ecrã "Modo Automático". Com isto, quando o operador larga o botão "Voltar" o ecrã táctil regressa ao ecrã "Modo Automático".

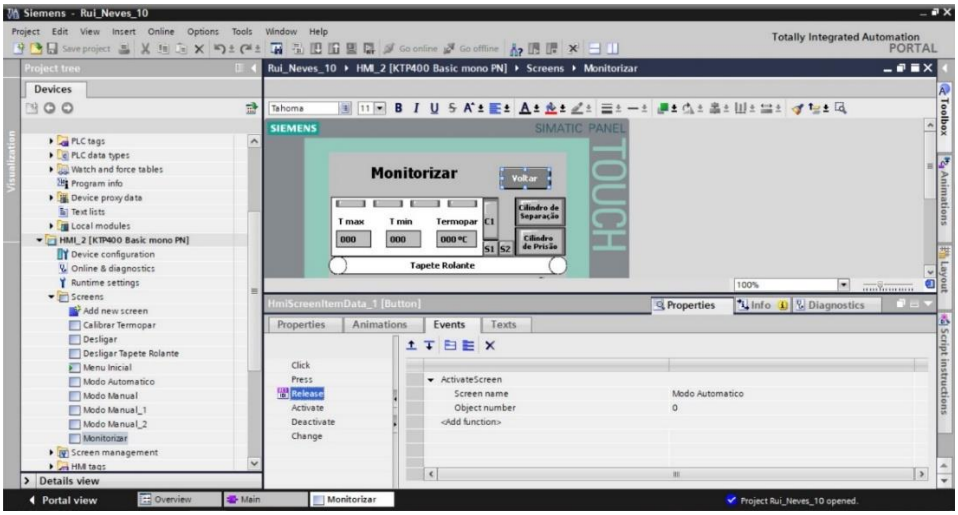

Figura 30 - Menu de eventos

Esta breve explicação mostra quão simpres é a programação de ecrãs tácteis com o *TIA Portal*, facilitando assim a tarefa do programador. Resumindo o processo, basta apenas colocar os objetos pretendidos a partir de uma lista, atribuir *tags* a cada um deles e atribuir os respetivos eventos.

6 APERFEIÇOAMENTOS REALIZADOS

O programa informático *Solidworks* foi claramente a ferramenta mais transversal aos diversos aspetos do presente projeto. Com o auxílio desta ferramenta, nomeadamente o *Solidworks Electrical* para o esquema do circuito elétrico e do quadro elétrico, foram desenvolvidos e redesenhados diversos elementos para mitigar alguns problemas que o sistema apresentava no início do presente projeto.

Durante a conceção de novos elementos, o *Solidworks* revelou-se uma ferramenta fulcral, na medida em que permite a conceção de peças em 3D contabilizando os comprimentos adicionais para a realização das quinagens dessas peças. Adicionalmente permitiu, a partir dos modelos 3D, a execução do desenho 2D devidamente cotado para fornecer à empresa que realizou as novas peças.

6.1 Circuito elétrico

Na versão inicial do sistema automatizado de descapsulagem rolhas de cortiça capsuladas, todos os componentes externos ao quadro elétrico (sensores, electroválvulas, motor elétrico, etc.) estavam ligados diretamente ao autómato programável, o que, apesar de permitir que o equipamento funcionasse corretamente, diminuía drasticamente a sua manutibilidade, pois os condutores estavam bastante desordenados dentro do quadro, dificultando a compreensão das diversas ligações e o acesso aos diversos componentes elétricos.

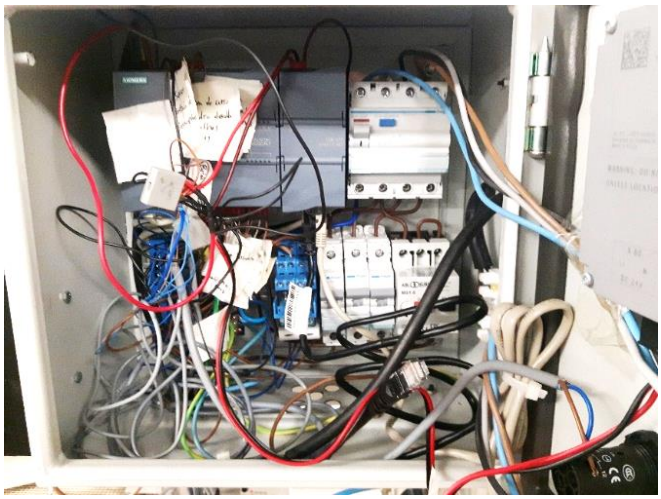

Figura 31 - Quadro elétrico inicial

De forma a aperfeiçoar o esquema de ligações do quadro elétrico, foi aplicada uma régua de bornes, de modo a fazer uma ligação permanente dentro do quadro, com todos os condutores passados por calhas. Os componentes elétricos ficaram mais acessíveis, para o caso de ser necessária a substituição de alguns, bem como para o manuseamento dos mesmos.

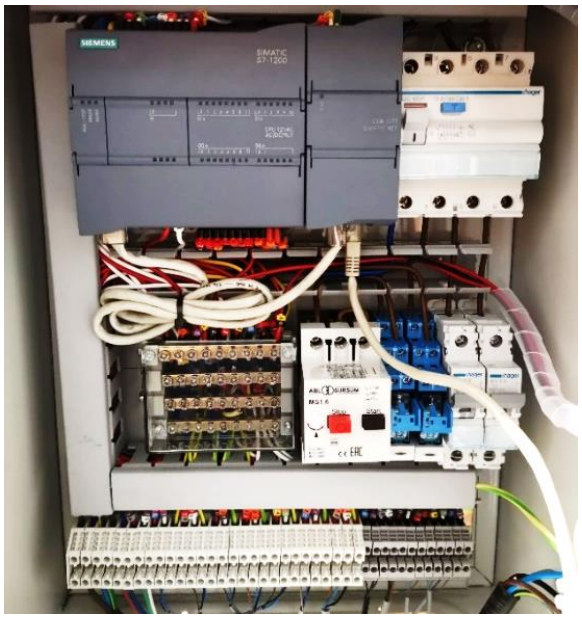

Figura 32 - Quadro elétrico após a alteração

Também importante é o facto de este novo esquema de ligações permitir que, desligando todos os componentes externos dos respetivos bornes, seja possível remover todos os componentes elétricos do interior do quadro em simultâneo, ou até mesmo a remoção do quadro completo do sistema sem desfazer todas as ligações internas. Além disso, foram colocados identificadores numéricos em ambas as pontas de todos os condutores do quadro, de modo a facilitar ainda mais a manutenção do mesmo, bem como a identificação mais rápida de todos os condutores, devido ao incremento da organização geral. Outro pormenor que facilita a leitura do quadro, é o facto de os bornes terem cores diferentes para as entradas e para as saídas, sendo os bornes mais claros destinados às entradas e os mais escuros destinados às saídas.

Não menos importante é o facto de todos os condutores do quadro elétrico terem sido colocados de acordo com a norma IEC 60445, conforme mostra a Tabela 2.

Tabela 2 - Código de cores de condutores

Código de cores de condutores - IEC 60445			
Designação	**Condutor**	**Cor**	
Trifásica	L1	Cinzento	
	L2	Preto	
	L3	Castanho	
	N	Azul	
Monofásica Alternada	F	Castanho	
	N	Azul	
Monofásica Contínua	F	Vermelho	
	N	Branco	
Terra de Proteção		Verde/Amarelo	

6.2 Guia de encaminhamento das rolhas

A ***Figura 33*** mostra a guia de encaminhamento inicial, em que o estrangulamento das rolhas era efetuado à saída do túnel de aquecimento.

Figura 33 - Configuração inicial da guia de encaminhamento de rolhas

De modo a eliminar a acumulação desordenada de rolhas e consequente encravamento no interior do túnel de aquecimento, foi desenhada e executada uma nova guia de encaminhamento das rolhas, conforme mostra a ***Figura 34***. O estrangulamento das rolhas passou a ser efetuado logo à entrada do túnel de aquecimento.

Figura 34 - Configuração aperfeiçoada da guia de encaminhamento de rolhas

Esta alteração produziu, no entanto, a necessidade de novos testes para verificar se o comportamento das rolhas no interior do túnel tinha ainda resultados satisfatórios, principalmente a nível do aquecimento das mesmas, visto que com a nova guia de encaminhamento, a circulação das rolhas concentra-se do lado esquerdo do túnel, em vez de se distribuírem por toda a largura do mesmo.

Após diversos testes com ambas as guias de encaminhamento, verificou-se não havia diferenças significativas no comportamento das rolhas, passando assim a ser esta a solução definitiva para o problema do encravamento de rolhas no interior do túnel de aquecimento.

6.3 Batente fixo de prisão das cápsulas

Outro dos problemas que surgiram nas primeiras fases de desenvolvimento do sistema foi o facto de os corpos de cortiça das rolhas de cortiça capsuladas, ao serem extraídos da cápsula mediante o avanço da cabeça de extração móvel acoplada ao cilindro de extração, por vezes ficavam entaladas entre essa cabeça de extração e o batente fixo de prisão das cápsulas. Isto fazia com que, com o recuo da haste do cilindro de extração, os corpos de cortiça recuassem juntamente com a cabeça de extração, causando o encravamento do descapsulador.

Figura 35 - Configuração inicial do batente fixo de prisão de cápsulas

Para resolver este problema, o batente fixo de prisão de cápsulas foi redesenhado de modo a ter um rebordo na parte superior que impeça os corpos de cortiça de recuar juntamente com a cabeça de extração móvel acoplada ao cilindro de extração.

Figura 36 - Configuração aperfeiçoada do batente fixo de prisão de cápsulas

6.4 Conformidade com o Decreto-Lei n.º 50/2005

6.4.1 Blindagem de proteção da transmissão de acionamento do tapete rolante

O Decreto-Lei n.º 50/2005 regula os requisitos mínimos de segurança e saúde dos trabalhadores na utilização de equipamentos de trabalho. Estando o sistema automatizado de descapsulagem rolhas de cortiça capsuladas em conformidade com este decreto-lei, é mais fácil certificá-lo no futuro, caso a empresa assim o pretenda.

Ao cumprir com estes requisitos, reduzem-se drasticamente quaisquer perigos para os operadores, podendo estes interagir com o equipamento de forma segura, sem o risco de lesões que muitas vezes têm repercussões graves na vida dos trabalhadores.

Este pormenor torna-se importante para empresas certificadas com as mais recentes normas de segurança, pois este é o primeiro requisito para que o equipamento possa operar em qualquer empresa certificada.

Uma vez que o equipamento já estava bastante otimizado neste aspeto, uma das tarefas do projeto foi a realização de uma proteção para a corrente de transmissão do tapete rolante, que de outra forma estava completamente exposta.

Para isso foi desenhada uma tampa de proteção recorrendo ao programa informático *Solidworks*, através da ferramenta *Sheet Metal*. Esta ferramenta permite desenhar peças em chapa com o formato pretendido, permitindo de seguida obter a planificação dos cortes e quinagens da chapa necessários para a conformação da peça, facilitando assim a tarefa, quer do desenhador, quer do executante da peça.

Figura 37 - Proteção da corrente de transmissão

A principal vantagem desta proteção é que pode ser retirada facilmente através da remoção de 3 parafusos, facilitando assim algumas tarefas rotineiras, tais como a lubrificação da corrente de transmissão ou a sua inspeção, bem como a substituição de algum dos componentes da transmissão.

6.4.2 Sinaléticas de indicação de perigo

De modo que o operador tenha uma melhor perceção dos perigos inerentes à interação com o equipamento e dos riscos associados a esses perigos, foram colocadas sinaléticas em diversos componentes, com indicação dos perigos inerentes a cada um desses componentes.

Um dos riscos é o de queimaduras se, por exemplo, o operador tocar na chapa inferior do túnel de aquecimento, que não tem isolamento térmico e que está substancialmente mais quente que a cobertura do túnel, isolada com manta térmica entre a superfície interior e a superfície exterior.

Figura 38 - Sinalética "Perigo altas temperaturas"

Outro dos riscos é o de entalamentos ao interagir com o descapsulador caso, por exemplo, o operador decida retirar rolhas encravadas do interior do descapsulador sem antes despressurizar o circuito electropneumático, pois um dos cilindros pneumáticos pode mover-se de forma inesperada e provocar o entalamento dos dedos/mãos do operador, podendo ocorrer ferimentos graves.

Figura 39 - Sinalética "Perigo cuidado com as mãos"

Por fim, há também o risco de entalamento na transmissão por corrente que faz o acionamento do tapete rolante. Caso o operador retire a proteção da transmissão antes de desligar o equipamento da tomada para realizar a manutenção deste componente, pode ocorrer o arranque do motor elétrico que aciona o tapete rolante no momento em que o operador esteja a manusear a transmissão, provocando igualmente o entalamento dos dedos/mão e os ferimentos que daí podem advir.

Figura 40 - Sinalética "Perigo de entalamento"

7 MANUAL DE OPERAÇÃO

Para facilitar a operação do sistema automatizado de descapsulagem de rolhas de cortiça capsuladas, foi elaborado um manual de operação, de modo a facilitar o trabalho dos colaboradores da empresa que irão operar o sistema, permitindo que estes o consultem sempre que achem necessário.

7.1 Instruções de funcionamento

7.1.1 Ligar o equipamento e aceder ao menu inicial

Para o funcionamento do equipamento em modo automático é necessária uma tomada de corrente trifásica de 16A e uma pressão de entre 6,5 e 7 bar. Caso o equipamento vá funcionar apenas em modo manual, é dispensável o ar comprimido.

A primeira operação a efetuar após ligar a ficha de alimentação e o ar comprimido do equipamento consiste em ligar o interruptor geral, localizado na porta do quadro. Após esta operação e o processo de arranque do equipamento estar concluído, aparece no ecrã táctil, localizado na porta do quadro, um ecrã igual ao da ***Figura 41***, relativo ao Menu Inicial.

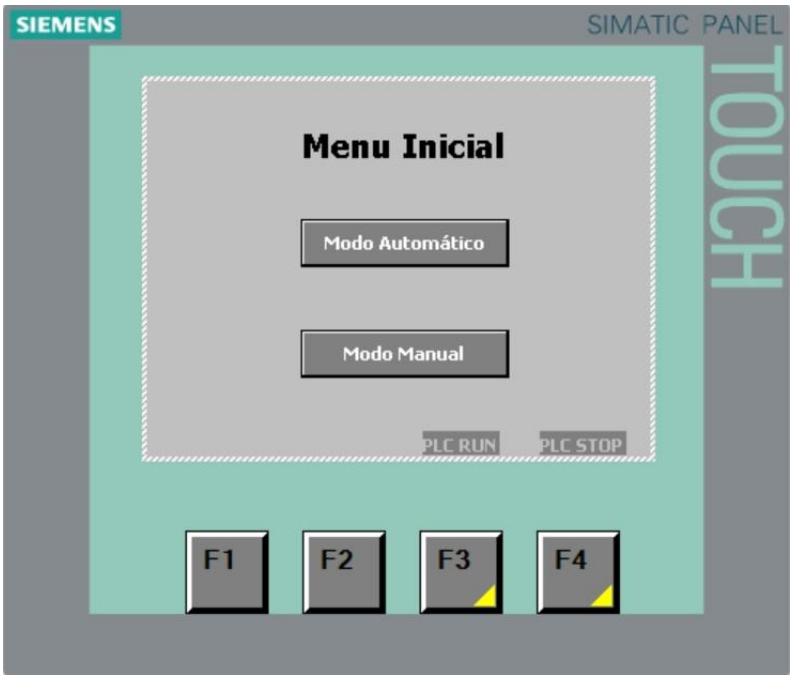

Figura 41 - Menu inicial

Assim que o Menu Inicial aparecer no ecrã táctil, o operador pode optar por selecionar o Modo Manual ou o Modo Automático, dependendo da necessidade.

Os Modos Manual e Automático são explicados nos parágrafos seguintes:

- Modo Automático: neste modo o equipamento liga o motor elétrico que aciona o tapete rolante, as resistências elétricas localizadas no interior do túnel de aquecimento, bem como os sensores que ativam a sequência de funcionamento do descapsulador. Neste modo, basta apenas alimentar o equipamento com rolhas capsuladas e deixar que este faça a separação das mesmas de forma automática, após o processo de arranque estar concluído.
- Modo manual: neste modo o operador pode ligar independentemente o motor elétrico que aciona o tapete rolante, ou o motor elétrico que aciona o tapete rolante e as resistências elétricas localizadas no interior do túnel de aquecimento. Este modo pode ser útil, por exemplo, em caso de avaria em algum dos componentes do descapsulador ou em alguma outra circunstância que o operador considere adequada.

7.1.2 Modo Manual

No caso de o operador optar pelo Modo manual, aparece um ecrã igual ao da ***Figura 42***. Este permite ao operador ligar o motor elétrico que aciona o tapete rolante ou regressar ao Menu Inicial.

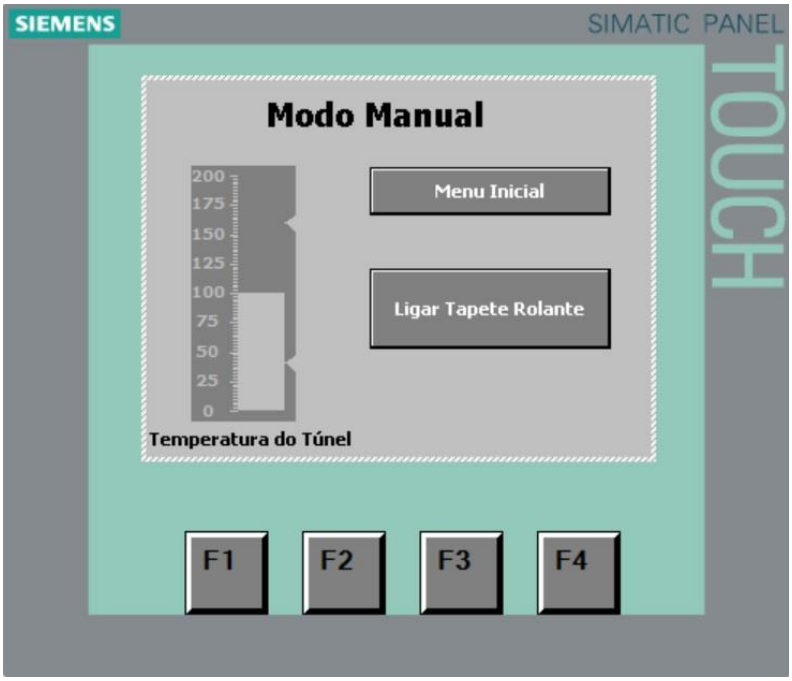

Figura 42 - Modo Manual (Ecrã 1)

Por questões de segurança, só depois de ser ligado o motor elétrico que aciona o tapete rolante é que aparece um ecrã igual ao da ***Figura 43***, que permite ao operador ligar as resistências elétricas localizadas no interior do túnel de aquecimento.

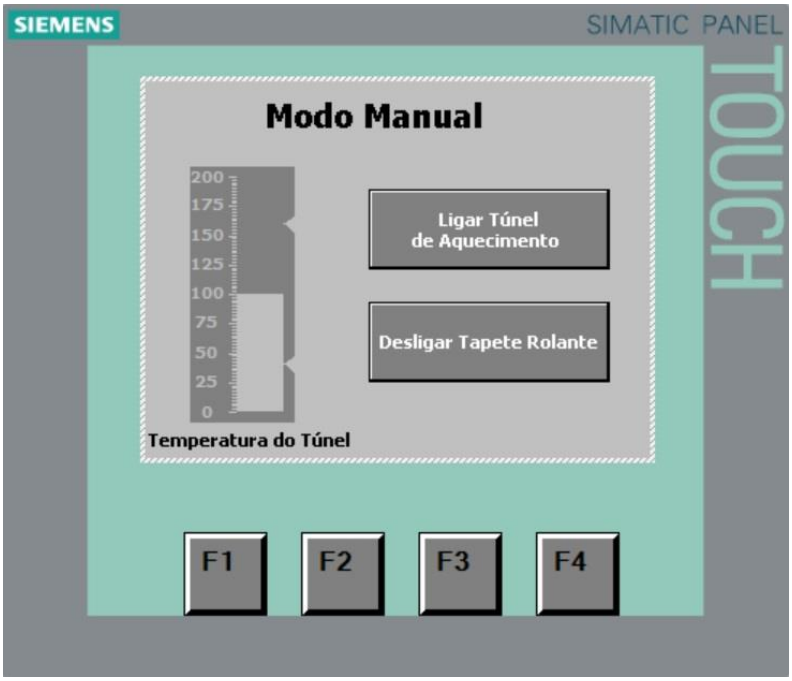

Figura 43 - Modo Manual (Ecrã 2)

Se o operador optar por ligar o túnel de aquecimento, aparecerá um ecrã igual ao da ***Figura 44***, que permite monitorizar a temperatura do túnel de aquecimento e ainda desligar o túnel de aquecimento. No caso de o operador desligar o túnel de aquecimento, surge novamente o ecrã do Modo Manual (ver ***Figura 43***) que permite voltar a ligar o túnel de aquecimento ou desligar o tapete rolante.

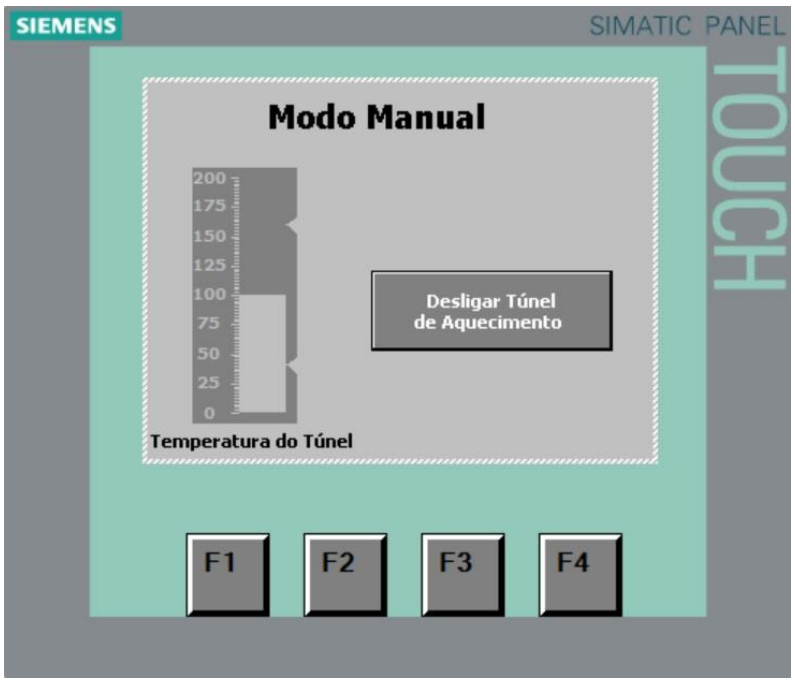

Figura 44 - Modo Manual (Ecrã 3)

Ao desligar o tapete rolante, será apresentado um ecrã igual ao da ***Figura 45***, que informa que o tapete rolante só se desligará assim que a temperatura do túnel de aquecimento seja suficientemente baixa, de modo a proteger o tapete rolante de um eventual sobreaquecimento que o possa danificar.

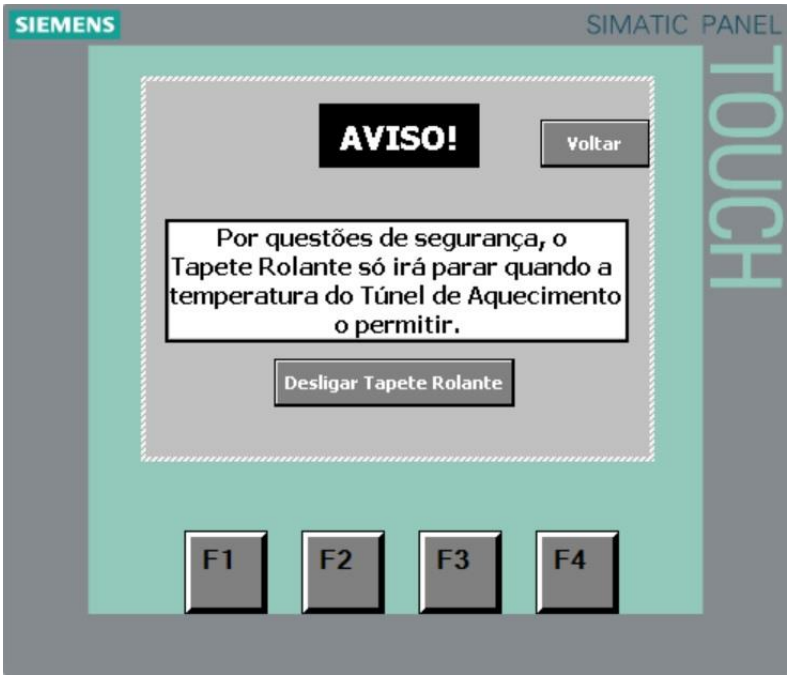

Figura 45 - Desligar tapete rolante

7.1.3 Modo Automático

Caso o operador selecione o Modo Automático, aparece um ecrã igual ao da ***Figura 46***. O operador pode optar por ligar o equipamento neste modo, monitorizar os parâmetros de funcionamento ou desligar o Modo Automático, regressando desta forma ao Menu Inicial (ver ***Figura 41***).

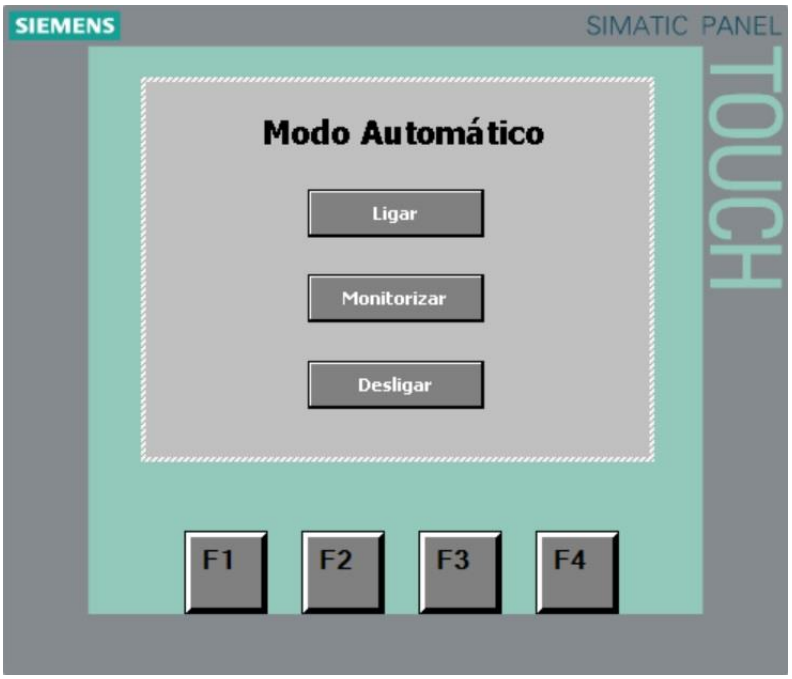

Figura 46 - Modo Automático

Caso o operador opte por ligar o Modo Automático, é aconselhável selecionar seguidamente a opção Monitorização. Aparece um ecrã igual ao da ***Figura 47***, que permite ter acesso a todos os parâmetros de funcionamento do equipamento.

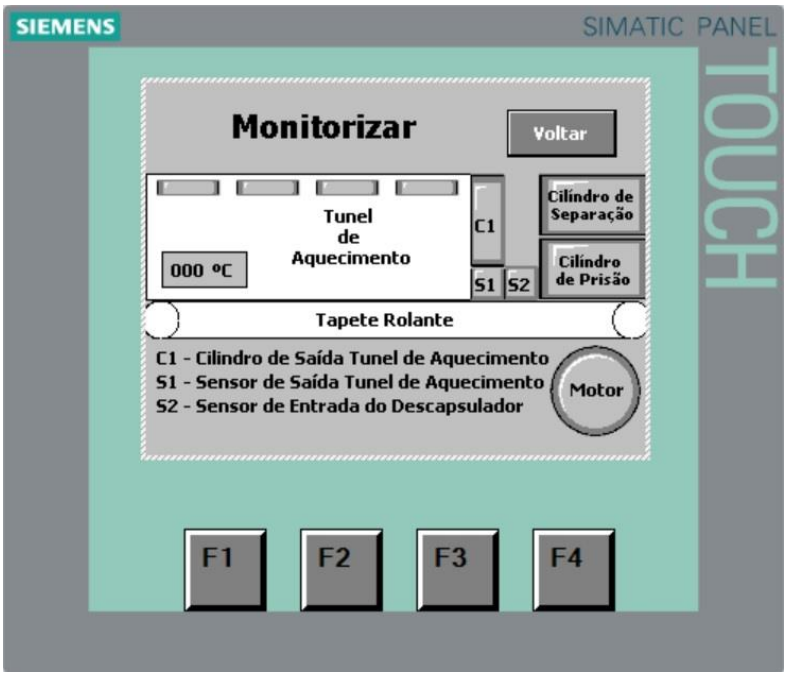

Figura 47 - Monitorização do Modo Automático

Ao desligar o Modo Automático, será apresentado um ecrã igual ao da ***Figura 48***, em que o operador pode confirmar que quer desligar ou manter o equipamento em funcionamento.

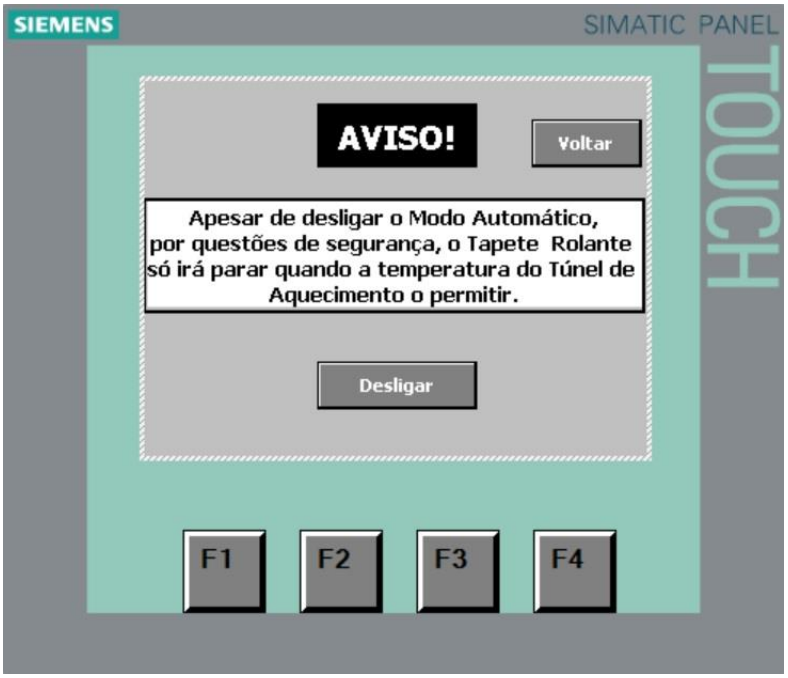

Figura 48 - Desligar Modo Automático

Se o operador optar por desligar o equipamento, será interrompida a sequência de funcionamento do equipamento e desligadas as resistências elétricas localizadas no interior do túnel de aquecimento. O motor elétrico que aciona o tapete rolante ficará em funcionamento até que a temperatura no interior do túnel de aquecimento seja suficientemente baixa, de modo a proteger o tapete rolante de um eventual sobreaquecimento que o possa danificar.

7.2 Resolução de problemas

7.2.1 Encravamento de rolhas na zona do descapsulador

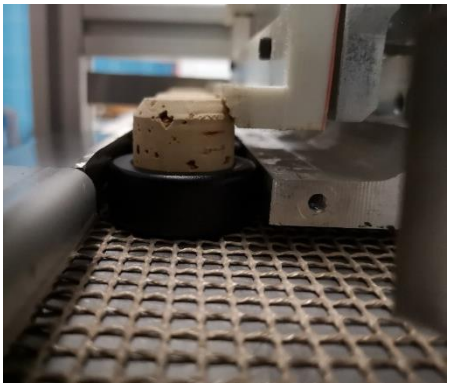

Figura 49 - Pormenor das rolhas no descapsulador

No caso de uma ou mais rolhas encravarem na zona do descapsulador, tal como mostra a ***Figura 49***, aquando da separação entre a cortiça e a cápsula, o operador deve pressionar imediatamente o botão de emergência, localizado na porta do quadro.

Depois deve retirar manualmente a(s) rolha(s) encravada(s) e também todas as rolhas localizadas entre o cilindro pneumático vertical situado à saída do túnel de aquecimento e a zona do descapsulador.

Após retirar a(s) rolha(s) encravada(s), o operador deve afastar as mãos, de modo a evitar lesões que podem ser provocadas pelo movimento das hastes dos cilindros pneumáticos de prisão e de separação, e só depois soltar o botão de emergência. O equipamento voltará a funcionar de imediato.

O pressionar do botão de emergência provoca a despressurização do circuito electropneumático do descapsulador, a paragem do tapete rolante, o desligar do túnel de aquecimento e reinicia a contagem das rolhas que saem do túnel de aquecimento!

Caso as rolhas comecem a encravar constantemente na zona do descapsulador, deve verificar-se a temperatura do túnel de aquecimento através do(s) ecrã(s) de monitorização (ver ***Figura 44*** ou ***Figura 47***, dependendo do modo selecionado). Normalmente, a temperatura deve situar-se entre os 120ºC e os 135ºC. No caso de a temperatura ser inferior, não existirá calor suficiente no interior do túnel de aquecimento para derreter a cola que une a cortiça à cápsula ao ponto de permitir a sua separação. Nesse caso será necessário esperar que a temperatura no túnel de aquecimento atinja a temperatura normal de funcionamento.

Outro fator que pode provocar o encravamento das rolhas na zona do descapsulador é a eventualidade de uma ou mais resistências elétricas não estarem a funcionar corretamente, causando uma temperatura menos uniforme no interior do túnel de aquecimento.

7.2.2 Equipamento sem resposta

Caso o equipamento não responda às ordens de arranque, quer em Modo Automático, quer em Modo Manual, o operador deve abrir a porta do quadro e verificar se o autómato está no estado “STOP”. Para isso deve, no autómato programável, verificar qual a cor do indicador luminoso situado mais à esquerda, correspondente ao estado “RUN/STOP”. No caso de a cor do indicador luminoso ser amarela, como mostra a ***Figura 50***, o autómato programável está no estado “STOP”.

Figura 50 - Pormenor do autómato em "Stop"

Para voltar a colocar o autómato programável novamente no estado “RUN”, basta regressar ao ecrã do Menu Inicial e pressionar na tecla F3 (associada a “PLC RUN”), conforme mostra a ***Figura 51***.

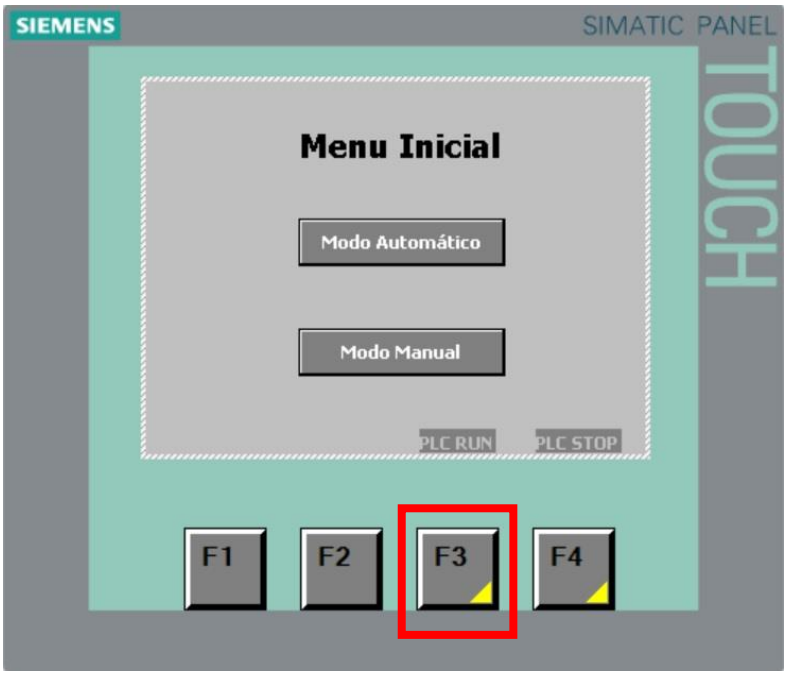

Figura 51 - Destaque da tecla "F3" no menu inicial

Após pressionar a tecla F3, a cor amarela do indicador luminoso mudará para cor verde dentro de poucos segundos, indicando assim que o autómato está no estado “RUN”.

Caso o problema persista, é necessário verificar o funcionamento de toda a instalação elétrica.

7.3 Lista de cápsulas testadas

7.3.1 Cápsulas a evitar

De todas as cápsulas fornecidas para serem testadas, alguns modelos não deram resultados satisfatórios durante os testes, por mais mudanças que fossem testadas. Posto isto, para o correto funcionamento da máquina, é recomendável que sejam evitadas as cápsulas abaixo.

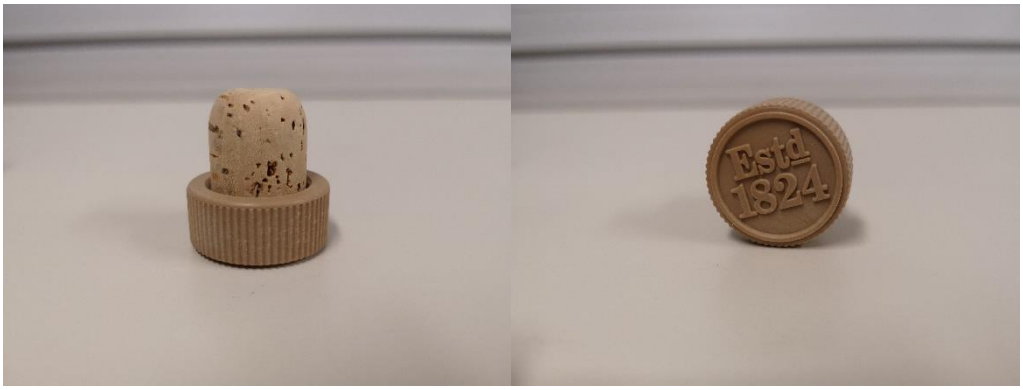

Figura 52 - Cápsulas a evitar 1

O tipo de cápsulas mostrado na ***Figura 52*** é bastante sensível à passagem da emenda e à textura da tela, fazendo com que as cápsulas virem com alguma recorrência quando estão paradas à saída do túnel ou já no descapsulador. Este problema poderá ser extensível a qualquer outro tipo de cápsula que tenha símbolos ou marcas salientes como a da ***Figura 52***.

Figura 53 - Cápsulas a evitar 2

Outro tipo de cápsula que obteve maus resultados nos testes foi o mostrado na ***Figura 53***. Estas cápsulas levantavam com alguma recorrência quando o descapsulador executava o movimento de separação, encravando a máquina na maioria das vezes. Não foi possível chegar a uma conclusão acerca deste fenómeno, porque cápsulas com características semelhantes não foram de todo problemáticas durante os testes realizados.

7.3.2 Cápsulas testadas com sucesso

As cápsulas mostradas na ***Figura 54*** foram as que foram testadas com bons resultados, podendo ser descapsuladas em modo automático.

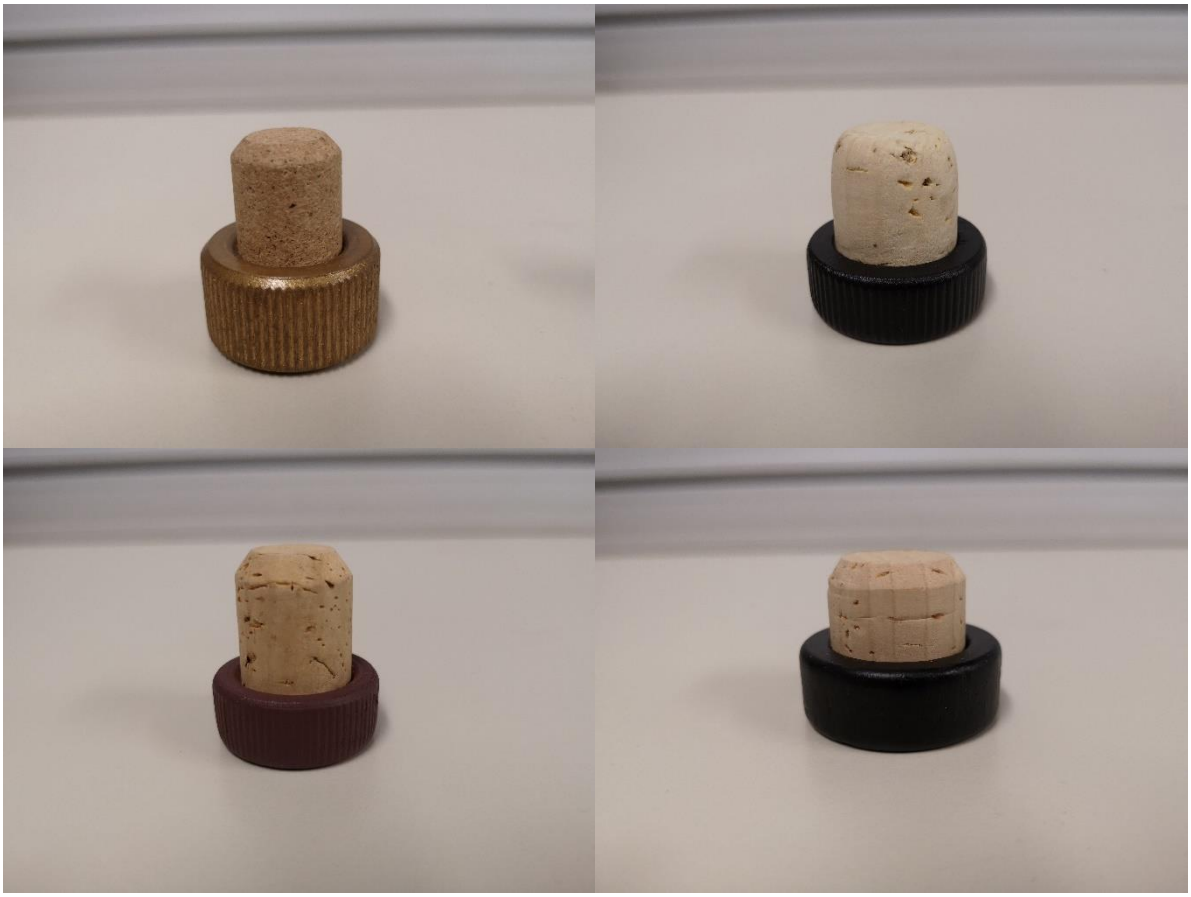

Figura 54 - Cápsulas testadas com sucesso

8 OPORTUNIDADES DE MELHORIA

Apesar das diversas melhorias realizadas no sistema automatizado de descapsulagem de rolhas de cortiça capsuladas no decurso do presente projeto, houve algumas melhorias que, apesar de identificadas, ficaram por fazer, não só pela escassez de recursos, mas também pelo facto de a empresa Beira Correia Lda. ter alguma urgência em receber o equipamento para começar a usufruir dele. Estes fatores levaram a compromissos em áreas que podem, no entanto, ser melhoradas no futuro, dada a natureza modular do equipamento.

8.1 Tapete rolante

Um dos pontos que é possível melhorar, e que é provavelmente o que mais facilmente se pode concretizar é a tela utilizada no tapete rolante.

A dada altura, numa fase bastante inicial do processo de conceção, foi previamente selecionada e instalada uma tela transportadora em malha quadrada, capaz de lidar com as temperaturas elevadas do túnel de aquecimento. No entanto, posteriormente verificou-se que este tipo de tela não é adequado para cápsulas com padrões salientes na zona que contacta com a superfície da tela, fazendo com que estas rolhas tombassem, causando encravamentos.

Figura 55 - Exemplo de configuração de cápsulas inadequadas

Além deste problema, o facto de a tela transportadora utilizar uma união metálica para o seu fecho, faz também com que este tipo de rolhas capsuladas tombe quando a união embate nas cápsulas, pois a união é muito saliente em relação à tela.

Figura 56 - União metálica da tela transportadora

A solução para estes problemas passa por substituir a tela transportadora original por uma tela com revestimento de borracha e com um sistema de união diferente.

8.2 Túnel de aquecimento

Outra área do sistema automatizado de descapsulagem de rolhas de cortiça capsuladas que necessita de melhorias é o túnel de aquecimento. Na atual versão do túnel de aquecimento, são utilizadas 10 resistências elétricas para fazer o aquecimento do túnel, de modo a derreter a cola termofusível, permitindo assim a separação entre o corpo de cortiça e a cápsula. Esta solução tem a vantagem de as rolhas precisarem de pouco tempo dentro do túnel de aquecimento para atingirem a temperatura necessária para derreter a cola termofusível. No entanto, e visto que as resistências elétricas funcionam de forma intermitente, passa a haver uma grande variação de calor absorvido pelas rolhas entre a fase em que as resistências estão ligadas e a fase em que estão desligadas. Esta variação faz com que seja difícil encontrar uma temperatura ideal no interior do túnel de aquecimento.

O problema criado no interior do túnel por esta situação reside no facto de as resistências elétricas não só aquecerem o ar no interior do túnel de aquecimento, mas também transmitirem para as rolhas uma grande quantidade de calor sob a forma de radiação. Este é o verdadeiro problema no interior do túnel, pois é devido à grande quantidade de calor absorvido por radiação pelos corpos de cortiça que estes saem queimados do túnel de aquecimento.

Para resolver o problema da transferência de calor por radiação, sugere-se que sejam eliminadas as resistências elétricas do interior do túnel de aquecimento. Em alternativa, sugere-se a colocação de um termoventilador para fazer o aquecimento do túnel, que admita o ar do interior do túnel e que o envie já aquecido de novo para o interior do túnel. Apesar de o túnel de aquecimento ter os pórticos de entrada e saída de rolhas capsuladas, as perdas de ar quente por estes pórticos serão mínimas, considerando-se a massa de ar expelida pelo termoventilador para o interior do túnel de aquecimento igual à massa de ar aspirada por este do interior do túnel de aquecimento. Esta solução irá permitir que a resistência do termoventilador possa ser desligada ou ter um controlo analógico que permita regular a energia gasta pela resistência em função da temperatura do ar de admissão do termoventilador. Consequentemente permitirá uma temperatura mais constante e homogénea no interior do túnel de aquecimento, uma vez que o ar se renovará a uma velocidade muito superior. Esta solução elimina também a transferência de calor por radiação para as rolhas, visto que o dispositivo que faz o aquecimento do ar deixa de estar próximo das rolhas, passando estas a ser aquecidas apenas por convecção forçada.

Este conjunto de melhorias levará também a uma economia de energia, visto que o facto de o ar admitido pelo termoventilador ser recirculado do interior do túnel e já aquecido, fará com que as resistências elétricas trabalhem apenas uma parte do

tempo, ou então, em alternativa, que trabalhem a uma intensidade reduzida, suficiente para manter constante a temperatura do ar no interior do túnel de aquecimento.

8.3 Extrator de rolhas

Relativamente ao atual extrator de rolhas, concluiu-se que o conceito utilizado poderá causar eventuais encravamentos de rolhas, exigindo que um operador desencrave o sistema para que este possa retomar o seu funcionamento. Além disso, com a solução atual, a cadência do sistema não vai além das 4 rolhas por minuto.

Para solucionar este problema, é proposta uma solução de extrator de rolhas com prato rotativo, semelhante ao da ***Figura 57***. Com esta solução, os corpos de cortiça podem ser separados da respetiva cápsula através de uma ventosa com vácuo ou com algum tipo de garra que agarre o corpo de cortiça e faça a separação. Esta solução, crê-se, vai aumentar não só a cadência do extrator de rolhas, como também irá aumentar a sua fiabilidade. Outra grande vantagem que poderá advir desta solução consiste no facto de se evitar partir alguns corpos de cortiça na cápsula, pois estes deixam de sofrer um momento fletor para que ocorra a separação, passando a sofrer uma força de tração.

Outra grande vantagem deste novo conceito, é o facto de poderem ser instalados outros equipamentos para realizar outras operações em volta do prato, como por exemplo um sistema que faça a remoção da cola do interior das cápsulas.

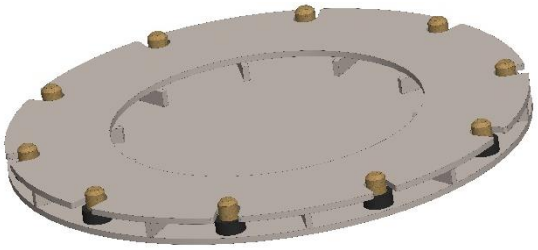

Figura 57 - Protótipo de um eventual futuro extrator de rolhas

É importante salientar que esta solução se trata apenas de um desenho de conceito, que poderá dar origem a um novo protótipo, que terá de ser testado e aperfeiçoado, pois com ele poderão surgir novos problemas que terão de ser resolvidos.

9 CONCLUSÃO

Após a conclusão do presente projeto, torna-se óbvio o quão difícil é a otimização de um sistema já desenvolvido no início do projeto, fazendo com que toda e qualquer alteração teria de ser unicamente superficial e nunca uma alteração de conceito de qualquer dos constituintes do sistema automatizado de descapsulagem de rolhas de cortiça capsuladas. Este foi o grande desafio do projeto: fazer alterações ao sistema que permitissem corrigir os defeitos ainda presentes no sistema, antes de este ser entregue à empresa, para que pudesse desempenhar a sua função da forma mais fiável e rentável possível.

No entanto, o facto de não poderem ser feitas alterações de fundo ao sistema durante o presente projeto, tornou-o mais desafiante e originou, paralelamente a este projeto, a conceção de uma ideia para um protótipo de descapsulador, que pode vir a ser desenvolvido no futuro pelo ISEC, em conjunto com a empresa Beira Correia Lda.. Este conceito está descrito na secção3 do Capítulo 8.

10 REFERÊNCIAS BIBLIOGRÁFICAS

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ANEXOS

Anexo A - Programação do autómato

Bloco *Main*

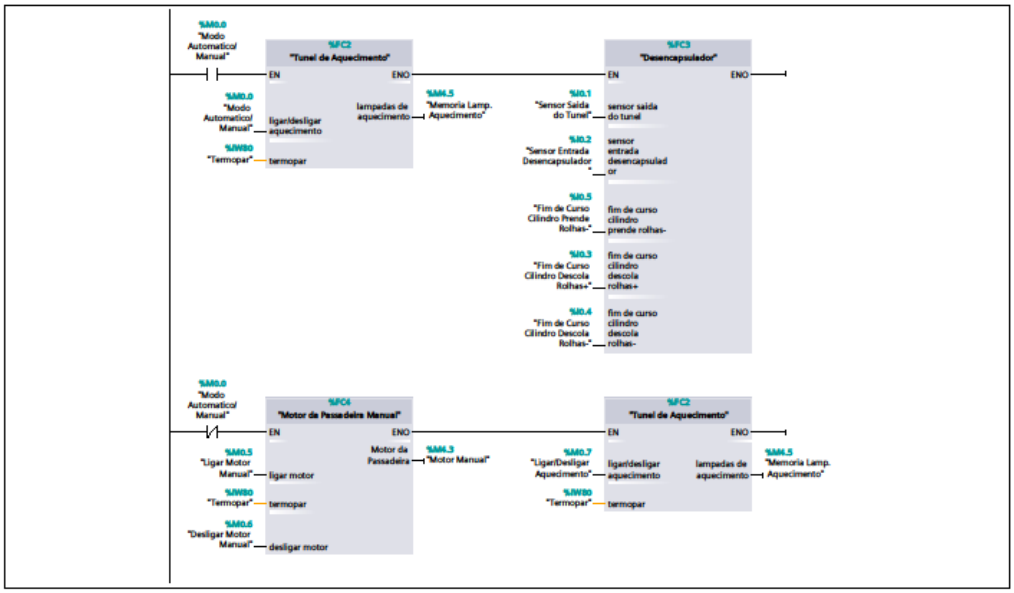
Totally Integrated Automation Portal		

Main [OB1]

Main Properties							
General							
Name	Main	**Number**	1	**Type**	OB	**Language**	LAD
Numbering	automatic						
Information							
Title	"Main Program Sweep (Cyde)"	**Author**		**Comment**		**Family**	
Version	0.1	**User-defined ID**					

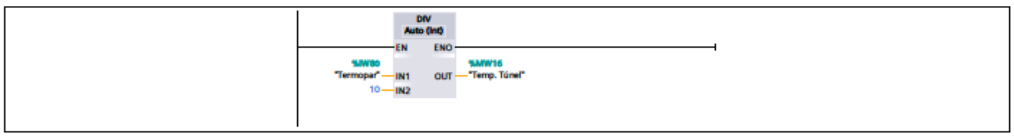
Name	Data type	Default value	Comment
Temp			
Constant			

Network 1:



Symbol	Address	Type	Comment
"Desligar Motor Manual"	%M0.6	Bool	
"Fim de Curso Cilindro Descola Rolhas-"	%I0.4	Bool	
"Fim de Curso Cilindro Descola Rolhas+"	%I0.3	Bool	
"Fim de Curso Cilindro Prende Rolhas-"	%I0.5	Bool	
"Ligar Motor Manual"	%M0.5	Bool	
"Ligar/Desligar Aquecimento"	%M0.7	Bool	
"Memoria Lamp. Aquecimento"	%M4.5	Bool	
"Modo Automatico/Manual"	%M0.0	Bool	
"Motor Manual"	%M4.3	Bool	
"Sensor Entrada Desencapsulador"	%I0.2	Bool	
"Sensor Saida do Tunel"	%I0.1	Bool	
"Termopar"	%IW80	Int	

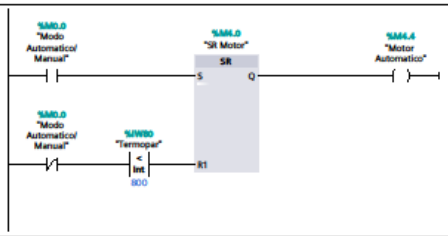
Network 2:



Symbol	Address	Type	Comment
"Temp. Túnel"	%MW16	Int	
"Termopar"	%IW80	Int	

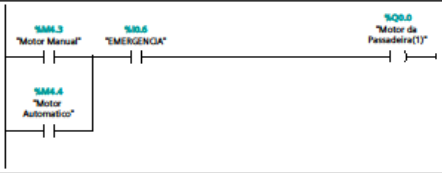
Network 3:

Totally Integrated Automation Portal



Symbol	Address	Type	Comment
"Modo Automatico/Manual"	%M0.0	Bool	
"Motor Automatico"	%M4.4	Bool	
"SR Motor"	%M4.0	Bool	
"Termopar"	%IW80	Int	

Network 4:



Symbol	Address	Type	Comment
"EMERGENCIA"	%I0.6	Bool	
"Motor Automatico"	%M4.4	Bool	
"Motor da Passadeira(1)"	%Q0.0	Bool	
"Motor Manual"	%M4.3	Bool	

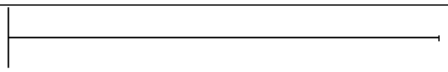
Network 5:

Symbol	Address	Type	Comment
"EMERGENCIA"	%I0.6	Bool	
"Válvula de Segurança"	%Q1.0	Bool	

Network 6:

Symbol	Address	Type	Comment
"EMERGENCIA"	%I0.6	Bool	
"Lâmpadas de Aquecimento"	%Q0.1	Bool	
"Memoria Lamp. Aquecimento"	%M4.5	Bool	

Network 7:



Symbol	Address	Type	Comment

Função Descapsulador

Totally Integrated Automation Portal		

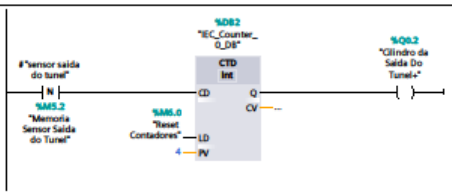
Rui_Neves_10 / PLC_1 [CPU 1214C AC/DC/Rly] / Program blocks

Desencapsulador [FC3]

Desencapsulador Properties							
General							
Name	Desencapsulador	**Number**	3	**Type**	FC	**Language**	LAD
Numbering	automatic						
Information							
Title		**Author**		**Comment**		**Family**	
Version	0.1	**User-defined ID**					

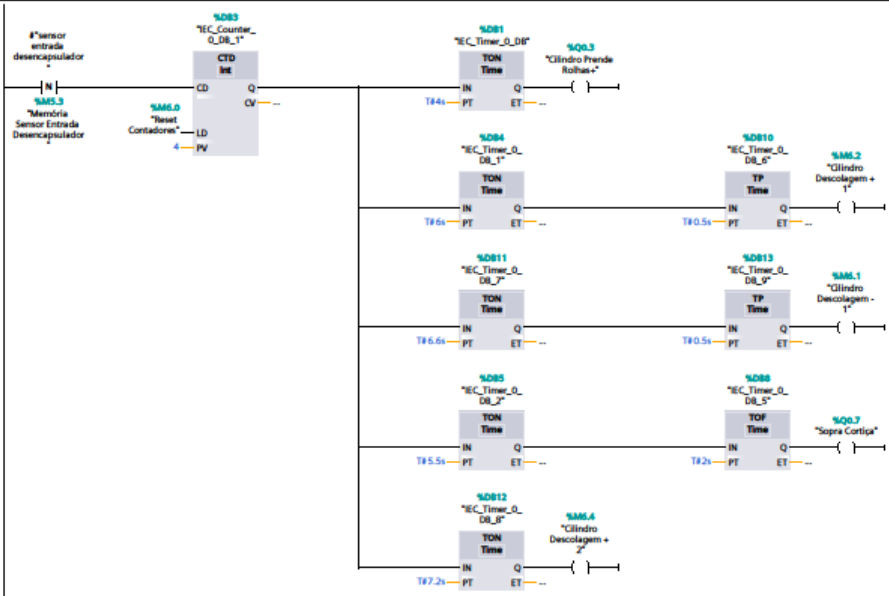
Desencapsulador			
Name	**Data type**	**Default value**	**Comment**
Input			
sensor saida do tunel	Bool		
sensor entrada desencapsulador	Bool		
fim de curso cilindro prende rolhas-	Bool		
fim de curso cilindro descola rolhas+	Bool		
fim de curso cilindro descola rolhas-	Bool		
Output			
InOut			
Temp			
Constant			
Return			
Desencapsulador	Void		

Network 1:



Symbol	Address	Type	Comment
"Cilindro da Saida Do Tunel+"	%Q0.2	Bool	
"Memoria Sensor Saida do Tunel"	%M5.2	Bool	
"Reset Contadores"	%M6.0	Bool	
#"sensor saida do tunel"		Bool	

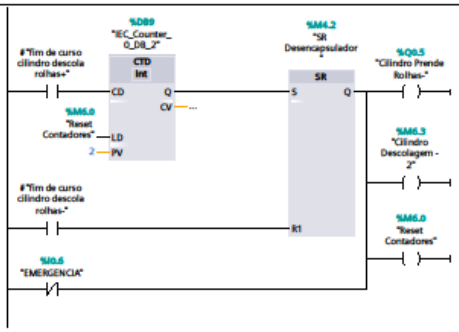
Network 2:



Totally Integrated Automation Portal

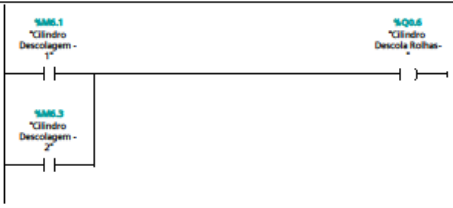
Symbol	Address	Type	Comment
"Cilindro Descolagem - 1"	%M6.1	Bool	
"Cilindro Descolagem + 1"	%M6.2	Bool	
"Cilindro Descolagem + 2"	%M6.4	Bool	
"Cilindro Prende Rolhas+"	%Q0.3	Bool	
"Memoria Sensor Entrada Desencapsulador"	%M5.3	Bool	
"Reset Contadores"	%M6.0	Bool	
"Sopra Cortiça"	%Q0.7	Bool	
#"sensor entrada desencapsulador"		Bool	

Network 3:



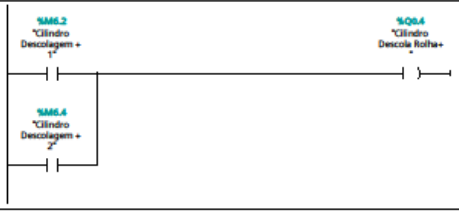
Symbol	Address	Type	Comment
"Cilindro Descolagem - 2"	%M6.3	Bool	
"Cilindro Prende Rolhas-"	%Q0.5	Bool	
"EMERGENCIA"	%I0.6	Bool	
"Reset Contadores"	%M6.0	Bool	
"SR Desencapsulador"	%M4.2	Bool	
#"fim de curso cilindro descola rolhas-"		Bool	
#"fim de curso cilindro descola rolhas+"		Bool	

Network 4:



Symbol	Address	Type	Comment
"Cilindro Descola Rolhas-"	%Q0.6	Bool	
"Cilindro Descolagem - 1"	%M6.1	Bool	
"Cilindro Descolagem - 2"	%M6.3	Bool	

Network 5:



Symbol	Address	Type	Comment
"Cilindro Descola Rolha+"	%Q0.4	Bool	
"Cilindro Descolagem + 1"	%M6.2	Bool	
"Cilindro Descolagem + 2"	%M6.4	Bool	

Função Motor Passadeira Manual

Totally Integrated Automation Portal		

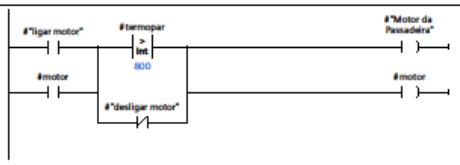
Rui_Neves_10 / PLC_1 [CPU 1214C AC/DC/Rly] / Program blocks

Motor da Passadeira Manual [FC4]

Motor da Passadeira Manual Properties							
General							
Name	Motor da Passadeira Manual	**Number**	4	**Type**	FC	**Language**	LAD
Numbering	automatic						
Information							
Title		**Author**		**Comment**		**Family**	
Version	0.1	**User-defined ID**					

Motor da Passadeira Manual			
Name	**Data type**	**Default value**	**Comment**
Input			
ligar motor	Bool		
termopar	Int		
desligar motor	Bool		
Output			
Motor da Passadeira	Bool		
InOut			
Temp			
motor	Bool		
Constant			
Return			
Motor da Passadeira Manual	Void		

Network 1:



Symbol	Address	Type	Comment
#"desligar motor"		Bool	
#"ligar motor"		Bool	
#"Motor da Passadeira"		Bool	
#motor		Bool	
#termopar		Int	

Função Túnel de Aquecimento

Totally Integrated Automation Portal		

Rui_Neves_10 / PLC_1 [CPU 1214C AC/DC/Rly] / Program blocks

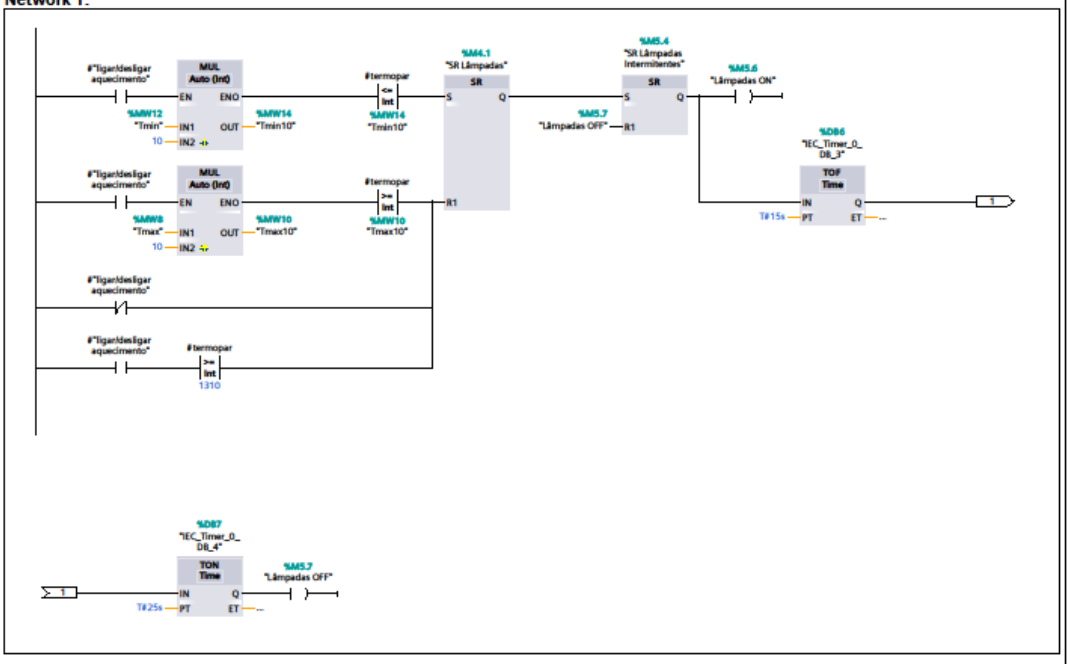
Tunel de Aquecimento [FC2]

Tunel de Aquecimento Properties							
General							
Name	Tunel de Aquecimento	**Number**	2	**Type**	FC	**Language**	LAD
Numbering	automatic						
Information							
Title		**Author**		**Comment**		**Family**	
Version	0.1	**User-defined ID**					

Tunel de Aquecimento			
Name	**Data type**	**Default value**	**Comment**
Input			
ligar/desligar aquecimento	Bool		
termopar	Int		
Output			
lampadas de aquecimento	Bool		
InOut			
Temp			
Constant			
Return			
Tunel de Aquecimento	Void		

Network 1:

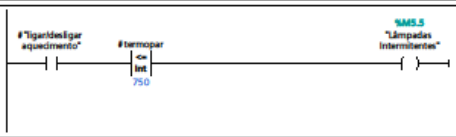
Network 1:



Symbol	Address	Type	Comment
"Lâmpadas OFF"	%M5.7	Bool	
"Lâmpadas ON"	%M5.6	Bool	
"SR Lâmpadas Intermitentes"	%M5.4	Bool	
"SR Lâmpadas"	%M4.1	Bool	
"Tmax10"	%MW10	Int	
"Tmax"	%MW8	Int	
"Tmin10"	%MW14	Int	
"Tmin"	%MW12	Int	
#"ligar/desligar aquecimento"		Bool	
#termopar		Int	

Network 2:

Totally Integrated Automation Portal



Symbol	Address	Type	Comment
"Lâmpadas Intermitentes"	%M5.5	Bool	
#"ligar/desligar aquecimento"		Bool	
#termopar		Int	

Network 3:

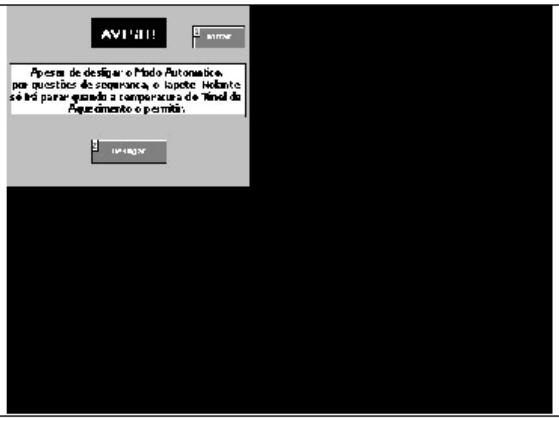
Symbol	Address	Type	Comment
"Lâmpadas Intermitentes"	%M5.5	Bool	
"Lâmpadas ON"	%M5.6	Bool	
#"lampadas de aquecimento"		Bool	

Ecrãs HMI

Totally Integrated Automation Portal		

Desligar

Hardcopy of Desligar



General					
Name	Desligar	Background color	192, 192, 192	Grid color	192, 192, 192
Number	4	Template	Template_1	Tooltip	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

HmiScreenItemData_1

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Voltar
Text ON	Back				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	30	X position	245
Y position	27	Width	69		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	HmiScreenItemData_1
Security					
Authorization		Allow operator control	Checked		

Totally Integrated Automation Portal

Dynamizations\Event

Event name	Release

Function list\ActivateScreen

Screen name	Modo Automatico	**Object number**	0

Text field_1

Type	Text field				
General					
Text	Apesar de desligar o Modo Automá-tico, por questões de segurança, o Ta-pete Rolante só irá parar quando a temperatura do Túnel de Aquecimento o permitir.				
Appearance					
Background color	255, 255, 255	**Background fill pat-tern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	66
X position	5	**Left margin**	0	**Right margin**	2
Y position	78	**Top margin**	2	**Width**	311
Text					
Font	Tahoma, 13px, style=Bold	**Horizontal align-ment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_1		

Rectangle_1

Type	Rectangle				
Appearance					
Background color	255, 255, 255	**Background fill pat-tern**	Transparent	**Border color**	0, 0, 0
Border width	2	**Line style**	Solid		
Layout					
Height	72	**X position**	2	**Round corner height**	0
Round corner width	0	**Y position**	76	**Width**	314
Miscellaneous					
Layer	0 - Layer_0	**Name**	Rectangle_1		

Rectangle_2

Type	Rectangle				
Appearance					
Background color	0, 0, 0	**Background fill pat-tern**	Solid	**Border color**	0, 0, 0
Border width	1	**Line style**	Solid		
Layout					
Height	40	**X position**	111	**Round corner height**	0
Round corner width	0	**Y position**	17	**Width**	100
Miscellaneous					
Layer	0 - Layer_0	**Name**	Rectangle_2		

Text field_2

Type	Text field				
General					
Text	AVISO!				
Appearance					
Background color	128, 128, 128	**Background fill pat-tern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	255, 255, 255				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	26
X position	124	**Left margin**	0	**Right margin**	2
Y position	24	**Top margin**	2	**Width**	75
Text					
Font	Tahoma, 20px, style=Bold	**Horizontal align-ment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_2		

HmiScreenItemData_2

Type	Button				
General					
Bit number	0	**Hotkey**	None	**Mode**	Text
Graphic list		**Graphic OFF**		**Graphic ON**	
Process value		**Text list**		**Text OFF**	Desligar
Text ON	Back				
Appearance					
Background color	128, 128, 128	**Foreground color**	255, 255, 255		

Totally Integrated Automation Portal

Design					
3D border style	Checked	**Focus color**	128, 128, 128		
Layout					
Fit to size	Unchecked	**Height**	30	**X position**	111
Y position	178	**Width**	100		
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	HmiScreenItemData_2
Security					
Authorization		**Allow operator control**	Checked		

Dynamizations\Event	
Event name	Release

Function list\ActivateScreen

Screen name	Menu Inicial	**Object number**	0

Dynamizations\Event	
Event name	Press

Function list\ResetBit

Tag	Modo automatico/manual

Totally Integrated Automation Portal		

Desligar Tapete Rolante

Hardcopy of Desligar Tapete Rolante

General					
Name	Desligar Tapete Rolante	Background color	192, 192, 192	Grid color	192, 192, 192
Number	6	Template	Template_1	Tooltip	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

HmiScreenItemData_1

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Voltar
Text ON	Back				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	30	X position	249
Y position	27	Width	69		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	HmiScreenItemData_1
Security					
Authorization		Allow operator control	Checked		

Totally Integrated Automation Portal

Dynamizations\Event					
Event name	Release				

Function list\ActivateScreen

Screen name	Modo Manual_1	Object number	0

Text field_1

Type	Text field				
General					
Text	Por questões de segurança, o Tapete Rolante só irá parar quando a temperatura do Túnel de Aquecimento o permitir.				
Appearance					
Background color	255, 255, 255	Background fill pattern	Solid	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Checked	Height	74
X position	18	Left margin	0	Right margin	2
Y position	89	Top margin	2	Width	284
Text					
Font	Tahoma, 15px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	Text field_1		

Rectangle_1

Type	Rectangle				
Appearance					
Background color	255, 255, 255	Background fill pattern	Transparent	Border color	0, 0, 0
Border width	2	Line style	Solid		
Layout					
Height	77	X position	15	Round corner height	0
Round corner width	0	Y position	89	Width	289
Miscellaneous					
Layer	0 - Layer_0	Name	Rectangle_1		

Rectangle_2

Type	Rectangle				
Appearance					
Background color	0, 0, 0	Background fill pattern	Solid	Border color	0, 0, 0
Border width	1	Line style	Solid		
Layout					
Height	40	X position	111	Round corner height	0
Round corner width	0	Y position	17	Width	100
Miscellaneous					
Layer	0 - Layer_0	Name	Rectangle_2		

Text field_2

Type	Text field				
General					
Text	AVISO!				
Appearance					
Background color	128, 128, 128	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	255, 255, 255				
Layout					
Bottom margin	0	Fit to size	Checked	Height	26
X position	124	Left margin	0	Right margin	2
Y position	24	Top margin	2	Width	75
Text					
Font	Tahoma, 20px, style=Bold	Horizontal alignment	Left	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	Text field_2		

HmiScreenItemData_2

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Desligar Tapete Rolante
Text ON	Back				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		

Totally Integrated Automation Portal

Design					
3D border style	Checked	**Focus color**	128, 128, 128		
Layout					
Fit to size	Unchecked	**Height**	30	**X position**	83
Y position	176	**Width**	150		
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	HmiScreenItemData_2
Security					
Authorization		**Allow operator control**	Checked		

Dynamizations\Event	
Event name	Release

Function list\ActivateScreen

Screen name	Modo Manual	**Object number**	0

Function list\SetBit

Tag	desligar motor manual

Function list\ResetBit

Tag	ligar motor manual

Totally Integrated Automation Portal		

Menu Inicial

Hardcopy of Menu Inicial

General					
Name	Menu Inicial	Background color	192, 192, 192	Grid color	192, 192, 192
Number	1	Template	Template_1	Tooltip	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

HmiScreenItemData

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Modo Automático
Text ON	Modo Autom...				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	30	X position	99
Y position	89	Width	130		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	HmiScreenItemData
Security					
Authorization		Allow operator control	Checked		

Totally Integrated Automation Portal

Dynamizations\Event					
Event name		Release			

Function list\ActivateScreen

Screen name	Modo Automatico	**Object number**	0

HmiScreenItemData_1

Type	Button				
General					
Bit number	0	**Hotkey**	None	**Mode**	Text
Graphic list		**Graphic OFF**		**Graphic ON**	
Process value		**Text list**		**Text OFF**	Modo Manual
Text ON	Modo Manual				
Appearance					
Background color	128, 128, 128	**Foreground color**	255, 255, 255		
Design					
3D border style	Checked	**Focus color**	128, 128, 128		
Layout					
Fit to size	Unchecked	**Height**	30	**X position**	99
Y position	158	**Width**	130		
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	HmiScreenItemData_1
Security					
Authorization		**Allow operator control**	Checked		

Dynamizations\Event			
Event name	Release		

Function list\ActivateScreen

Screen name	Modo Manual	**Object number**	0

HmiScreenItemData_2

Type	Text field				
General					
Text	Menu Inicial				
Appearance					
Background color	192, 192, 192	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Unchecked	**Height**	40
X position	92	**Left margin**	0	**Right margin**	2
Y position	22	**Top margin**	2	**Width**	144
Text					
Font	Tahoma, 20px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	HmiScreenItemData_2		

Softkey_F3

Type	Function key				
General					
Authorization		**Global assignment**	Unchecked	**KeyCode**	222
LED tag		**Bit in the LED tag**	0	**Graphic**	

Dynamizations\Event			
Event name	Press key		

Function list\SetPLCMode

Connection	HMI_Connection_2	**Mode**	RUN

Softkey_F4

Type	Function key				
General					
Authorization		**Global assignment**	Unchecked	**KeyCode**	223
LED tag		**Bit in the LED tag**	0	**Graphic**	

Dynamizations\Event			
Event name	Release key		

Function list\SetPLCMode

Connection	HMI_Connection_2	**Mode**	STOP

Text field_1

Type	Text field
General	
Text	PLC RUN

Totally Integrated Automation Portal

Appearance					
Background color	128, 128, 128	**Background fill pattern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	192, 192, 192				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	175	**Left margin**	0	**Right margin**	2
Y position	221	**Top margin**	2	**Width**	48
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_1		

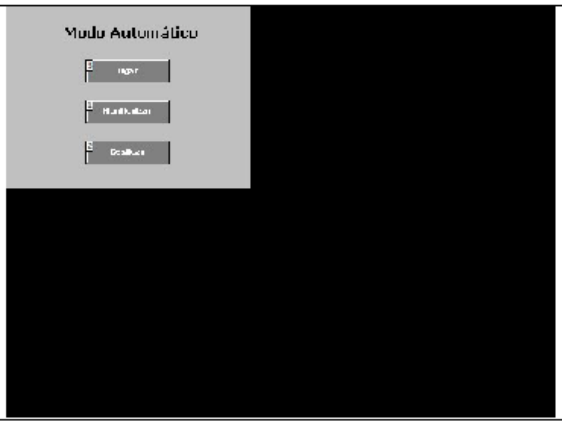
Text field_2

Type	Text field				
General					
Text	PLC STOP				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	192, 192, 192				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	248	**Left margin**	0	**Right margin**	2
Y position	221	**Top margin**	2	**Width**	54
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_2		

Totally Integrated Automation Portal		

Modo Automatico

Hardcopy of Modo Automatico



General					
Name	Modo Automatico	**Background color**	192, 192, 192	**Grid color**	192, 192, 192
Number	2	**Template**	Template_1	**Tooltip**	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

HmiScreenItemData_2

Type	Button				
General					
Bit number	0	**Hotkey**	None	**Mode**	Text
Graphic list		**Graphic OFF**		**Graphic ON**	
Process value		**Text list**		**Text OFF**	Monitorizar
Text ON	Monitorizar				
Appearance					
Background color	128, 128, 128	**Foreground color**	255, 255, 255		
Design					
3D border style	Checked	**Focus color**	128, 128, 128		
Layout					
Fit to size	Unchecked	**Height**	30	**X position**	104
Y position	123	**Width**	110		
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	HmiScreenItemData_2
Security					
Authorization		**Allow operator control**	Checked		

Totally Integrated Automation Portal

Dynamizations\Event	
Event name	Release

Function list\ActivateScreen

Screen name	Monitorizar	Object number	0

HmiScreenItemData_3

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Desligar
Text ON	Desligar				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	30	X position	104
Y position	177	Width	110		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	HmiScreenItemData_3
Security					
Authorization		Allow operator control	Checked		

Dynamizations\Event	
Event name	Release

Function list\ActivateScreen

Screen name	Desligar	Object number	0

HmiScreenItemData

Type	Text field				
General					
Text	Modo Automático				
Appearance					
Background color	128, 128, 128	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Unchecked	Height	40
X position	56	Left margin	0	Right margin	2
Y position	13	Top margin	2	Width	218
Text					
Font	Tahoma, 20px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	HmiScreenItemData		

Button_1

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Ligar
Text ON	Text				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	30	X position	104
Y position	70	Width	110		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	Button_1
Security					
Authorization		Allow operator control	Checked		

Dynamizations\Event	
Event name	Press

Function list\SetBit

Tag	Modo automatico/manual

Totally Integrated Automation Portal		

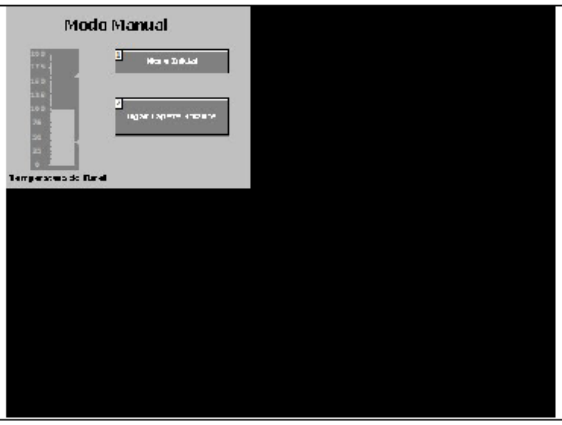
Softkey_F1

Type	Function key				
General					
Authorization		**Global assignment**	Unchecked	**KeyCode**	220
LED tag		**Bit in the LED tag**	0	**Graphic**	

Totally Integrated Automation Portal		

Modo Manual

Hardcopy of Modo Manual



General					
Name	Modo Manual	Background color	192, 192, 192	Grid color	192, 192, 192
Number	5	Template	Template_1	Tooltip	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

HmiScreenItemData_1

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Menu Inicial
Text ON	Back				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	30	X position	142
Y position	57	Width	150		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	HmiScreenItemData_1
Security					
Authorization		Allow operator control	Checked		

Totally Integrated Automation Portal

Dynamizations\Event					
Event name		Release			

Function list\ActivateScreen

Screen name	Menu Inicial	**Object number**	0

Button_1

Type	Button				
General					
Bit number	0	**Hotkey**	None	**Mode**	Text
Graphic list		**Graphic OFF**		**Graphic ON**	
Process value		**Text list**		**Text OFF**	Ligar Tapete Rolante
Text ON	Text				
Appearance					
Background color	128, 128, 128	**Foreground color**	255, 255, 255		
Design					
3D border style	Checked	**Focus color**	128, 128, 128		
Layout					
Fit to size	Unchecked	**Height**	50	**X position**	142
Y position	120	**Width**	150		
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	Button_1
Security					
Authorization		**Allow operator control**	Checked		

Dynamizations\Event			
Event name	Release		

Function list\ActivateScreen

Screen name	Modo Manual_1	**Object number**	0

Function list\SetBit

Tag	ligar motor manual

Function list\ResetBit

Tag	desligar motor manual

Bar_1

Type	Bar				
General					
Maximum value	200	**Minimum value**	0	**Process value**	0
Appearance					
Background color	128, 128, 128	**Background color of bar**	128, 128, 128	**Segment coloring**	Segmented
Foreground color	192, 192, 192	**Color of scale**	192, 192, 192	**Show limit lines**	Unchecked
Show limit markers	Checked				
Design					
Bar edge style	None	**3D border style**	Unchecked		
Scales					
Divisions	10	**Large mark labeling**	1	**Scale gradation**	25
Show scale	Checked	**Auto-scale**	Unchecked		
Label					
Integer digits	3	**Decimal places**	0	**Double-lined scale label**	Unchecked
Show "+" for positive numbers	Unchecked	**Show scale marks**	Checked	**Use exponential format**	Unchecked
Unit					
Layout					
Bar orientation	Top	**Height**	159	**X position**	31
Scale position	Left/up	**Y position**	56	**Width**	65
Text					
Font	Tahoma, 9px, style=Bold				
Limits					
Color low limit alarms	192, 192, 192	**Color high limit alarms**	192, 192, 192		
Miscellaneous					
Layer	0 - Layer_0	**Name**	Bar_1		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	temp. tunel		

HmiScreenItemData

Type	Text field				
General					
Text	Modo Manual				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Unchecked	**Height**	20
X position	66	**Left margin**	0	**Right margin**	2

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Y position	13	**Top margin**	2	**Width**	162
Text					
Font	Tahoma, 20px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	HmiScreenItemData		

Text field_1

Type	Text field				
General					
Text	Temperatura do Túnel				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	5	**Left margin**	0	**Right margin**	2
Y position	217	**Top margin**	2	**Width**	128
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_1		

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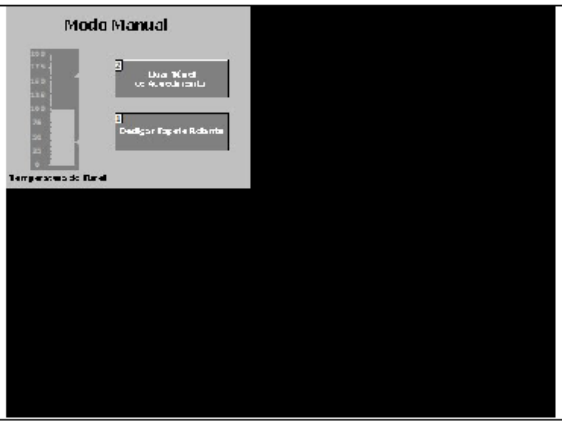
Modo Manual_1

Hardcopy of Modo Manual_1



General					
Name	Modo Manual_1	Background color	192, 192, 192	Grid color	192, 192, 192
Number	7	Template	Template_1	Tooltip	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

HmiScreenItemData_2

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Desligar Tapete Rolante
Text ON	Desligar Pass...				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	50	X position	142
Y position	140	Width	150		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	HmiScreenItemData_2
Security					
Authorization		Allow operator control	Checked		

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Dynamizations\Event	
Event name	Release

Function list\ActivateScreen

Screen name	Desligar Tapete Rolante	Object number	0

Bar_1

Type	Bar				
General					
Maximum value	200	Minimum value	0	Process value	0
Appearance					
Background color	128, 128, 128	Background color of bar	128, 128, 128	Segment coloring	Segmented
Foreground color	192, 192, 192	Color of scale	192, 192, 192	Show limit lines	Unchecked
Show limit markers	Checked				
Design					
Bar edge style	None	3D border style	Unchecked		
Scales					
Divisions	10	Large mark labeling	1	Scale gradation	25
Show scale	Checked	Auto-scale	Unchecked		
Label					
Integer digits	3	Decimal places	0	Double-lined scale label	Unchecked
Show "+" for positive numbers	Unchecked	Show scale marks	Checked	Use exponential format	Unchecked
Unit					
Layout					
Bar orientation	Top	Height	159	X position	31
Scale position	Left/up	Y position	56	Width	65
Text					
Font	Tahoma, 9px, style=Bold				
Limits					
Color low limit alarms	192, 192, 192	Color high limit alarms	192, 192, 192		
Miscellaneous					
Layer	0 - Layer_0	Name	Bar_1		
Dynamizations\Tag connection					
Property name	Process value	Tag	temp. tunel		

HmiScreenItemData

Type	Text field				
General					
Text	Modo Manual				
Appearance					
Background color	128, 128, 128	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Unchecked	Height	20
X position	66	Left margin	0	Right margin	2
Y position	13	Top margin	2	Width	162
Text					
Font	Tahoma, 20px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	HmiScreenItemData		

Text field_1

Type	Text field				
General					
Text	Temperatura do Tunel				
Appearance					
Background color	128, 128, 128	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Checked	Height	15
X position	5	Left margin	0	Right margin	2
Y position	217	Top margin	2	Width	128
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Left	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	Text field_1		

Button_1

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	

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Process value		**Text list**		**Text OFF**	Ligar Túnel de Aquecimento
Text ON	Text				
Appearance					
Background color	128, 128, 128	**Foreground color**	255, 255, 255		
Design					
3D border style	Checked	**Focus color**	128, 128, 128		
Layout					
Fit to size	Unchecked	**Height**	50	**X position**	142
Y position	70	**Width**	150		
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	Button_1
Security					
Authorization		**Allow operator control**	Checked		

Dynamizations\Event	
Event name	Release

Function list\ActivateScreen

Screen name	Modo Manual_2	**Object number**	0

Function list\SetBit

Tag	ligar/desligar aquecimento(1)

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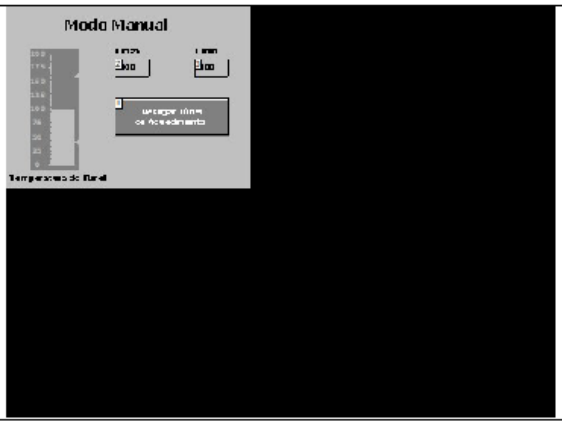
Modo Manual_2

Hardcopy of Modo Manual_2



General					
Name	Modo Manual_2	**Background color**	192, 192, 192	**Grid color**	192, 192, 192
Number	8	**Template**	Template_1	**Tooltip**	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

Bar_1

Type	Bar				
General					
Maximum value	200	**Minimum value**	0	**Process value**	0
Appearance					
Background color	128, 128, 128	**Background color of bar**	128, 128, 128	**Segment coloring**	Segmented
Foreground color	192, 192, 192	**Color of scale**	192, 192, 192	**Show limit lines**	Unchecked
Show limit markers	Checked				
Design					
Bar edge style	None	**3D border style**	Unchecked		
Scales					
Divisions	10	**Large mark labeling**	1	**Scale gradation**	25
Show scale	Checked	**Auto-scale**	Unchecked		
Label					
Integer digits	3	**Decimal places**	0	**Double-lined scale label**	Unchecked
Show "+" for positive numbers	Unchecked	**Show scale marks**	Checked	**Use exponential format**	Unchecked
Unit					
Layout					
Bar orientation	Top	**Height**	159	**X position**	31

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Scale position	Left/up	**Y position**	56	**Width**	65
Text					
Font	Tahoma, 9px, style=Bold				
Limits					
Color low limit alarms	192, 192, 192	**Color high limit alarms**	192, 192, 192		
Miscellaneous					
Layer	0 - Layer_0	**Name**	Bar_1		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	temp. tunel		

HmiScreenItemData

Type	Text field				
General					
Text	Modo Manual				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Unchecked	**Height**	20
X position	66	**Left margin**	0	**Right margin**	2
Y position	13	**Top margin**	2	**Width**	162
Text					
Font	Tahoma, 20px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	HmiScreenItemData		

Text field_1

Type	Text field				
General					
Text	Temperatura do Túnel				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	5	**Left margin**	0	**Right margin**	2
Y position	217	**Top margin**	2	**Width**	128
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_1		

Button_1

Type	Button				
General					
Bit number	0	**Hotkey**	None	**Mode**	Text
Graphic list		**Graphic OFF**		**Graphic ON**	
Process value		**Text list**		**Text OFF**	Desligar Túnel de Aquecimento
Text ON	Text				
Appearance					
Background color	128, 128, 128	**Foreground color**	255, 255, 255		
Design					
3D border style	Checked	**Focus color**	128, 128, 128		
Layout					
Fit to size	Unchecked	**Height**	50	**X position**	142
Y position	120	**Width**	150		
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	Button_1
Security					
Authorization		**Allow operator control**	Checked		

Dynamizations\Event	
Event name	Release

Function list\ActivateScreen

Screen name	Modo Manual_1	**Object number**	0

Function list\ResetBit

Tag	ligar/desligar aquecimento(1)

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Setpoint Temp Max Tunel Man

Type	I/O field				
General					
Display format	Decimal	**Field length**	3	**Format pattern**	999
Mode	Input/output	**Process value**		**Shift decimal point**	0
Show leading zeros	Unchecked				
Appearance					
Background color	192, 192, 192	**Background fill pattern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Line style**	Solid	**Foreground color**	0, 0, 0
Unit					
Characteristics					
Hidden input	Unchecked				
Layout					
Bottom margin	2	**Fit to size**	Unchecked	**Height**	23
X position	142	**Left margin**	5	**Right margin**	2
Y position	69	**Top margin**	2	**Width**	46
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	Setpoint Temp Max Tunel Man
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	Tmax		

Setpoint Temp Min Tunel Man

Type	I/O field				
General					
Display format	Decimal	**Field length**	3	**Format pattern**	999
Mode	Input/output	**Process value**		**Shift decimal point**	0
Show leading zeros	Unchecked				
Appearance					
Background color	192, 192, 192	**Background fill pattern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Line style**	Solid	**Foreground color**	0, 0, 0
Unit					
Characteristics					
Hidden input	Unchecked				
Layout					
Bottom margin	2	**Fit to size**	Unchecked	**Height**	23
X position	246	**Left margin**	5	**Right margin**	2
Y position	69	**Top margin**	2	**Width**	46
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	Setpoint Temp Min Tunel Man
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	Tmin		

Text field_2

Type	Text field				
General					
Text	T max				
Appearance					
Background color	0, 0, 0	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	142	**Left margin**	0	**Right margin**	2
Y position	51	**Top margin**	2	**Width**	37
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_2		

Text field_3

Type	Text field
General	
Text	T min

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Appearance					
Background color	0, 0, 0	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	246	**Left margin**	0	**Right margin**	2
Y position	51	**Top margin**	2	**Width**	33
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_3		

Softkey_F1

Type	Function key				
General					
Authorization		**Global assignment**	Unchecked	**KeyCode**	220
LED tag		**Bit in the LED tag**	0	**Graphic**	

Softkey_F2

Type	Function key				
General					
Authorization		**Global assignment**	Unchecked	**KeyCode**	221
LED tag		**Bit in the LED tag**	0	**Graphic**	

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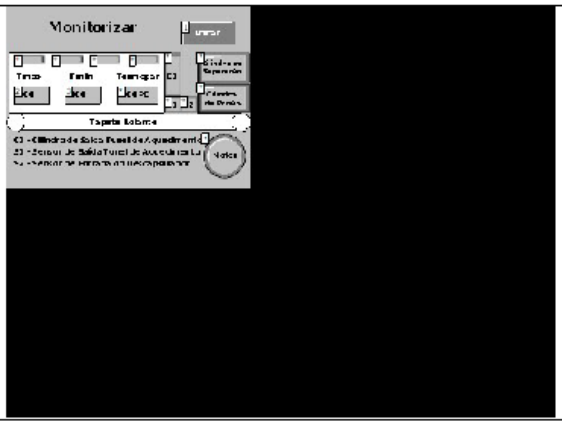
Monitorizar

Hardcopy of Monitorizar



General					
Name	Monitorizar	Background color	192, 192, 192	Grid color	192, 192, 192
Number	3	Template	Template_1	Tooltip	
Layers					
Active layer	0				

Layer_0	Checked
Layer_1	Checked
Layer_2	Checked
Layer_3	Checked
Layer_4	Checked
Layer_5	Checked
Layer_6	Checked
Layer_7	Checked
Layer_8	Checked
Layer_9	Checked
Layer_10	Checked
Layer_11	Checked
Layer_12	Checked
Layer_13	Checked
Layer_14	Checked
Layer_15	Checked
Layer_16	Checked
Layer_17	Checked
Layer_18	Checked
Layer_19	Checked
Layer_20	Checked
Layer_21	Checked
Layer_22	Checked
Layer_23	Checked
Layer_24	Checked
Layer_25	Checked
Layer_26	Checked
Layer_27	Checked
Layer_28	Checked
Layer_29	Checked
Layer_30	Checked
Layer_31	Checked

HmiScreenItemData_1

Type	Button				
General					
Bit number	0	Hotkey	None	Mode	Text
Graphic list		Graphic OFF		Graphic ON	
Process value		Text list		Text OFF	Voltar
Text ON	Back				
Appearance					
Background color	128, 128, 128	Foreground color	255, 255, 255		
Design					
3D border style	Checked	Focus color	128, 128, 128		
Layout					
Fit to size	Unchecked	Height	30	X position	230
Y position	20	Width	69		
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Centered	Vertical alignment	Middle
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	HmiScreenItemData_1
Security					
Authorization		Allow operator control	Checked		

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Dynamizations\Event					
Event name	Release				

Function list\ActivateScreen

Screen name	Modo Automatico	**Object number**	0

HmiScreenItemData

Type	Text field				
General					
Text	Monitorizar				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Unchecked	**Height**	20
X position	50	**Left margin**	0	**Right margin**	2
Y position	16	**Top margin**	2	**Width**	133
Text					
Font	Tahoma, 20px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	HmiScreenItemData		

Rectangle_1

Type	Rectangle				
Appearance					
Background color	255, 255, 255	**Background fill pattern**	Solid	**Border color**	0, 0, 0
Border width	1	**Line style**	Solid		
Layout					
Height	80	**X position**	3	**Round corner height**	0
Round corner width	0	**Y position**	60	**Width**	205
Miscellaneous					
Layer	0 - Layer_0	**Name**	Rectangle_1		

I/O field_1

Type	I/O field				
General					
Display format	Decimal	**Field length**	3	**Format pattern**	999
Mode	Output	**Process value**		**Shift decimal point**	0
Show leading zeros	Unchecked				
Appearance					
Background color	192, 192, 192	**Background fill pattern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Line style**	Solid	**Foreground color**	0, 0, 0
Unit					
Characteristics					
Hidden input	Unchecked				
Layout					
Bottom margin	2	**Fit to size**	Unchecked	**Height**	23
X position	145	**Left margin**	5	**Right margin**	2
Y position	105	**Top margin**	2	**Width**	54
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	I/O field_1
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	temp. tunel		

Text field_1

Type	Text field				
General					
Text	°C				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	174	**Left margin**	0	**Right margin**	2
Y position	108	**Top margin**	2	**Width**	15
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle

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Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_1		

PlotLight_Round_N_Mono_2

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Round_N_Off_mono	**Graphic ON**	PilotLight_Round_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked
Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	256	**Width**	60	**Y position**	167
Height	60	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Round_N_Mono_2
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	Motor da Passadeira(1)		

Text field_3

Type	Text field				
General					
Text	C1 - Cilindro de Saida Tunel de Aquecimento				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	10	**Left margin**	0	**Right margin**	2
Y position	167	**Top margin**	2	**Width**	249
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_3		

Text field_4

Type	Text field				
General					
Text	S1 - Sensor de Saida Tunel de Aquecimento				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	10	**Left margin**	0	**Right margin**	2
Y position	182	**Top margin**	2	**Width**	246
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_4		

Text field_5

Type	Text field				
General					
Text	Cilindro de Prisão				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	24
X position	261	**Left margin**	0	**Right margin**	2
Y position	108	**Top margin**	2	**Width**	49

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Text					
Font	Tahoma, 9px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_5		

Text field_6

Type	Text field				
General					
Text	Cilindro de Separação				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	24
X position	256	**Left margin**	0	**Right margin**	2
Y position	67	**Top margin**	2	**Width**	59
Text					
Font	Tahoma, 9px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_6		

PlotLight_Square_N_Mono

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Square_N_Off_mono	**Graphic ON**	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked
Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	250	**Width**	70	**Y position**	60
Height	40	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Square_N_Mono
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	cilindro descola rolha+		

PlotLight_Square_N_Mono_1

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Square_N_Off_mono	**Graphic ON**	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked
Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	250	**Width**	70	**Y position**	100
Height	40	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Square_N_Mono_1
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	cilindro prende rolhas+		

PlotLight_Square_N_Mono_2

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Square_N_Off_mono	**Graphic ON**	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked

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Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	10	**Width**	40	**Y position**	64
Height	10	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Square_N_Mono_2
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	lampadas de aquecimento		

PlotLight_Square_N_Mono_3

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Square_N_Off_mono	**Graphic ON**	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked
Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	60	**Width**	40	**Y position**	64
Height	10	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Square_N_Mono_3
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	lampadas de aquecimento		

PlotLight_Square_N_Mono_4

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Square_N_Off_mono	**Graphic ON**	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked
Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	110	**Width**	40	**Y position**	64
Height	10	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Square_N_Mono_4
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	lampadas de aquecimento		

PlotLight_Square_N_Mono_5

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Square_N_Off_mono	**Graphic ON**	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked
Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	160	**Width**	40	**Y position**	64
Height	10	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Square_N_Mono_5
Security					
Authorization		**Allow operator control**	Checked		

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Border width	1	Line style	None	Focus color	0, 0, 0
Layout					
X position	10	Width	40	Y position	64
Height	10	Fit embedded graphic object to screen size	Fit graphic to object size	Fit to size	Unchecked
Limits					
Color for High limit violated	128, 128, 128	Color for Low limit violated	192, 192, 192		
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	PlotLight_Square_N_Mono_2
Security					
Authorization		Allow operator control	Checked		
Dynamizations\Tag connection					
Property name	Process value	Tag	lampadas de aquecimento		

PlotLight_Square_N_Mono_3

Type	Graphic I/O field				
General					
Bit number	0	Mode	Two states	Value status ON	1
Graphic list		Graphic OFF	PilotLight_Square_N_Off_mono	Graphic ON	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	Border color	0, 0, 0	3D border style	Unchecked
Border width	1	Line style	None	Focus color	0, 0, 0
Layout					
X position	60	Width	40	Y position	64
Height	10	Fit embedded graphic object to screen size	Fit graphic to object size	Fit to size	Unchecked
Limits					
Color for High limit violated	128, 128, 128	Color for Low limit violated	192, 192, 192		
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	PlotLight_Square_N_Mono_3
Security					
Authorization		Allow operator control	Checked		
Dynamizations\Tag connection					
Property name	Process value	Tag	lampadas de aquecimento		

PlotLight_Square_N_Mono_4

Type	Graphic I/O field				
General					
Bit number	0	Mode	Two states	Value status ON	1
Graphic list		Graphic OFF	PilotLight_Square_N_Off_mono	Graphic ON	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	Border color	0, 0, 0	3D border style	Unchecked
Border width	1	Line style	None	Focus color	0, 0, 0
Layout					
X position	110	Width	40	Y position	64
Height	10	Fit embedded graphic object to screen size	Fit graphic to object size	Fit to size	Unchecked
Limits					
Color for High limit violated	128, 128, 128	Color for Low limit violated	192, 192, 192		
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	PlotLight_Square_N_Mono_4
Security					
Authorization		Allow operator control	Checked		
Dynamizations\Tag connection					
Property name	Process value	Tag	lampadas de aquecimento		

PlotLight_Square_N_Mono_5

Type	Graphic I/O field				
General					
Bit number	0	Mode	Two states	Value status ON	1
Graphic list		Graphic OFF	PilotLight_Square_N_Off_mono	Graphic ON	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	Border color	0, 0, 0	3D border style	Unchecked
Border width	1	Line style	None	Focus color	0, 0, 0
Layout					
X position	160	Width	40	Y position	64
Height	10	Fit embedded graphic object to screen size	Fit graphic to object size	Fit to size	Unchecked
Limits					
Color for High limit violated	128, 128, 128	Color for Low limit violated	192, 192, 192		
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	PlotLight_Square_N_Mono_5
Security					
Authorization		Allow operator control	Checked		

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Dynamizations\Tag connection					
Property name	Process value	Tag	lampadas de aquecimento		

Circle_1

Type	Circle				
Appearance					
Background color	255, 255, 255	Background fill pattern	Solid	Border color	0, 0, 0
Border width	1	Line style	Solid		
Layout					
Height	24	X position	0	Radius	12
Y position	140	Width	24		
Miscellaneous					
Layer	0 - Layer_0	Name	Circle_1		

Circle_2

Type	Circle				
Appearance					
Background color	255, 255, 255	Background fill pattern	Solid	Border color	0, 0, 0
Border width	1	Line style	Solid		
Layout					
Height	24	X position	296	Radius	12
Y position	140	Width	24		
Miscellaneous					
Layer	0 - Layer_0	Name	Circle_2		

Rectangle_2

Type	Rectangle				
Appearance					
Background color	255, 255, 255	Background fill pattern	Solid	Border color	0, 0, 0
Border width	1	Line style	Solid		
Layout					
Height	24	X position	10	Round corner height	0
Round corner width	0	Y position	140	Width	299
Miscellaneous					
Layer	0 - Layer_0	Name	Rectangle_2		

Text field_7

Type	Text field				
General					
Text	Tapete Rolante				
Appearance					
Background color	255, 255, 255	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Checked	Height	15
X position	110	Left margin	0	Right margin	2
Y position	143	Top margin	2	Width	89
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Left	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	Text field_7		

Text field_8

Type	Text field				
General					
Text	Motor				
Appearance					
Background color	128, 128, 128	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Checked	Height	15
X position	270	Left margin	0	Right margin	2
Y position	187	Top margin	2	Width	36
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Left	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	Text field_8		

PlotLight_Square_N_Mono_6

Type	Graphic I/O field				
General					
Bit number	0	Mode	Two states	Value status ON	1
Graphic list		Graphic OFF	PilotLight_Square_N_Off_mono	Graphic ON	PilotLight_Square_N_On_mono

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Process value	0				
Appearance					
Background color	192, 192, 192	Border color	0, 0, 0	3D border style	Unchecked
Border width	1	Line style	None	Focus color	0, 0, 0
Layout					
X position	207	Width	22	Y position	118
Height	22	Fit embedded graphic object to screen size	Fit graphic to object size	Fit to size	Unchecked
Limits					
Color for High limit violated	128, 128, 128	Color for Low limit violated	192, 192, 192		
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	PlotLight_Square_N_Mono_6
Security					
Authorization		Allow operator control	Checked		
Dynamizations\Tag connection					
Property name	Process value	Tag	sensor saida do tunel		

PlotLight_Square_N_Mono_7

Type	Graphic I/O field				
General					
Bit number	0	Mode	Two states	Value status ON	1
Graphic list		Graphic OFF	PilotLight_Square_N_Off_mono	Graphic ON	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	Border color	0, 0, 0	3D border style	Unchecked
Border width	1	Line style	None	Focus color	0, 0, 0
Layout					
X position	228	Width	22	Y position	118
Height	22	Fit embedded graphic object to screen size	Fit graphic to object size	Fit to size	Unchecked
Limits					
Color for High limit violated	128, 128, 128	Color for Low limit violated	192, 192, 192		
Miscellaneous					
Tooltip		Layer	0 - Layer_0	Name	PlotLight_Square_N_Mono_7
Security					
Authorization		Allow operator control	Checked		
Dynamizations\Tag connection					
Property name	Process value	Tag	sensor entrada desencapsulador		

Text field_9

Type	Text field				
General					
Text	S1				
Appearance					
Background color	128, 128, 128	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Checked	Height	15
X position	210	Left margin	0	Right margin	2
Y position	121	Top margin	2	Width	16
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Left	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	Text field_9		

Text field_10

Type	Text field				
General					
Text	S2				
Appearance					
Background color	128, 128, 128	Background fill pattern	Transparent	Border color	0, 0, 0
3D border style	Unchecked	Border width	1	Line style	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	Fit to size	Checked	Height	15
X position	231	Left margin	0	Right margin	2
Y position	121	Top margin	2	Width	16
Text					
Font	Tahoma, 11px, style=Bold	Horizontal alignment	Left	Vertical alignment	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	Name	Text field_10		

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PlotLight_Square_N_Mono_8

Type	Graphic I/O field				
General					
Bit number	0	**Mode**	Two states	**Value status ON**	1
Graphic list		**Graphic OFF**	PilotLight_Square_N_Off_mono	**Graphic ON**	PilotLight_Square_N_On_mono
Process value	0				
Appearance					
Background color	192, 192, 192	**Border color**	0, 0, 0	**3D border style**	Unchecked
Border width	1	**Line style**	None	**Focus color**	0, 0, 0
Layout					
X position	207	**Width**	22	**Y position**	60
Height	60	**Fit embedded graphic object to screen size**	Fit graphic to object size	**Fit to size**	Unchecked
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	PlotLight_Square_N_Mono_8
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	cilindro da saida to tunel+		

Text field_11

Type	Text field				
General					
Text	C1				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	210	**Left margin**	0	**Right margin**	2
Y position	84	**Top margin**	2	**Width**	16
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_11		
Dynamizations\Appearance					
Tag - Cycle	cilindro da saida to tunel+ -	**Data type**	Range		

Text field_12

Type	Text field				
General					
Text	S2 - Sensor de Entrada do Descapsulador				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	10	**Left margin**	0	**Right margin**	2
Y position	197	**Top margin**	2	**Width**	233
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Centered	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_12		

Softkey_F1

Type	Function key				
General					
Authorization		**Global assignment**	Unchecked	**KeyCode**	220
LED tag		**Bit in the LED tag**	0	**Graphic**	

Softkey_F2

Type	Function key				
General					
Authorization		**Global assignment**	Unchecked	**KeyCode**	221
LED tag		**Bit in the LED tag**	0	**Graphic**	

Setpoint Temp Max Tunel Auto

Type	I/O field				
General					
Display format	Decimal	**Field length**	3	**Format pattern**	999

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Mode	Input/output	**Process value**	0	**Shift decimal point**	0
Show leading zeros	Unchecked				
Appearance					
Background color	192, 192, 192	**Background fill pattern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Line style**	Solid	**Foreground color**	0, 0, 0
Unit					
Characteristics					
Hidden input	Unchecked				
Layout					
Bottom margin	2	**Fit to size**	Unchecked	**Height**	23
X position	10	**Left margin**	5	**Right margin**	2
Y position	105	**Top margin**	2	**Width**	47
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	Setpoint Temp Max Tunel Auto
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	Tmax		

Text field_13

Type	Text field				
General					
Text	T max				
Appearance					
Background color	0, 0, 0	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	13	**Left margin**	0	**Right margin**	2
Y position	84	**Top margin**	2	**Width**	37
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_13		

Setpoint Temp Min Tunel Auto

Type	I/O field				
General					
Display format	Decimal	**Field length**	3	**Format pattern**	999
Mode	Input/output	**Process value**	0	**Shift decimal point**	0
Show leading zeros	Unchecked				
Appearance					
Background color	192, 192, 192	**Background fill pattern**	Solid	**Border color**	0, 0, 0
3D border style	Unchecked	**Line style**	Solid	**Foreground color**	0, 0, 0
Unit					
Characteristics					
Hidden input	Unchecked				
Layout					
Bottom margin	2	**Fit to size**	Unchecked	**Height**	23
X position	77	**Left margin**	5	**Right margin**	2
Y position	105	**Top margin**	2	**Width**	47
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Limits					
Color for High limit violated	128, 128, 128	**Color for Low limit violated**	192, 192, 192		
Miscellaneous					
Tooltip		**Layer**	0 - Layer_0	**Name**	Setpoint Temp Min Tunel Auto
Security					
Authorization		**Allow operator control**	Checked		
Dynamizations\Tag connection					
Property name	Process value	**Tag**	Tmin		

Text field_2

Type	Text field				
General					
Text	T min				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				

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Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	82	**Left margin**	0	**Right margin**	2
Y position	84	**Top margin**	2	**Width**	33
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_2		

Text field_14

Type	Text field				
General					
Text	Termopar				
Appearance					
Background color	128, 128, 128	**Background fill pattern**	Transparent	**Border color**	0, 0, 0
3D border style	Unchecked	**Border width**	1	**Line style**	None
Foreground color	0, 0, 0				
Layout					
Bottom margin	0	**Fit to size**	Checked	**Height**	15
X position	145	**Left margin**	0	**Right margin**	2
Y position	84	**Top margin**	2	**Width**	58
Text					
Font	Tahoma, 11px, style=Bold	**Horizontal alignment**	Left	**Vertical alignment**	Middle
Flashing					
Flashing	None				
Miscellaneous					
Layer	0 - Layer_0	**Name**	Text field_14		

Tags PLC

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Rui_Neves_10 / PLC_1 [CPU 1214C AC/DC/Rly]

PLC tags

	Name	Data type	Address	Retain	Visible in HMI	Accessible from HMI	Comment
	Ligar/Desligar	Bool	%I0.0	False	True	True	
	Termopar	Int	%IW80	False	True	True	
	Sensor Saida do Tunel	Bool	%I0.1	False	True	True	
	Sensor Entrada Desencapsulador	Bool	%I0.2	False	True	True	
	Fim de Curso Cilindro Prende Rolhas-	Bool	%I0.5	False	True	True	
	Fim de Curso Cilindro Descola Rolhas+	Bool	%I0.3	False	True	True	
	Fim de Curso Cilindro Descola Rolhas-	Bool	%I0.4	False	True	True	
	EMERGENCIA	Bool	%I0.6	False	True	True	
	Motor da Passadeira(1)	Bool	%Q0.0	False	True	True	
	Lâmpadas de Aquecimento	Bool	%Q0.1	False	True	True	
	Cilindro da Saida Do Tunel+	Bool	%Q0.2	False	True	True	
	Cilindro Prende Rolhas+	Bool	%Q0.3	False	True	True	
	Cilindro Descola Rolha+	Bool	%Q0.4	False	True	True	
	Cilindro Prende Rolhas-	Bool	%Q0.5	False	True	True	
	Cilindro Descola Rolhas-	Bool	%Q0.6	False	True	True	
	Sopra Cortiça	Bool	%Q0.7	False	True	True	
	Válvula de Segurança	Bool	%Q1.0	False	True	True	
	Modo Automatico/Manual	Bool	%M0.0	False	True	True	
	SR Motor	Bool	%M4.0	False	True	True	
	SR Lâmpadas	Bool	%M4.1	False	True	True	
	Memoria Sensor Saida do Tunel	Bool	%M5.2	False	True	True	
	Memória Sensor Entrada Desencapsulador	Bool	%M5.3	False	True	True	
	SR Desencapsulador	Bool	%M4.2	False	True	True	
	Ligar Motor Manual	Bool	%M0.5	False	True	True	
	Desligar Motor Manual	Bool	%M0.6	False	True	True	
	Ligar/Desligar Aquecimento	Bool	%M0.7	False	True	True	
	Temp. Tunel	Int	%MW16	False	True	True	
	Motor Manual	Bool	%M4.3	False	True	True	
	Motor Automatico	Bool	%M4.4	False	True	True	
	Memoria Lamp. Aquecimento	Bool	%M4.5	False	True	True	
	%%Minimo Temp	Int	%MW18	False	True	True	
	%%Maximo Temp	Int	%MW20	False	True	True	
	Tag_1	Int	%MW22	False	True	True	
	Tag_2	Int	%MW24	False	True	True	
	Lâmpadas Intermitentes	Bool	%M5.5	False	True	True	
	Lâmpadas ON	Bool	%M5.6	False	True	True	
	Lâmpadas OFF	Bool	%M5.7	False	True	True	
	SR Lâmpadas Intermitentes	Bool	%M5.4	False	True	True	
	Reset Contadores	Bool	%M6.0	False	True	True	
	Cilindro Descolagem - 1	Bool	%M6.1	False	True	True	
	Cilindro Descolagem + 1	Bool	%M6.2	False	True	True	
	Cilindro Descolagem - 2	Bool	%M6.3	False	True	True	
	Cilindro Descolagem + 2	Bool	%M6.4	False	True	True	
	Tmin	Int	%MW12	False	True	True	
	Tmax	Int	%MW8	False	True	True	
	Tmax10	Int	%MW10	False	True	True	
	Tmin10	Int	%MW14	False	True	True	

Tags HMI

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Rui_Neves_10 / HMI_2 [KTP400 Basic mono PN]

HMI tags

Modo automatico/manual

General					
Name	Modo automatico/manual	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Modo Automatico/Manual"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

motor manual

General					
Name	motor manual	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Motor Manual"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

ligar motor manual

General					
Name	ligar motor manual	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Ligar Motor Manual"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

desligar motor manual

General					
Name	desligar motor manual	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Desligar Motor Manual"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		

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Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

ligar/desligar aquecimento(1)

General					
Name	ligar/desligar aquecimento(1)	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Ligar/Desligar Aquecimento"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

temp. tunel

General					
Name	temp. tunel	**Connection**	HMI_Connection_2	**Data type**	Int
Array elements	0	**Length**	2	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Temp. Túnel"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

sensor saida do tunel

General					
Name	sensor saida do tunel	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Sensor Saida do Tunel"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

sensor entrada desencapsulador

General					
Name	sensor entrada desencapsulador	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Sensor Entrada Desencapsulador"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		

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Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

cilindro descola rolha+

General					
Name	cilindro descola rolha+	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Cilindro Descola Rolha+"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

cilindro prende rolhas+

General					
Name	cilindro prende rolhas+	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Cilindro Prende Rolhas+"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

Motor da Passadeira(1)

General					
Name	Motor da Passadeira(1)	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Motor da Passadeira(1)"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

maximo temp

General					
Name	maximo temp	**Connection**	HMI_Connection_2	**Data type**	Int
Array elements	0	**Length**	2	**Address**	
Access mode	<symbolic access>	**PLC tag**	"%%Maximo Temp"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		

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Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

minimo temp

General					
Name	minimo temp	**Connection**	HMI_Connection_2	**Data type**	Int
Array elements	0	**Length**	2	**Address**	
Access mode	<symbolic access>	**PLC tag**	"%%Minimo Temp"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

lampadas de aquecimento

General					
Name	lampadas de aquecimento	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Lâmpadas de Aquecimento"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

cilindro da saida to tunel+

General					
Name	cilindro da saida to tunel+	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Cilindro da Saida Do Tunel+"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

cilindro prende rolhas-

General					
Name	cilindro prende rolhas-	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Cilindro Prende Rolhas-"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		

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Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

cilindro descola rolhas-

General					
Name	cilindro descola rolhas-	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Cilindro Descola Rolhas-"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

sopra cortiça

General					
Name	sopra cortiça	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Sopra Cortiça"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

fim de curso descola rolhas +

General					
Name	fim de curso descola rolhas +	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	%I0.3
Access mode	<absolute access>	**PLC tag**	"Fim de Curso Cilindro Descola Rolhas+"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	500 ms	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0
HMI device value range end value	100	**HMI device value range start value**	0		
Miscellaneous					
ID tag		**Start value**			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	**Index tag**			

Tag_7

General					
Name	Tag_7	**Connection**	HMI_Connection_2	**Data type**	Bool
Array elements	0	**Length**	1	**Address**	
Access mode	<symbolic access>	**PLC tag**	"Reset Contadores"	**Coding**	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	**Acquisition mode**	Cyclic in operation		
Limits					
Maximum		**Minimum**			
Linear scaling					
Linear scaling	Unchecked	**PLC value range end value**	10	**PLC value range start value**	0

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HMI device value range end value	100	HMI device value range start value	0		
Miscellaneous					
ID tag		Start value			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	Index tag			

Tmax

General					
Name	Tmax	Connection	HMI_Connection_2	Data type	Int
Array elements	0	Length	2	Address	
Access mode	<symbolic access>	PLC tag	Tmax	Coding	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	Acquisition mode	Cyclic in operation		
Limits					
Maximum		Minimum			
Linear scaling					
Linear scaling	Unchecked	PLC value range end value	10	PLC value range start value	0
HMI device value range end value	100	HMI device value range start value	0		
Miscellaneous					
ID tag		Start value			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	Index tag			

Tmin

General					
Name	Tmin	Connection	HMI_Connection_2	Data type	Int
Array elements	0	Length	2	Address	
Access mode	<symbolic access>	PLC tag	Tmin	Coding	Binary
PLC name	PLC_1				
Settings					
Acquisition cycle	1 s	Acquisition mode	Cyclic in operation		
Limits					
Maximum		Minimum			
Linear scaling					
Linear scaling	Unchecked	PLC value range end value	10	PLC value range start value	0
HMI device value range end value	100	HMI device value range start value	0		
Miscellaneous					
ID tag		Start value			
Comment					
Comment					
Multiplexing					
Multiplexing	Unchecked	Index tag			

Anexo B - Data Sheets

Cilindros Camozzi

Series 16, 23, 24 and 25 mini-cylinders

Series 16: ø 8, 10, 12 mm - non-magnetic
Series 23: ø 16, 20, 25 mm - magnetic, auto-cushioned
Series 24: ø 16, 20, 25 mm - magnetic
Series 25: ø 16, 20, 25 mm - magnetic, cushioned

- Single and double-acting
- In compliance with ISO 6432
- Stainless steel rod and barrel
- Anodized aluminium end-blocks
- Cushioning types: mechanical with bumper, pneumatic auto-cushioning, adjustable pneumatic cushioning

Series 16, 23, 24 and 25 mini-cylinders are designed according to ISO 6432.
It is possible to choose from three different types of cushioning: mechanical (standard bumper on Series 16 and 24), adjustable pneumatic cushioning (Series 25) and pneumatic auto-cushioning (Series 23). This last version, thanks to a patented system, automatically adjusts the cushioning in order to provide optimal deceleration during the entire cushioning phase. The cylinder enjoys smooth, jolt-free movement, reducing vibrations and noise, while also guaranteeing high reliability and constant performance over time.

The adopted technical solutions and the choice of materials have provided the basis for a complete range of versatile and very reliable mini-cylinders. They are suitable to be used in a multitude of industrial applications, especially where operating conditions undergo changes over time like for example wear of machine components. Various mounting accessories are available to fix the cylinders in different ways.

GENERAL DATA

Type of construction	crimped
Operation	single-acting and double-acting
Design	ISO 6432
Materials	anodized aluminium end-caps - stainless steel barrel and rod, aluminium piston - NBR/PU seals, other parts: see the coding example
Brackets	rod end - flange - foot - trunnion
Stroke min - max	Series 16 ø 8 ÷ ø 10: 10 - 250 mm - Series 16: ø 12: 10 - 300 mm - Series 23, 24 and 25 ø 16: 10 - 600 mm; ø 20 - ø 25: 10 - 1000 mm
Bores	Series 16: ø 8, 10, 12 - Series 23, 24 and 25: ø 16, 20, 25
Operating temperature	0°C ÷ 80°C (with dry air -20°C)
Operating pressure	1 ÷ 10 bar (double-acting); 2 ÷ 10 bar (single-acting)
Fluid	filtered air in class 7.8.4 according to ISO 8573-1. If lubricated air is used, it is recommended to use oil ISO VG32. Once applied the lubrication should never be interrupted.
Speed	10 ÷ 1000 mm/sec (without load)

Products designed for industrial applications.
General terms and conditions for sale are available on www.camozzi.com.

STANDARD STROKES FOR MINICYLINDERS

■ = Double-acting
✖ = Single-acting

STANDARD STROKES															
Series	Ø	10	25	40	50	80	100	125	160	200	250	300	320	400	500
16	8	✖	✖	✖	✖	■	■	■	■	■					
16	10	✖	✖	✖	✖	■	■	■	■	■					
16	12	✖	✖	✖	✖	■	■	■	■	■	■	■			
24	16	✖	✖	✖	✖	■	■	■	■	■	■	■	■	■	■
24	20	✖	✖	✖	✖	■	■	■	■	■	■	■	■	■	■
24	25	✖	✖	✖	✖	■	■	■	■	■	■	■	■	■	■
23/25	16	■	■	■	■	■	■	■	■	■	■	■	■	■	■
23/25	20	■	■	■	■	■	■	■	■	■	■	■	■	■	■
23/25	25	■	■	■	■	■	■	■	■	■	■	■	■	■	■

CODING EXAMPLE

24	N	2	A	16	A	100	

24 — SERIES
16= non magnetic, with mechanical cushioning
23= magnetic, auto-cushioning
24= magnetic, with mechanical cushioning
25= magnetic, adjustable cushioning

N — VERSION
N = standard

2 — OPERATION
1 = single-acting, front spring, no cushion (only for series 16, 24)
2 = double-acting
3 = double-acting, through-rod
7 = single-acting, through-rod (only for series 16, 24)

PNEUMATIC SYMBOLS
CS02 (s. 16) - CS06 (s. 24)
CD01 (s. 16) - CD08 (s. 24) - CD23 (s.23) - CD09 (s. 25)
CD05 (s. 16) - CD12 (s. 24) - CD24 (s.23) - CD13 (s. 25)
CS04 (s. 16) - CS10 (s. 24)

A — MATERIALS
A= raised stainless steel AISI 303 rod, stainless steel AISI 304 tube, anodized AL end-caps

16 — BORE
08= 8 mm (only for series 16)
10= 10 mm (only for series 16)
12= 12 mm (only for series 16)
16= 16 mm (only for series 23, 24 e 25)
20= 20 mm (only for series 23, 24 e 25)
25= 25 mm (only for series 23, 24 e 25)

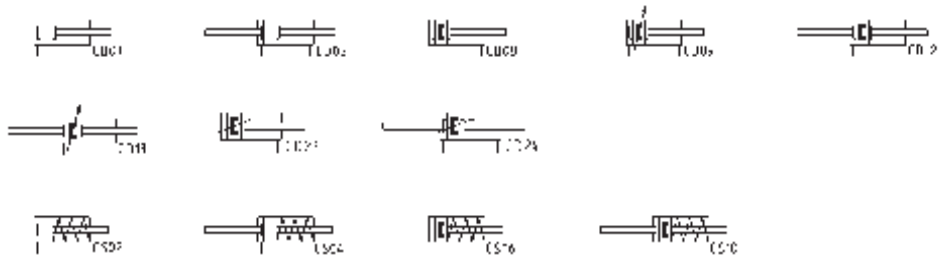
A — CONSTRUCTION
A= Nose nut Mod. V + Piston rod sock nut Mod. U
RL = cylinder with rod sock (only for Ø20 - Ø25)

100 — STROKE (see graph)

= standard
V= rod seal in FKM
W= all seals in FKM, +130°C (for series 25 only)
(___)= extended rod_ __mm

PNEUMATIC SYMBOLS

The pneumatic symbols which have been indicated in the CODING EXAMPLE are shown below.



ACCESSORIES FOR MINICYLINDERS SERIES 16 - 23 - 24 - 25

Foot mount Mod. B

Front/rear flange mount Mod. E

Rear trunnion bracket Mod. I

Rod fork end Mod. G

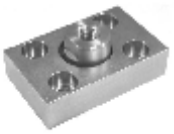
Swivel ball joint Mod. GA

Piston rod socket joint Mod. GY

Piston rod lock nut Mod. U

Nose nut Mod. V

Self aligning rod Mod. GK



Coupling piece Mod. GKF

All accessories are supplied separately, except for piston rod lock nut Mod. U and nose nut Mod. V

SERIES 23: APPLICABLE MASS ACCORDING TO THE CYLINDER'S SPEED

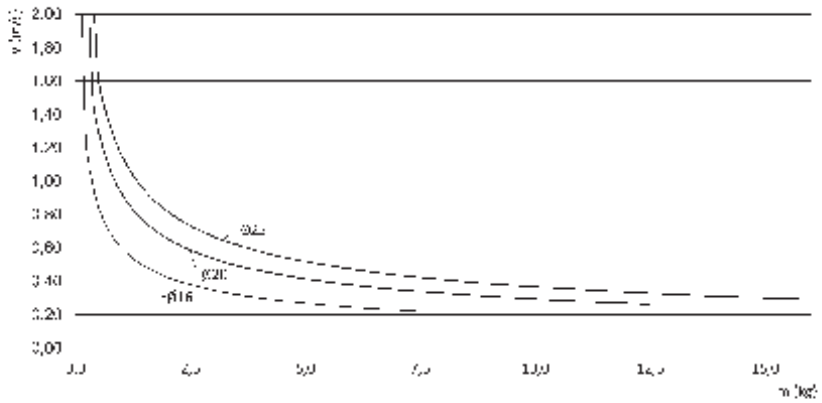
CHOICE OF THE CYLINDER

1) Choose the right size according to the force needed in the application

2) Check on the graph if the working conditions, mass and speed intersect at a point below the curve that corresponds to the size chosen

m = mass applied to the cylinder
v = speed applied to the cylinder (m/s)

Example:
Diameter = 20 mm; Max speed = 0,4 m/s; Applicable mass = 6kg;



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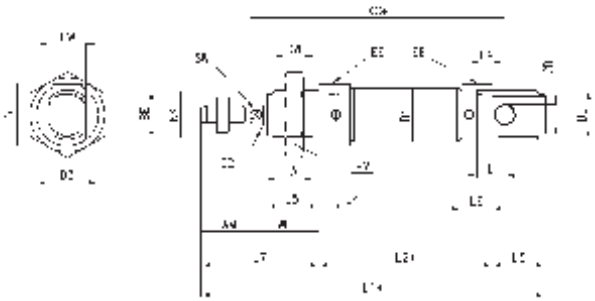
Series 16, 23, 24 and 25 mini-cylinders

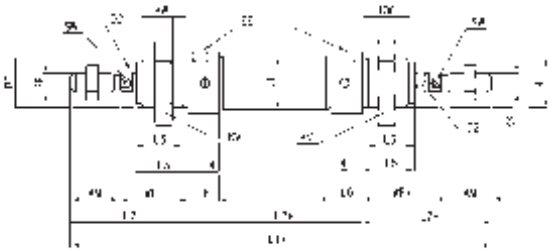
+ = add the stroke



DIMENSIONS																								
Series	Ø	EW	KW	BE	KK	CD	⌀D1	EE	⌀D2	L1+	XC+	L2+	AM	L3	L4	L5	L	WF	L6	L7	KV	SW	D	D3	from/rear cushion stroke
16	8	8	7	M12x1,25	M4x0,7	4	9,3	M5	4	86	64	46	12	10	4,5	12	6	16	9	28	19	-	15	15	-
16	10	8	7	M12x1,25	M4x0,7	4	11,3	M5	4	86	64	46	12	10	4,5	12	6	16	9	28	19	-	15	15	-
16	12	12	8	M16x1,5	M6x1	6	13,3	M5	6	105	75	50	16	15	4,5	17	9	22	9	38	24	5	20,5	20	-
23	16	12	8	M16x1,5	M6x1	6	17,3	M5	6	111	82	56	16	15	5,5	17	9	22	12	38	24	5	20,5	20	10
24-25	16	12	8	M16x1,5	M6x1	6	17,3	M5	6	111	82	56	16	15	5,5	17	9	22	10	38	24	5	20,5	20	10
23-24-25	20	16	10	M22x1,5	M8x1,25	8	21,3	G1/8	8	132	95	68	20	18	8	20	12	24	16	44	32	7	27	27	15
23-24-25	25	16	10	M22x1,5	M10x1,25	8	26,5	G1/8	10	141,5	104	60,5	22	20	8	22	12	28	16	50	32	9	27	27	16

Series 16, 23, 24 and 25 mini-cylinders with through-rod

+ = add the stroke once
++ = add the stroke twice



DIMENSIONS																		
Series	Ø	KW	BE	KK	⌀D1	EE	⌀D2	L1++	L2+	AM	L3	L4	L5	WF+	L6	L7+	KV	SW	from/rear cushion stroke
16	16	7	M12x1,25	M4x0,7	9,3	M5	4	102	46	12	10	4,5	12	16	9	28	19	-	-
16	16	7	M12x1,25	M4x0,7	11,3	M5	4	102	46	12	10	4,5	12	16	9	28	19	-	-
16	16	8	M16x1,5	M6x1	13,3	M5	6	126	50	16	15	4,5	17	22	9	38	24	5	-
23	23	8	M16x1,5	M6x1	17,3	M5	6	132	56	16	15	5,5	17	22	12	38	24	5	10
24-25	24-25	8	M16x1,5	M6x1	17,3	M5	6	132	56	16	15	5,5	17	22	10	38	24	5	10
24-25	24-25	10	M22x1,5	M8x1,25	21,3	G1/8	8	156	68	20	18	8	20	24	16	44	32	7	15
24-25	24-25	10	M22x1,5	M10x1,25	26,5	G1/8	10	169,5	69,5	22	20	8	22	28	16	50	32	9	16

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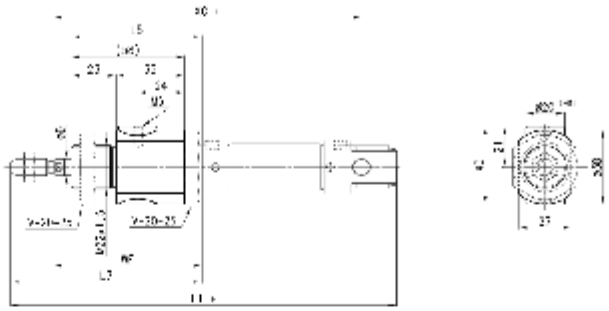
Series 23 - 24 - 25 mini-cylinders with rod lock (Mod. RLC)

+ = add the stroke



DIMENSIONS								
Series	Ø	⁴⁺⁰D	WF	L5	L7	XC+	L1+	F (N)
23-24-25	20	8	74	70	94	145	182	300
23-24-25	25	10	76	70	98	152	189,5	400

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Relés Finder

40 SERIES
PCB/Plug-in relays 8 - 10 - 12 - 16 A

finder

40 SERIES

A

Power relays 1 and 2 pole for direct PCB or socket mount

Type 40.31/51
- 1 CO 12 A (3.5 mm pin pitch)
- 1 CO 12 A (5.0 mm pin pitch)

Type 40.52
- 2 CO 8 A (5.0 mm pin pitch)

Type 40.61
- 1 CO 16 A (5.0 mm pin pitch)

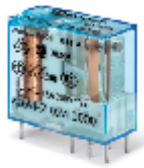
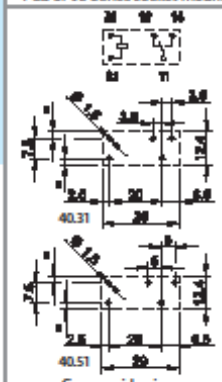
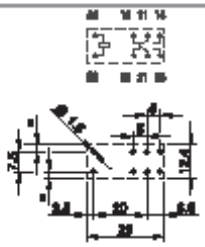
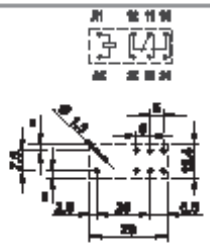
- Pin length 3.5 mm for PCB mount
- Pin length 5.3 mm for Plug-in mount
- DC coils (650 mW or 500 mW)
- Cadmium-free contact material available
- 8 mm Creepage and Clearance, 6 kV (1.2/50µs) between coil and contact
- Meets EN 60335-1 glow wire requirements
- 95 series sockets for PCB or 35 mm rail mounting (EN 60715) with Screw, Screwless or Push-in terminals
- Coil Indication and EMC suppression modules 99 series and Timer module 86.30 options
- Environmental protection:
  RT II - flux proof (Standard)
  RT III - wash tight (Option)

* Mounted on sockets ≤ 10 A

** With the $AgSnO_2$ material the maximum peak current is 120 A - 5 ms on normally open contact.

For UL ratings see: "General technical information" page V

For outline drawing see page 12

	40.31/51	40.52	40.61
			
	• 1 CO 12 A on PCB, 10 A with socket • 3.5 mm pin pitch (40.31), 5.0 mm pin pitch (40.51) • PCB or 95 Series socket mount	• 2 CO 8 A • 5.0 mm pin pitch • PCB or 95 Series socket mount	• 1 CO 16 A • 5.0 mm pin pitch • PCB or 95 Series socket mount
			
	Copper side view Pin length 3.5 mm for PCB only Pin length 5.3 mm for PCB or sockets	Copper side view Pin length 5.3 mm for PCB or sockets	Copper side view Pin length 3.5 mm for PCB only Pin length 5.3 mm for PCB or sockets
	See ordering information	See ordering information	See ordering information

Contact specification				
Contact configuration		1 CO (SPDT)	2 CO (DPDT)	1 CO (SPDT)
Rated current/Maximum peak current	A	12*/20	8/15	16/30**
Rated voltage/ Maximum switching voltage	V AC	250/400	250/400	250/400
Rated load AC1	VA	3000	2000	4000
Rated load AC15 (230 V AC)	VA	1000	750	1000
Single phase motor rating (230 V AC)	kW	0.55	0.37	0.55
Breaking capacity DC1: 30/110/220 V	A	12/0.6/0.25	8/0.6/0.25	16/0.6/0.25
Minimum switching load	mW (V/mA)	300 (5/5)	300 (5/5)	500 (10/5)
Standard contact material		AgNi	AgNi	AgCdO
Coil specification				
Nominal voltage (U_N)	V AC (50/60 Hz)	—	—	—
	V DC	5 - 6 - 7 - 9 - 12 - 14 - 18 - 21 - 24 - 28 - 36 - 48 - 60 - 90 - 110 - 125		
Rated power DC/sensitive DC	W	0.65/0.5	0.65/0.5	0.65/0.5
Operating range	AC	—	—	—
	DC/sensitive DC	$(0.73...1.5)U_N/(0.73...1.5)U_N$	$(0.73...1.5)U_N/(0.73...1.5)U_N$	$(0.73...1.5)U_N/(0.8...1.5)U_N$
Holding voltage	DC	$0.4\ U_N$	$0.4\ U_N$	$0.4\ U_N$
Must drop-out voltage	DC	$0.1\ U_N$	$0.1\ U_N$	$0.1\ U_N$
Technical data				
Mechanical life	cycles	$10 \cdot 10^6$	$10 \cdot 10^6$	$10 \cdot 10^6$
Electrical life at rated load AC1	cycles	$200 \cdot 10^3$	$100 \cdot 10^3$	$100 \cdot 10^3$
Operate/release time	ms	7/3 (10/3 sensitive)	7/3 (12/4 sensitive)	7/3 (10/3 sensitive)
Insulation between coil and contacts (1.2/50 µs)	kV	6 (8 mm)	6 (8 mm)	6 (8 mm)
Dielectric strength between open contacts	V AC	1000	1000	1000
Ambient temperature range	°C	-40...+85	-40...+85	-40...+85
Environmental protection		RT II***	RT II***	RT II***
Approvals (according to type)		RINA		

*** See general technical information "Guidelines for automatic flow solder processes" page II.

X-2011A www.finder-relay.com

40 SERIES

40 SERIES
PCB/Plug-in relays 8 - 10 - 12 - 16 A

finder

A

Ordering information

Example: 40 series PCB relay, 2 CO, 230 V AC coil.

4	0	.	5	2	.	8	.	2	3	0	.	0 (A)	0 (B)	0 (C)	0 (D)

Series

Type
1 = PCB - 3.5 mm pinning, flat
3 = PCB/Plug-in - 3.5 mm pinning
5 = PCB/Plug-in - 5 mm pinning
6 = PCB/Plug-in - 5 mm pinning

No. of poles
1 = 1 pole
2 = 2 pole

Coil version
6 = AC/DC bistable
7 = Sensitive DC, 0.5 W
8 = AC (50/60 Hz)
9 = Standard DC, 0.65 W

Coil voltage
See coil specifications

A: Contact material
See table below

B: Contact circuit
0 = CO (nPDT)
3 = NO (nPST)

D: Special versions
0 = Standard
1 = Wash tight (RT III)
3 = High temperature (+125 °C) wash tight

C: Options
0 = Pin length 5.3 mm (Plug-in relays)
2 = Pin length 3.5 mm (PCB relays)

Selecting features and options: only combinations in the same row are possible.
Preferred selections for best availability are shown in **bold**.

Terminal pin	Type	Coil version	A	B	C	D
PCB relay, pin length 3.5 mm	40.11	Sensitive DC	**2** (AgCdO) - 4 ($AgSnO_2$)	**0**	**0**	**0**
	40.31/51	Standard DC/sensitive DC	**1** (AgNi)	**0** - 3	**2**	**0** - 1
	40.61	Standard DC/sensitive DC	1 (AgNi) - **2** (AgCdO)	**0** - 3	**2**	**0** - 1
PCB/Plug-in relay pin length 5.3 mm	40.31/51	AC/sensitive DC	**0** (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	**0** - 3	**0**	**0** - 1
	40.31/51	Standard DC	**0** (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	**0** - 3	**0**	**0** - 1 - 3
	40.52	AC/sensitive DC	**0** (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	**0** - 3	**0**	**0** - 1
	40.52	Standard DC	**0** (AgNi) - 2 (AgCdO) - 5 (AgNi+Au)	**0** - 3	**0**	**0** - 1 - 3
	40.61	AC/sensitive DC	**0** (AgCdO) - 4 ($AgSnO_2$)	**0** - 3	**0**	**0** - 1
	40.61	Standard DC	**0** (AgCdO) - 4 ($AgSnO_2$)	**0** - 3	**0**	**0** - 1 - 3
	40.62	Standard DC/sensitive DC	**0** (AgNi) - 4 ($AgSnO_2$)	**0**	**0**	**0** - 1
	40.31/51/52	Bistable	**0** (AgNi)	**0**	**0**	**0**
	40.61	Bistable	**0** (AgCdO)	**0**	**0**	**0**

10-20 18, www.finder-et.com

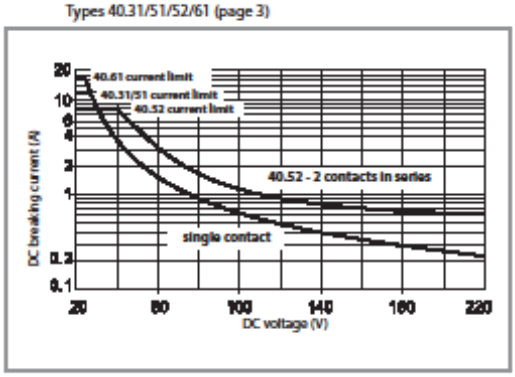
Technical data

Insulation according to EN 61810-1						
			1 pole		2 pole	
Nominal voltage of supply system		V AC	230/400		230/400	
Rated insulation voltage		V AC	250	400	250	400
Pollution degree			3	2	3	2
Insulation between coil and contact set						
Type of insulation			Reinforced (8 mm)		Reinforced (8 mm)	
Overvoltage category			III		III	
Rated impulse voltage		kV (1.2/50 µs)	6		6	
Dielectric strength		V AC	4000		4000	
Insulation between adjacent contacts (40.52, page 4)						
Type of insulation			—		Basic	
Overvoltage category			—		II	
Rated impulse voltage		kV (1.2/50 µs)	—		2.5	
Dielectric strength		V AC	—		2000	
Insulation between adjacent contacts (40.52, page 3 + 40.62)						
Type of insulation			—		Basic	
Overvoltage category					III	
Rated impulse voltage		kV (1.2/50 µs)	—		4	
Dielectric strength		V AC	—		2500	
Insulation between open contacts						
Type of disconnection			Micro-disconnection		Micro-disconnection	
Dielectric strength		V AC/kV (1.2/50 µs)	1000/1.5		1000/1.5	
Insulation between coil terminals						
Rated impulse voltage (surge) differential mode (according to EN 61000-4-5)		kV(1.2/50 µs)	2			
Other data						
Bounce time: NO/NC		ms	2/5			
Vibration resistance (10...150)Hz NO/NC		g	20/5 (1 changeover)		15/4 (2 changeover)	
Shock resistance NO/NC		g	20/13 (1 changeover)		20/12 (2 changeover)	
Power lost to the environment	without contact current	W	0.65			
	with rated current	W	1.2 (40.11/31/51)		2 (40.61/52/62)	
Recommended distance between relays mounted on PCB		mm	≥ 5			

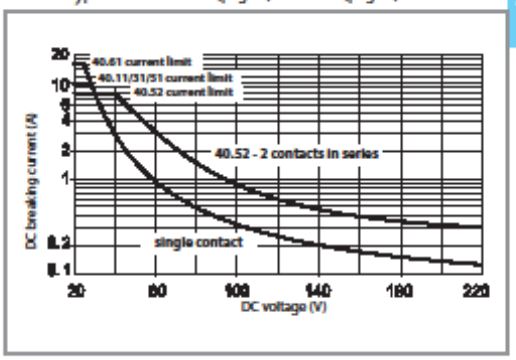
XI-2016, www.finder-relays.com

Contact specification

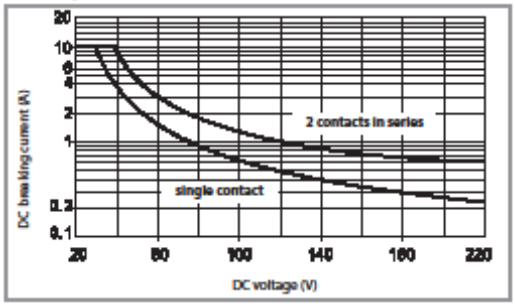
H 40.1 - Maximum DC1 breaking capacity
Types 40.31/51/52/61 (page 3)



H 40.2 - Maximum DC1 breaking capacity
Types 40.31/51/52/61 (page 4) and 40.11 (page 5)



H 40.6 - Maximum DC1 breaking capacity
Type 40.62 (page 5)



- When switching a resistive load (DC1) having voltage and current values under the curve, an electrical life of ≥ 100 · 10^3 can be expected.
- In the case of DC13 loads, the connection of a diode in parallel with the load will permit a similar electrical life as for a DC1 load.
  Note: the release time for the load will be increased.

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Coil specifications

A

DC coil data - 0.65 W standard (types 40.31/51/52/61/62)

Nominal voltage U_N V	Coil code	Operating range U_{min} V	Operating range U_{max} V	Resistance R Ω	Rated coil consumption I at U_N mA
5	9.005	3.65	7.5	38	130
6	9.006	4.4	9	55	109
7	9.007	5.1	10.5	75	94
9	9.009	6.6	13.5	125	72
12	9.012	8.8	18	220	55
14	9.014	10.2	21	300	47
18	9.018	13.1	27	500	36
21	9.021	15.3	31.5	700	30
24	9.024	17.5	36	900	27
28	9.028	20.5	42	1200	23
36	9.036	26.3	54	2000	18
48	9.048	35	72	3500	14
60	9.060	43.8	90	5500	11
90	9.090	65.7	135	12500	7.2
110	9.110	80.3	165	18000	6.2
125	9.125	91.2	188	23500	5.3

DC coil data - 0.5 W sensitive (types 40.31/51/52/61/62)

Nominal voltage U_N V	Coil code	Operating range U_{min} V	Operating range U_{max} V	Resistance R Ω	Rated coil consumption I at U_N mA
5	7.005	3.7	7.5	50	100
6	7.006	4.4	9	75	80
7	7.007	5.1	10.5	100	70
9	7.009	6.6	13.5	160	56
12	7.012	8.8	18	288	42
14	7.014	10.2	21	400	35
18	7.018	13.2	27	650	27.7
21	7.021	15.4	31.5	900	23.4
24	7.024	17.5	36	1150	21
28	7.028	20.5	42	1600	17.5
36	7.036	26.3	54	2600	13.8
48	7.048	35	72	4800	10
60	7.060	43.8	90	7200	8.4
90	7.090	65.7	135	16200	5.6
110	7.110	80.3	165	23500	4.7
125	7.125	91.2	188	32000	3.9

* U_{min} = 0.8 U_N for 40.61

DC coil data - 0.5 W sensitive (types 40.11)

Nominal voltage U_N V	Coil code	Operating range U_{min} V	Operating range U_{max} V	Resistance R Ω	Rated coil consumption I at U_N mA
6	7.006	4.4	10.5	75	80
12	7.012	8.8	21	300	40
24	7.024	17.5	42	1200	20
48	7.048	35	84	4600	10.4
60	7.060	43.8	105	7200	8.3

AC coil data (types 40.31/51/52/61)

Nominal voltage U_N V	Coil code	Operating range U_{min} V	Operating range U_{max} V	Resistance R Ω	Rated coil consumption I at U_N (50 Hz) mA
6	8.006	4.8	6.6	21	168
12	8.012	9.6	13.2	80	90
24	8.024	19.2	26.4	320	45
48	8.048	38.4	52.8	1350	21
60	8.060	48	66	2100	16.8
110	8.110	88	121	6900	9.4
120	8.120	96	132	9000	8.4
230	8.230	184	253	28000	5
240	8.240	192	264	31500	4.1

AC/DC coil data - bistable (types 40.31/51/52/61)

Nominal voltage U_N V	Coil code	Operating range U_{min} V	Operating range U_{max} V	Resistance R Ω	Rated coil consumption I at U_N mA	DC Release resistance** R_{DC} Ω
5	6.005	4	5.5	23	215	37
6	6.006	4.8	6.6	33	165	62
12	6.012	9.6	13.2	130	83	220
24	6.024	19.2	26.4	520	40	910
48	6.048	38.4	52.8	2100	21	3,600
110	6.110	88	121	11000	10	16,500

** R_{DC} = Resistance in DC, R_{AC} = 1.3 x R_{DC} 1 W

40 SERIES
PCB/Plug-in relays 8 - 10 - 12 - 16 A

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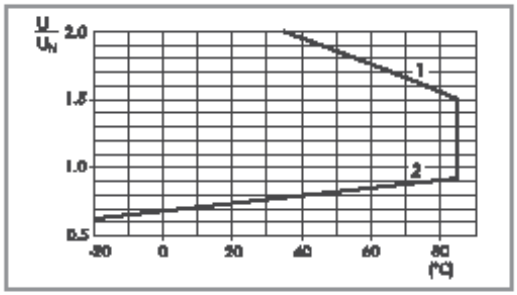
40 SERIES

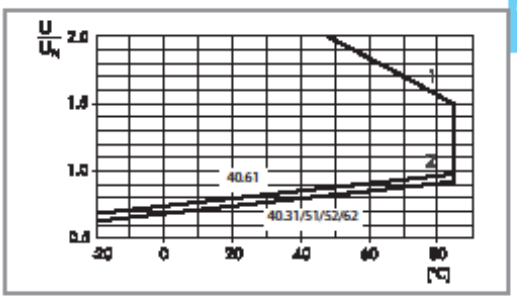
A

Contact specification

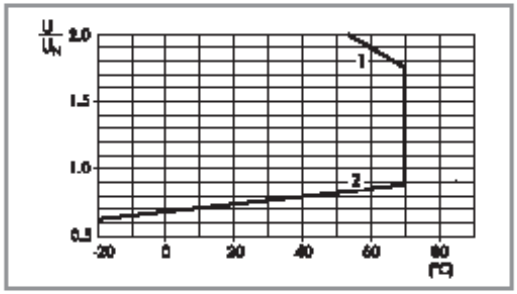
R 40 - DC coil operating range v ambient temperature
Standard coil



R 40 - DC coil operating range v ambient temperature
Sensitive coil, types 40.31/51/52/61/62

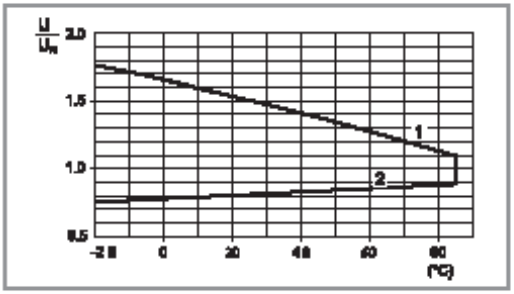


R 40 - DC coil operating range v ambient temperature
Sensitive coil, type 40.11



1 - Max. permitted coil voltage.
2 - Min. pick-up voltage with coil at ambient temperature.

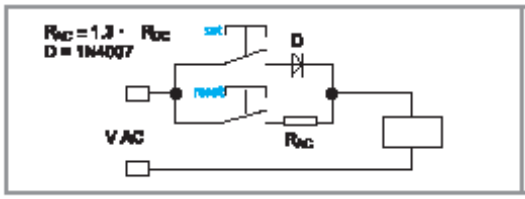
R 40 - AC coil operating range v ambient temperature



1 - Max. permitted coil voltage.
2 - Min. pick-up voltage with coil at ambient temperature.

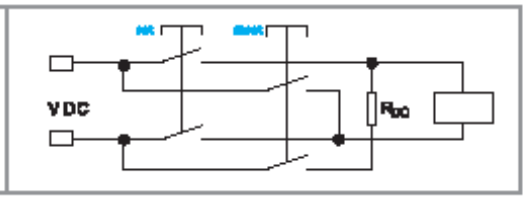
Wiring diagram for 40 series bistable coil version

AC Operation



On momentary closure of the SET switch the relay is magnetised through the diode and the relay contacts transfer to the set position and remain in this position.
On momentary closure of the RESET switch the relay is demagnetised through limiting resistor (R_{AC}) and the contacts return to the reset position.

DC Operation



On momentary closure of the SET switch the relay is magnetised and the relay contacts transfer to the set position and remain in this position.
On momentary closure of the RESET switch the relay is demagnetised through limiting resistor (R_{DC}) and the contacts return to the reset position.

Notes: The minimum SET or RESET impulse time is 20 ms. The maximum time can be continuous. In practice, always ensure that the SET and RESET contacts cannot be operated simultaneously.

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95 SERIES
Socket overview for 40 series relays

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40 SERIES

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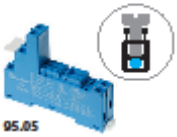
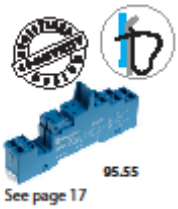
95.P5
See page 14

Module	Socket	Relay	Description	Mounting	Accessories
99.02	95.P3	40.31	**Push-in terminal sockets** - For fast cable connection - Top terminals - Contacts - Bottom terminals - Coil	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Timer modules - Plastic retaining and release clip
	95.P5	40.51 40.52 40.61 40.62			



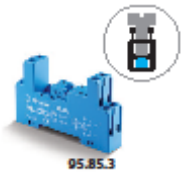
95.05
See page 16

Module	Socket	Relay	Description	Mounting	Accessories
99.02	95.03	40.31	**Screw terminal (Box clamp) socket** - Top terminals - Contacts - Bottom terminals - Coil	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Timer modules - Plastic retaining and release clip
	95.05	40.51 40.52 40.61 40.62			



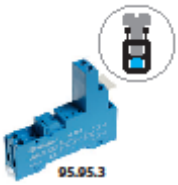
95.55
See page 17

Module	Socket	Relay	Description	Mounting	Accessories
99.02	95.55	40.51 40.52 40.61 40.62	**Screwless terminal socket** - Top terminals - Contacts - Bottom terminals - Coil	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Timer modules - Plastic retaining and release clip



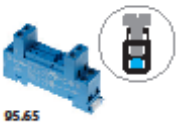
95.85.3
See page 18

Module	Socket	Relay	Description	Mounting	Accessories
99.80	95.83.3	40.31	**Screw terminal (Box clamp) socket** - Top terminals - NO and COM Contacts - Bottom terminals - Coil and NC Contacts	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Plastic retaining and release clip
	95.85.3	40.51 40.52 40.61 40.62			



95.95.3
See page 19

Module	Socket	Relay	Description	Mounting	Accessories
99.80	95.93.3	40.31	**Screw terminal (Box clamp) socket** - Top terminals - Contacts - Bottom terminals - Coil	Panel or 35 mm rail (EN 60715) mount	- Coil indication and EMC suppression modules - Jumper link - Plastic retaining and release clip
	95.95.3	40.51 40.52 40.61 40.62			



95.65
See page 20

Module	Socket	Relay	Description	Mounting	Accessories
99.01	95.63	40.31	**Screw terminal (Box clamp) socket** - Top terminals - Contacts - Bottom terminals - Coil	Panel or 35 mm rail (EN 60715) mount	- Metal retaining clip
	95.65	40.51 40.52 40.61 40.62			

95.13.2
See page 21

Module	Socket	Relay	Description	Mounting	Accessories
—	95.13.2	40.31	**PCB socket**	PCB mounting	- Metal retaining clip - Plastic retaining clip
—	95.15.2	40.51 40.52 40.61 40.62			

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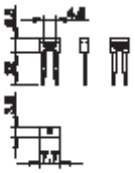
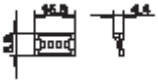
097.42

2-way jumper link for 95.P3 and 95.P5 sockets	097.42
Rated values	10 A - 250 V



097.00

Marker tag holder for 95.P3 and 95.P5 sockets	097.00



86.30

86 series timer modules	
(12…24)V AC/DC; Bi-function: AI, DI; (0.05 s…100 h)	86.30.0.024.0000
(110…125)V AC; Bi-function: AI, DI; (0.05 s…100 h)	86.30.8.120.0000
(230…240)V AC; Bi-function: AI, DI; (0.05 s…100 h)	86.30.8.240.0000

Approvals (according to type):

99.02

Approvals (according to type):

DC Modules with non-standard polarity (+A2) on request.

99.02 coil indication and EMC suppression modules for 95.P3 and 95.P5 sockets		
Diode (+A1, standard polarity)	(6…220)V DC	99.02.3.000.00
LED	(6…24)V DC/AC	99.02.0.024.59
LED	(28…60)V DC/AC	99.02.0.060.59
LED	(110…240)V DC/AC	99.02.0.230.59
LED + Diode (+A1, standard polarity)	(6…24)V DC	99.02.9.024.99
LED + Diode (+A1, standard polarity)	(28…60)V DC	99.02.9.060.99
LED + Diode (+A1, standard polarity)	(110…220)V DC	99.02.9.220.99
LED + Varistor	(6…24)V DC/AC	99.02.0.024.98
LED + Varistor	(28…60)V DC/AC	99.02.0.060.98
LED + Varistor	(110…240)V DC/AC	99.02.0.230.98
RC circuit	(6…24)V DC/AC	99.02.0.024.09
RC circuit	(28…60)V DC/AC	99.02.0.060.09
RC circuit	(110…240)V DC/AC	99.02.0.230.09
Residual current by-pass	(110…240)V AC	99.02.8.230.07

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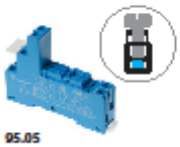


95.05

Approvals (according to type):

Certain relay/socket combinations

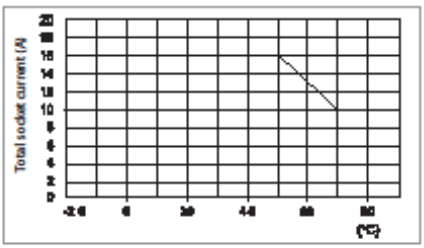
095.01

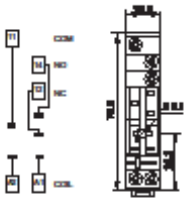
060.48

Screw terminal (Box clamp) socket panel or 35 mm rail mount		95.03 (blue)	95.03.0 (black)	95.05 (blue)	95.05.0 (black)
For relay type		40.31		40.51, 40.52, 40.61, 40.62	
Accessories					
Metal retaining clip		095.71			
Plastic retaining and release clip (supplied with socket - packaging code SPA)		095.01	095.01.0	095.01	095.01.0
8-way jumper link		095.18	095.18.0	095.18	095.18.0
Marker tag holder (for tags 060.48 type)		097.00			
Identification tag		095.00.4			
Modules (see table below)		99.02			
Timer modules (see table below)		86.30			
Sheet of marker tags for plastic retaining and release clip 095.01 and for marker tag holder 097.00, 48 tags, 6 x 12 mm, for CEMBRE thermal transfer printers		060.48			
Technical data					
Rated values		10 A - 250 V*			
Dielectric strength between coil and contacts (1.2/50 µs)		6 kV			
Protection category		IP 20			
Ambient temperature	°C	–40...+70 (see diagram L95)			
Screw torque	Nm	0.5			
Wire strip length	mm	8			
Max. wire size for 95.03 and 95.05 sockets		solid wire		stranded wire	
	mm²	1 x 6 / 2 x 2.5		1 x 4 / 2 x 2.5	
	AWG	1 x 10 / 2 x 14		1 x 12 / 2 x 14	

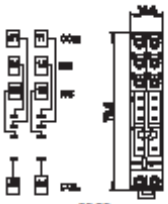
* For currents > 10 A, contact terminals must be connected in parallel (21 with 11, 24 with 14, 22 with 12).
With the relay 40.51 the change-over contact will be 21-12-14.

L 95 - Total socket current v ambient temperature

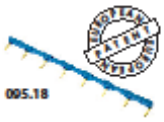




95.03

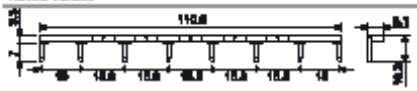


95.05



095.18

8-way jumper link for 95.03 and 95.05 sockets	095.18 (blue)	095.18.0 (black)
Rated values	10 A - 250 V	



86.30

86 series timer modules	
(12...24)V AC/DC; Bi-function: AI, DI; (0.05 s...100 h)	86.30.0.024.0000
(110...125)V AC; Bi-function: AI, DI; (0.05 s...100 h)	86.30.8.120.0000
(230...240)V AC; Bi-function: AI, DI; (0.05 s...100 h)	86.30.8.240.0000

Approvals (according to type):

99.02

Approvals (according to type):

DC Modules with non-standard polarity (+A2) on request.

99.02 coil indication and EMC suppression modules for 95.03 and 95.05 sockets		
Diode (+A1, standard polarity)	(6...220)V DC	99.02.3.000.00
LED	(6...24)V DC/AC	99.02.0.024.59
LED	(28...60)V DC/AC	99.02.0.060.59
LED	(110...240)V DC/AC	99.02.0.230.59
LED + Diode (+A1, standard polarity)	(6...24)V DC	99.02.9.024.99
LED + Diode (+A1, standard polarity)	(28...60)V DC	99.02.9.060.99
LED + Diode (+A1, standard polarity)	(110...220)V DC	99.02.9.220.99
LED + Varistor	(6...24)V DC/AC	99.02.0.024.98
LED + Varistor	(28...60)V DC/AC	99.02.0.060.98
LED + Varistor	(110...240)V DC/AC	99.02.0.230.98
RC circuit	(6...24)V DC/AC	99.02.0.024.09
RC circuit	(28...60)V DC/AC	99.02.0.060.09
RC circuit	(110...240)V DC/AC	99.02.0.230.09
Residual current by-pass	(110...240)V AC	99.02.8.230.07

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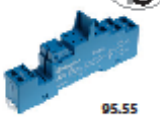


95.55

Approvals (according to type):

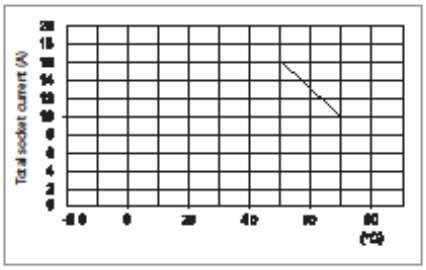
095.91.3

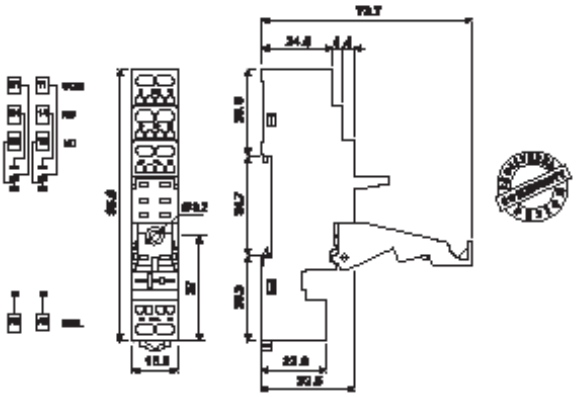
060.48

Screwless terminal socket panel or 35 mm rail mount		**95.55 (blue)**	**95.55.0 (black)**
For relay type		40.51, 40.52, 40.61, 40.62	
Accessories			
Metal retaining clip		095.71	
Plastic retaining and release clip (supplied with socket - packaging code SPA)		095.91.3	
Modules (see table below)		99.02	
Timer modules (see table below)		86.30	
Sheet of marker tags for plastic retaining and release clip 095.91.3, 48 tags, 6 x 12 mm, for CEMBRE thermal transfer printers		060.48	
Technical data			
Rated values		10 A - 250 V*	
Dielectric strength between coil and contacts (1.2/50 µs)		6 kV	
Protection category		IP 20	
Ambient temperature	°C	−25…+70 (see diagram L95)	
Wire strip length	mm	8	
Max. wire size for 95.55 socket		solid wire	stranded wire
	mm²	2 x (0.5…1.5)	2 x (0.5…1.5)
	AWG	2 x (21…18)	2 x (21…18)

* For currents > 10 A, contact terminals must be connected in parallel (21 with 11, 24 with 14, 22 with 12). With the relay 40.51 the change-over contact will be 21-12-14.

L 95 - Total socket current v ambient temperature





86.30

86 series timer modules	
(12…24)V AC/DC; Bi-function: AI, DI; (0.05 s…100 h)	86.30.0.024.0000
(110…125)V AC; Bi-function: AI, DI; (0.05 s…100 h)	86.30.8.120.0000
(230…240)V AC; Bi-function: AI, DI; (0.05 s…100 h)	86.30.8.240.0000

Approvals (according to type):

99.02

Approvals (according to type):

DC Modules with non-standard polarity (+A2) on request.

99.02 coil indication and EMC suppression modules for 95.55 socket		
Diode (+A1, standard polarity)	(6…220)V DC	99.02.3.000.00
LED	(6…24)V DC/AC	99.02.0.024.59
LED	(28…60)V DC/AC	99.02.0.060.59
LED	(110…240)V DC/AC	99.02.0.230.59
LED + Diode (+A1, standard polarity)	(6…24)V DC	99.02.9.024.99
LED + Diode (+A1, standard polarity)	(28…60)V DC	99.02.9.060.99
LED + Diode (+A1, standard polarity)	(110…220)V DC	99.02.9.220.99
LED + Varistor	(6…24)V DC/AC	99.02.0.024.98
LED + Varistor	(28…60)V DC/AC	99.02.0.060.98
LED + Varistor	(110…240)V DC/AC	99.02.0.230.98
RC circuit	(6…24)V DC/AC	99.02.0.024.09
RC circuit	(28…60)V DC/AC	99.02.0.060.09
RC circuit	(110…240)V DC/AC	99.02.0.230.09
Residual current by-pass	(110…240)V AC	99.02.8.230.07

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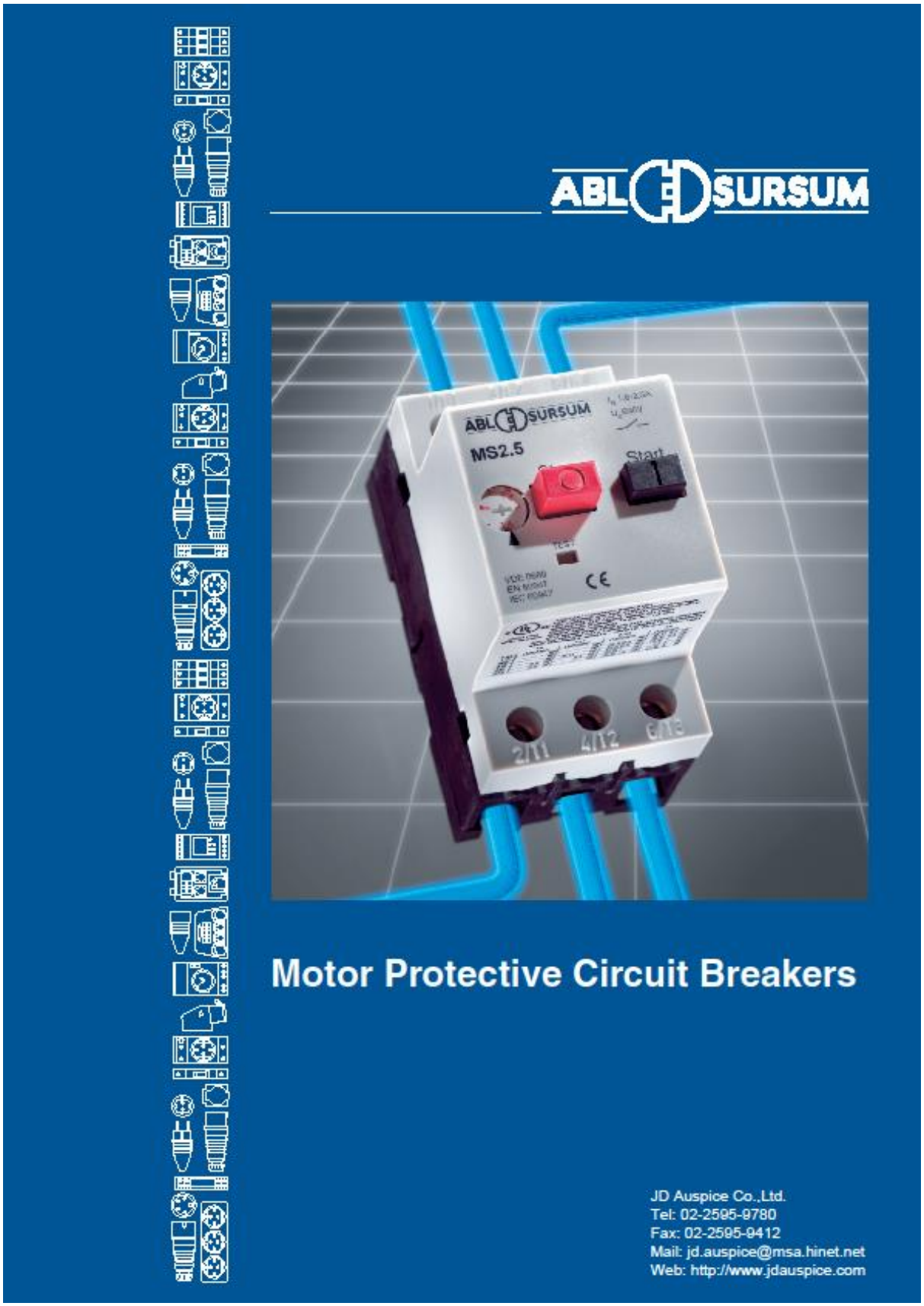

ABL SURSUM

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Motor Protective Circuit Breakers MSH (for AC motors) - with auxiliary contact, overload and short circuit tripping	**Page**	**13**
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Accessories	**Page**	**30**

Motor Protective Circuit Breakers

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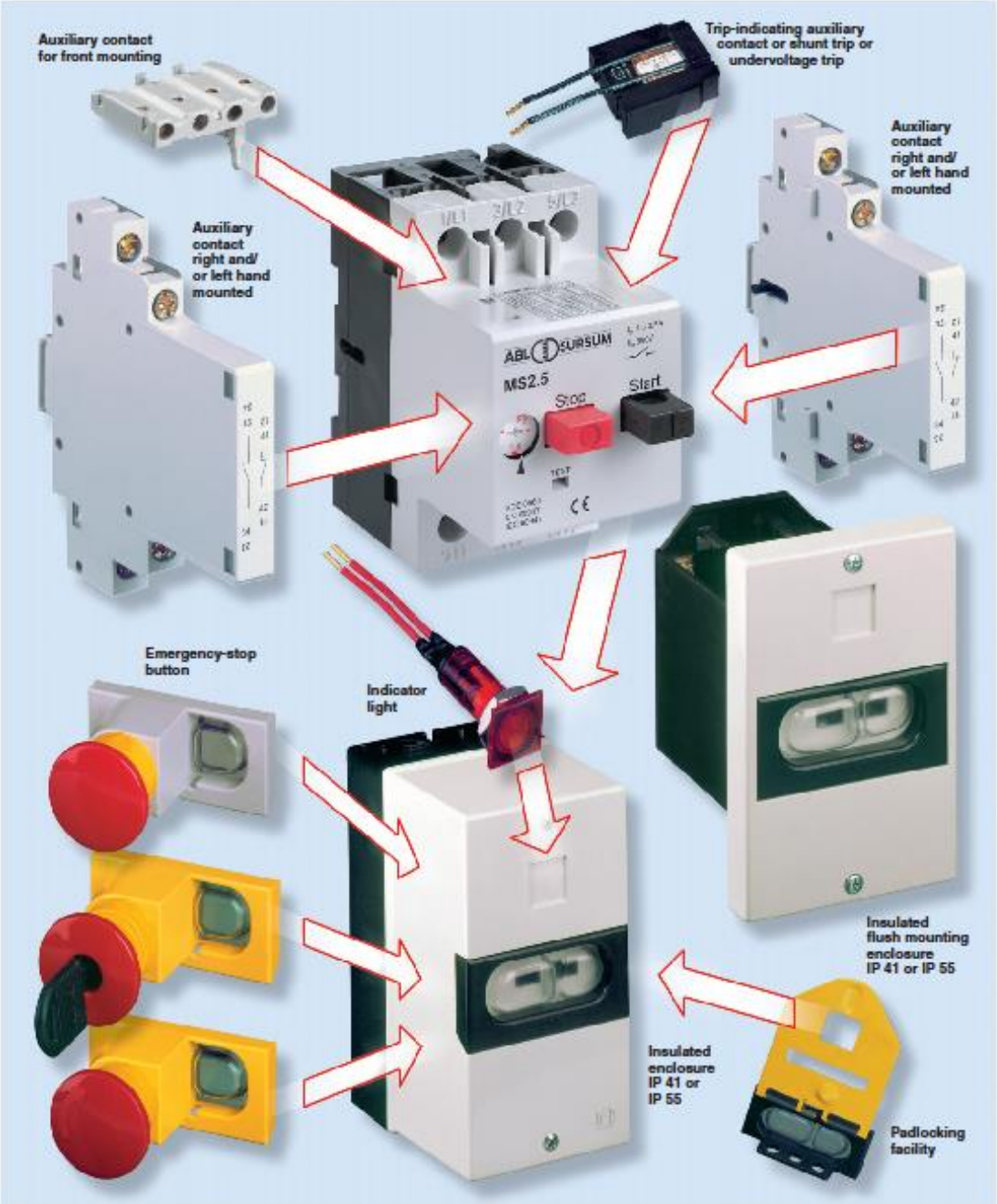
Motor Protective Circuit Breakers MS

Overview



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ABL SURSUM

Motor Protective Circuit Breakers MS

Technical Data

Standards	IEC 60947, DIN EN 60947, VDE 0660
Mechanical endurance = Electrical endurance	0,1 x 10^6 switching cycles
Max. operating frequency	30 switching cycles / h
Ambient temperature not enclosed, max./min. enclosed, max./min.	+55° C / -20° C +40° C / -20° C
Resistance to mechanical shocks	15 g / 10 ms
Installation position	any, in IP 41 enclosure vertical
Cross section (1 or 2 conductors)	1,0 – 6 r; 0,75 – 4 f (with ferrule) 2 conductors differing by not more than 2 sizes
Torque for terminal screws - Main conductor - Auxiliary conductor - Auxiliary contact for front mounting	1,2 Nm 1,0 Nm 0,5 Nm
Rated impulse withstand voltage U_{imp}	6000 V
Overvoltage category / Pollution level	III / 3
Rated operating voltage U_e	690 V AC
Rated operating current I_e	0,16 – 32 A according to setting range
Frequenzy	40...60 Hz
	At higher frequencies, the electromagnetic tripping values rise by a factor of about 1,1 at 100 Hz; 1,2 at 200 Hz; 1,4 at 400 Hz; 1,5 at 500 Hz
Utilization category (IEC 60947-4-1, DIN EN 60947-4-1, VDE 0660-102)	AC-3 max. 690 V
Temperature compensation (reference values to VDE / IEC)	-5° C / +40° C
Temperature compensation Operating range	-20° C....+55° C
Power loss in watt per path of current	by min. setting range 0,6 – 1,05 W / by max. setting range 1,5 – 2,6 W

Rated short circuit withstand rating I_{cu} MS
IEC 60947-2, DIN EN 60947-2, VDE 0660-101

Upper setting Thermal tripping	I_{cu} (kA)				Current limiter SBMS32 I_{cu} (kA)	
	230 V	400 V	500 V	690 V	230 V	400 V
0,16 – 1,6 A	No additional protective devices needed Inherently stable for any selected short circuit currents				No additional protective devices needed Inherently stable for any selected short circuit currents	
2,5 – 6,3 A			3	2,5		
10 A		6	3	2,5		50
16 – 32 A	10	6	2,5	2	100	50

Switching times at short circuit

minimum command time	2 ms
opening delay	2 ms
opening time	7 ms

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ABL SURSUM

Motor Protective Circuit Breakers MS

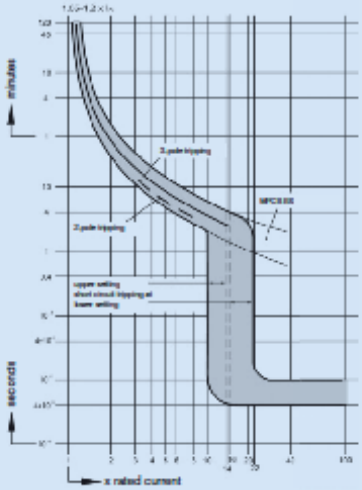
Technical Data

Back-up-protection MS (if the short circuit current is higher than the short circuit withstand rating of MS)

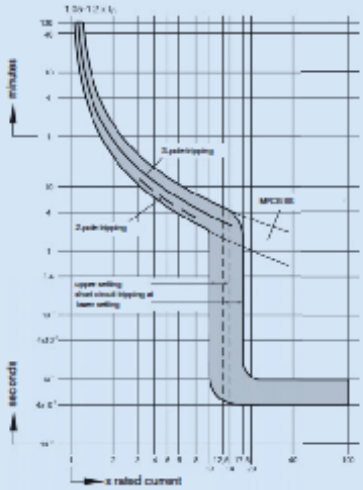
Rated current	Back-up fuse (gL, aM) (A) 230 V	400 V	500 V	690 V
0,1 - 0,16 A				
0,16 - 0,25 A	No back-up fuse necessary			
0,25 - 0,4 A	Inherently stable for any			
0,4 - 0,63 A	selected short circuit currents			
0,63 - 1 A				
1 - 1,6 A				
1,6 - 2,5 A			25	20
2,5 - 4 A			35	25
4 - 6,3 A			50	35
6,3 - 10 A		80	50	35
10 - 16 A	80	80	63	35
16 - 20 A	80	80	63	50
20 - 25 A	80	80	63	50
25 - 32 A	80	80	63	50

Back-up-protection BS

Rated current (A)	Fuse (A)	Rated current (A)	Fuse (A)	Rated current (A)	Fuse (A)
0,4 – 0,63	2	2,5 – 4	10	16 – 20	50
0,63 – 1	4	4 – 6,3	16	20 – 25	50
1 – 1,6	6	6,3 – 10	25	25 – 32	50
1,6 – 2,5	6	10 – 16	35		



Characteristic for MS016 – MS16



Characteristic for MS20 – MS32

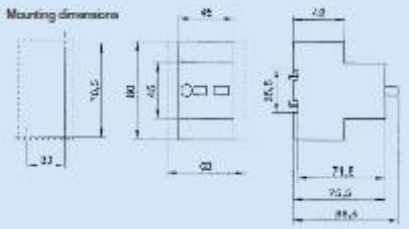
8

ABL SURSUM

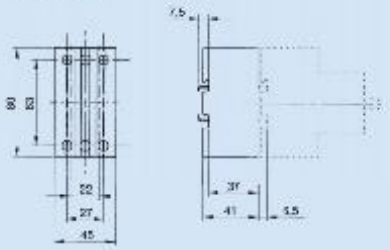
Motor Protective Circuit Breakers MS

Dimension Drawings

Motor protective circuit breaker MS

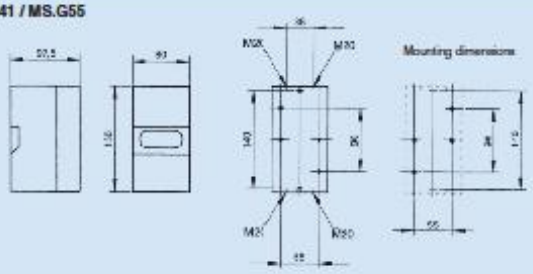


Current limiter SBMS32

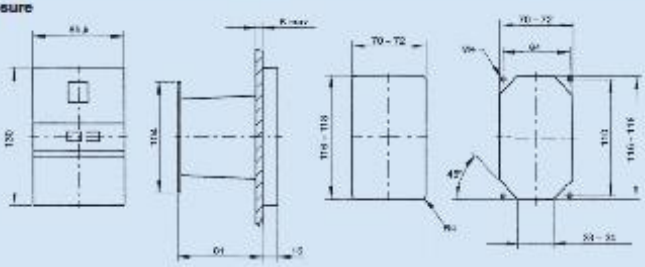


Insulated enclosure IP41 / IP55 MS.G41 / MS.G55

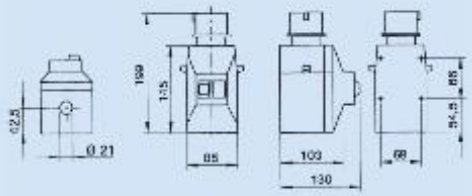
possible to integrate 1 MPCB and 2 side mounted auxiliary contacts



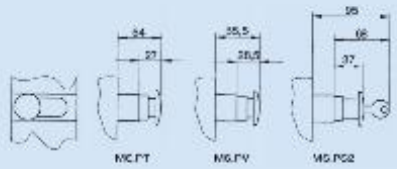
Insulated flush mounting enclosure MS.F41 / MS.F55



Insulated enclosure with CEE plug



Emergency-stop button MS.PT – PS.PS2



9

ABL SURSUM

Motor Protective Circuit Breakers

Nominal Rated Motor Currents

Nominal rated motor currents for three-phase motors (reference values for cage rotors)
Lowest possible short circuit fuse for three-phase motors. The maximum value is calculated according to setting range.

Motor power			230 V Nominal rated motor current	Fuse Start-up direct	Y/Δ	400 V Nominal rated motor current	Fuse Start-up direct	Y/Δ	500 V Nominal rated motor current	Fuse Start-up direct	Y/Δ	690 V Nominal rated motor current	Fuse Start-up direct	Y/Δ
kW	cos. φ	%	A	A	A	A	A	A	A	A	A	A	A	A
0,06	0,7	58	0,37	2	-	0,21	2	-	0,17	2	-	0,12	2	-
0,09	0,7	60	0,54	2	-	0,31	2	-	0,25	2	-	0,18	2	-
0,12	0,7	60	0,72	4	2	0,41	2	-	0,33	2	-	0,24	2	-
0,18	0,7	62	1,04	4	2	0,6	2	-	0,48	2	-	0,35	2	-
0,25	0,7	62	1,4	4	2	0,8	4	2	0,7	2	-	0,43	2	-
0,37	0,72	62	2	6	4	1,2	4	2	0,9	2	2	0,7	2	-
0,55	0,75	69	2,7	10	4	1,5	4	2	1,2	4	2	0,9	4	2
0,75	0,78	74	3,2	10	4	1,9	6	4	1,5	4	2	1,1	4	2
1,1	0,81	74	4,6	10	6	2,6	6	4	2,1	6	4	1,5	4	2
1,5	0,81	74	6,3	16	10	3,6	6	4	2,9	6	4	2,1	6	4
2,2	0,81	78	8,7	20	10	5	10	6	4	10	4	2,9	10	4
3	0,82	80	11,5	25	16	6,6	16	10	5,3	16	6	3,8	10	4
4	0,82	83	14,8	32	16	8,5	20	10	6,8	16	10	4,9	16	6
5,5	0,82	86	19,6	32	25	11,3	25	16	9	20	16	6,5	16	10
7,5	0,82	87	26,4	50	32	15,2	32	16	12,1	25	16	8,8	20	10
11	0,84	87	38	80	40	21,7	40	25	17,4	32	20	12,6	25	16
15	0,84	88	51	100	63	29,3	63	32	23,4	50	25	17	32	20
18,5	0,84	88	63	125	80	36	63	40	28,9	50	32	20,9	32	25
22	0,84	92	71	125	80	41	80	50	33	63	32	23,8	50	25
30	0,85	92	96	200	100	55	100	63	44	80	50	32	63	32
37	0,86	92	117	200	125	68	125	80	54	100	63	39	80	50
45	0,86	93	141	250	160	81	160	100	65	125	80	47	80	63
55	0,86	93	173	250	200	99	200	125	79	160	80	58	100	63
75	0,86	94	233	315	250	134	200	160	107	200	125	78	160	100
90	0,86	94	279	400	315	161	250	200	129	200	160	93	160	100
110	0,86	94	342	500	400	196	315	200	157	250	160	114	200	125
132	0,87	95	401	630	500	231	400	250	184	250	200	134	250	160
160	0,87	95	486	630	630	279	400	315	224	315	250	162	250	200
200	0,87	95	607	800	630	349	500	400	279	400	315	202	315	250
250	0,87	95	-	-	-	437	630	500	349	500	400	253	400	315
315	0,87	96	-	-	-	544	800	630	436	630	500	316	500	400
400	0,88	96	-	-	-	683	1000	800	547	800	630	396	630	400
450	0,88	96	-	-	-	769	1000	800	615	800	630	446	630	630
500	0,88	97	-	-	-	-	-	-	-	-	-	491	630	630
560	0,88	97	-	-	-	-	-	-	-	-	-	550	800	630
630	0,88	97	-	-	-	-	-	-	-	-	-	618	800	630

The nominal rated motor currents are valid for normal three-phase motors with surface and internal surface cooling with 1500 min^{-1}.

Start-up direct: Start-up current max. 6 x nominal rated motor current
Start-up time max. 5 s.

Y/Δ Start-up: Start-up current max. 2 x nominal rated motor current
Start-up time max. 15 s.
Set motor circuit breaker relays in a line to 0.58 x protective nominal rated motor current.

Nominal rated fuse currents for Y/Δ starts are also valid for three-phase motors with slip ring rotors.
Use larger fuses for a higher rated current, start-up current and/or a longer start-up time.
The table is valid for "delayed-action" or "gl" fuses (DIN VDE 0636)

For NH-fuses with aM characteristic, fuse = nominal rated current is selected.

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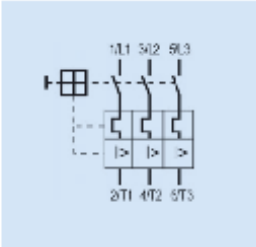
ABL SURSUM

Motor Protective Circuit Breakers MS/BS

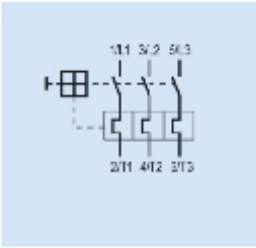
IEC 60947-4-1, DIN EN 60947-4-1, VDE 0660-102

The MS motor protective circuit breakers offer optimal protection for motors and other loads up to 32 A, due to its high breaking capacity with strongly limited current.
They are equipped with phase failure sensitivity, isolating and main switch functions; 14 ranges are covering nominal rated currents from 0,1 up to 32 A. The MPCBs are self protected up to 6,3 A at 400 V. Ranges > 6,3 A provide a short circuit withstand rating of 6 kA. The MPCBs are temperature compensated; the actuating current of the short circuit trip is 12 x I_u.

The MS motor protective circuit breakers are VDE-tested and UL-approved.



Rated current A	Max. rated operating power (kW/AC 3) 400/415 V	500 V	690 V	Operating current short circuit trip (A)	Article no.	Weight g/each	Pack. unit
MS with overload and short circuit tripping Phase failure sensitivity							
0,1 – 0,16	–	–	0,06	1,92	MS016	250	1
0,16 – 0,25	0,06	0,06	0,12	3	MS025	250	1
0,25 – 0,4	0,09	0,12	0,18	4,8	MS04	250	1
0,4 – 0,63	0,12	0,18	0,25	7,6	MS063	250	1
0,63 – 1	0,25	0,37	0,55	12	MS1	250	1
1 – 1,6	0,55	0,75	1,1	19,2	MS1.6	250	1
1,6 – 2,5	0,75	1,1	1,5	30	MS2.5	250	1
2,5 – 4	1,5	2,2	3	48	MS4	250	1
4 – 6,3	2,2	3	4	75,6	MS6.3	250	1
6,3 – 10	4	5,5	7,5	120	MS10	250	1
10 – 16	7,5	9	12,5	192	MS16	250	1
16 – 20	9	12,5	15	240	MS20	250	1
20 – 25	12,5	15	22	300	MS25	250	1
25 – 32	15	18,5	–	384	MS32	250	1



BS with overload tripping only Phase failure sensitivity							
0,4 – 0,63	0,12	0,18	0,25		BS063	230	1
0,63 – 1	0,25	0,37	0,55		BS1	230	1
1 – 1,6	0,55	0,75	1,1		BS1.6	230	1
1,6 – 2,5	0,75	1,1	1,5		BS2.5	230	1
2,5 – 4	1,5	2,2	3		BS4	230	1
4 – 6,3	2,2	3	4		BS6.3	230	1
6,3 – 10	4	5,5	7,5		BS10	230	1
10 – 16	7,5	9	12,5		BS16	230	1
16 – 20	9	12,5	15		BS20	230	1
20 – 25	12,5	15	22		BS25	230	1
25 – 32	15	18,5	-		BS32	230	1

Botão de Emergência ABB

PRODUCT-DETAILS

CE3T-10G-11

Machine Stop CE3T-10G-11

General Information

Extended Product Type	CE3T-10G-11
Product ID	1SFA619500R1072
EAN	7320500308585
Catalog Description	Machine Stop CE3T-10G-11
Long Description	Compact Machine Stop - Twistrelease - Mushroom - Green - Non-illuminated - Black plastic - 1NO+1NC

Ordering

EAN	7320500308585
Minimum Order Quantity	1 piece
Customs Tariff Number	85369001

Dimensions

Product Net Width	0.03 m
Product Net Height	0.03 m
Product Net Depth / Length	0.073 m
Product Net Weight	0.032 kg

Container Information

CE3T-10G-11 2

Package Level 1 Units	bag 1 piece
Package Level 1 Width	0.1 m
Package Level 1 Height	0.03 m
Package Level 1 Depth / Length	0.1 m
Package Level 1 Gross Weight	0.032 kg

Environmental

RoHS Status	Following EU Directive 2011/65/EU

Additional Information

Actuator Type	Mushroom
Bezel Material	n/a
Block	1NO+1NC
Color	Green
Connection Type	Screw Clamp
Function	Twist release
Illumination	Non-illuminated
Number of Auxiliary Contacts NC	1
Number of Auxiliary Contacts NO	1
Product Main Type	CE3T
Product Name	Machine Stop
Product Range	Compact
Product Type	CE
RoHS Date	0626 S

Certificates and Declarations (Document Number)

cURus Certificate	UL_E496500-20171020
Data Sheet, Technical Information	1SFC151007C0201
Declaration of Conformity - CE	2CMT2015-005451
Environmental Information	1SFC151009D0201
Instructions and Manuals	1SFC151011M0201
RoHS Information	2CMT2015-005451

Classifications

ETIM 4	EC002024 - Accessories for control circuit devices
ETIM 5	EC002034 - Emergency stop complete
ETIM 6	EC002034 - Emergency stop complete
ETIM 7	EC001028 - Push button, complete
Object Classification Code	5
UNSPSC	39121500
WEEE Category	5. Small Equipment (No External Dimension More Than 50 cm)

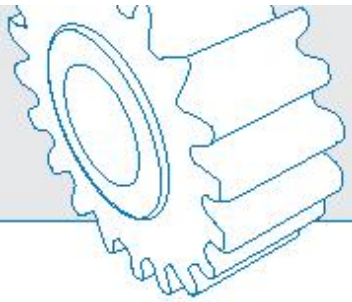
CE3T-10G-11 3

Categories

Low Voltage Products and Systems → Control Products → Pilot Devices → Compact Range

Motoredutor Nord

FLEXBLOC™ & MINICASE® Speed Reducers



FLEXBLOC™ and MINICASE® Worm Gears

NORD modular worm gear products cover 5 industry standard center distances from 31 mm-75 mm (1.2 in-3.0 in) and range in torque capacity up to 3,779 lb-in. This product offering comes in a variety of standard, single worm, and compound worm ratios ranging from 5:1 to 10,000:1. The product family consists of the FLEXBLOC™ (SI Series) worm with universal gear housing and the MINICASE® (SMI Series) worm characterized by its smooth outer surface design and its separate footed and flanged gear housing. Exceptional modularity is guaranteed by offering a unified set of factory-stocked and easy-to-assemble accessory kits. This flexibility allows for a variety of input and output mounting options along with a large variety of output shaft options. The FLEXBLOC™ and MINICASE® worm gear products share many innovative design features.

FLEXBLOC™ Key Features:

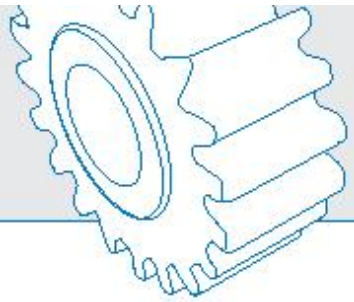
- Factory-stocked worm-modules & accessory kits
- Universal foot and flange-mount housings
- Keyed hollow-bore units with solid shaft kits
- Adaptable to any mounting position (universal oil fill)
- Easy to assemble accessories
- NEMA, IEC, or solid shaft input as standard
- Accommodates stocked C-Face motors or brakemotors

MINICASE® Key Features:

- Factory-assembled from stocked parts
- Separate smooth-bodied foot & flange-mount housings
- Keyed hollow-bore or one-piece solid shaft as standard
- Specific bores accommodate plug-in shafts
- Easy to assemble accessories
- NEMA, IEC, or solid shaft input
- Supplied as an integral motor or brakemotor (C-Face motorized options possible)

NORD DRIVESYSTEMS

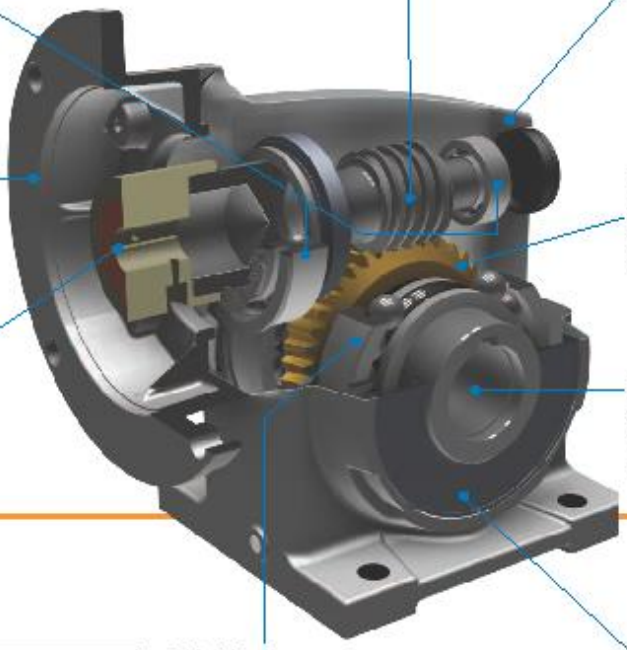
Product Features



Dual Pinion Shaft Bearings
Two bearing supports maintain accurate gear and shaft alignment, isolate and protect motor bearings, and provide smooth/quite operation.

Worm Pinion Gear
Surfaced hardened alloy steel gears with an optimized tooth form maximize gear contact and provide long service life.

Alluminum Alloy Housing
Light weight, high strength, optimal heat dissipation and natural corrosion resistance. Flange or torque-arm mount options available.

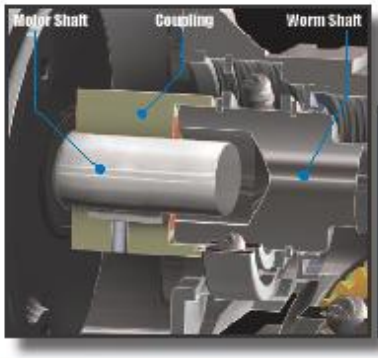


Input Configuration
NEMA, IEC and free input shaft designs are readily available. Integral motor mounting is optional. Adaptation to servo motors is possible.

Worm Gear
Fine-grained bronze alloy minimizes wear providing maximum strength and durability.

Motor Coupling
Guarantees accurate motor shaft alignment, minimizes fretting and provides a low backlash / high strength connection.

Output Shaft
Hollow bore and single-sided or double-sided shafted models are also available.



Output Bearings
Oversized bearings provide high radial and axial load capacities and long service life.

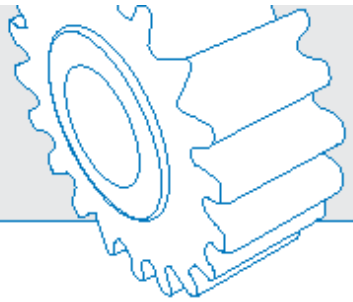
Oil Seals
Double-lip oil seals provide extra sealing and protection against the elements.

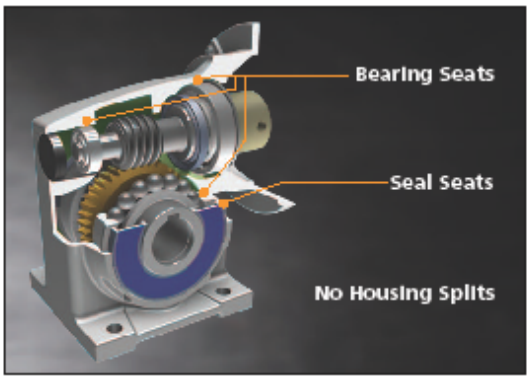
Advantages of the NORD Compact Coupled Unit

- Easy to assemble and disassemble.
- Eliminates fretting corrosion common to quill-mount inputs.
- Maintains shaft alignment and provides vibration-free torque transfer.
- Protects and isolates motor shaft and reducer shaft bearings.
- Provides a stiff, high-strength, near-zero backlash connection.
- Reduces the chance of bearing, shaft and key failures.

NORD DRIVESYSTEMS

Innovative Design Features





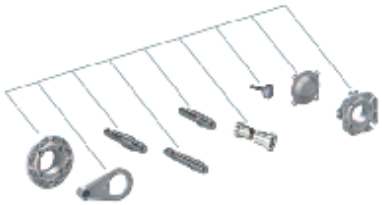
UNICASE® One Piece Housing

NORD heavy-duty, one-piece housings are precisely machined to exacting standards. Internal reinforcements further increase strength and rigidity. All bearings and seal seats are contained within the casting, eliminating splits or bolt-on carriers that can weaken the housing and allow oil leakage. Bores and mounting faces are machined in one step, producing extremely precise tolerances — thus ensuring accurate positioning of gear teeth, bearings and seals, and longer life for all components.

- Increased torsional strength and rigidity.
- Eliminates housing splits and bolt-on carriers.
- Leak-free housing design.
- Versatile mounting options and accessory kits.

Modular Construction

- Easy-to-configure input and output accessories.
- Integral motor or motorized c-face units.
- NEMA, IEC or solid shaft input options.
- Footed, flanged or shaft-mount.
- 10:1 helical pre-stage & compound assemblies.
- Keyed hollow bore, solid shaft, and bushing-kit options.



Factory Oil Filled

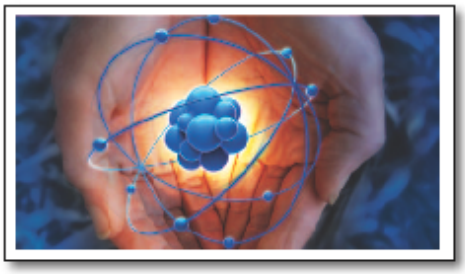
NORD factory-filled gear units allow for easy commissioning of the gear unit and prevent damage caused by dry start-ups. Each unit is filled with a quality gear lubricant that is recognized by the industry.

- Maintence free / lubricated-for-life.
- High-quality long-life synthetic lubricant.
- USDA H1 lubrication readily available.
- Optional venting capabilities.

NORD DRIVESYSTEMS

Sealed Surface Conversion

The NEW NSDtuph Sealed Surface Conversion System offers a cost effective weight saving alternative to stainless steel reducers. Through a revolutionary process the reducer housing and its components are electrically catalyzed resulting in a surface conversion at the molecular level. NSDtuph provides exceptional chemical, corrosion and abrasion resistance. The converted surface also becomes extremely scratch resistant as it becomes 6-7 times harder than the original aluminum alloy.



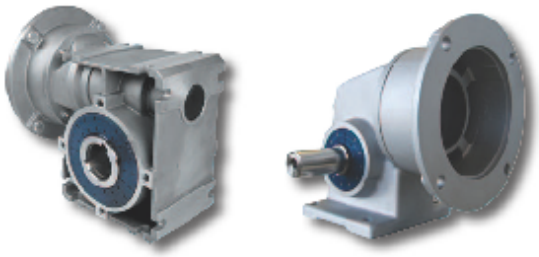
The NSDtuph package includes stainless steel reducer hardware and c-face gasket for the motor. Options include stainless steel reducer shafting, smooth-bodied stainless steel c-face motors, and food grade lubricants. NSDtuph is the ideal package for many harsh environments involving chemicals or wash-downs and areas where sanitation and cleanliness are the highest priority.

Available FLEXBLOC™ / MINICASE® worm Units with NSDtuph Conversion

	SK1SI31 / SK1SMI31	SK1SI40 / SK1SMI40	SK1SI50 / SK1SMI50	SK1SI63 / SK1SMI63
N48C Input	X			
N56C Input		X	X	X
N140TC Input		X	X	X

System Package

- Standard electrically catalized reducer housing and accessories
- Standard stainless steel hardware
- Standard C-Face gasket included
- Housings surfaces are self draining
- Food grade H1 synthetic lubrication (optional)
- Stainless steel output shafting (optional)
- Stainless steel C-Face inverter duty motor up to 10HP (optional)
- 3 Year warranty when supplied with synthetic lube



is Useful in Many Harsh Environments

(not limited to but including)

- Chemical wash down
- Damp and wet environments
- Marine / Coastal
- Food & Beverage Industry
- Car Wash
- Dairy
- Pharmaceutical
- Water and waste treatment

Some of the Many Benefits of

- Cost effective alternate to stainless steel
- Corrosion resistance
- Chip resistance
- Non propagating from scratches or other blemishes
- Highly Cleanable low friction surface
- Non-porous
- Lighter than stainless
- Chemical resistant
- Elimination of galvanic corrosion
- Surface conversion is 1000X harder than paint

FLEXBLOC™ & MINICASE®
Flexible Solutions & Bolt-On Modules

NEMA C-FACE COUPLING ADAPTER
For attaching standard motors

Kit contains:
- Adapter flange
- Coupling
- Nuts and bolts

2ND REDUCTION
Helical 10:1 gear set
Fits all size gearboxes
Lifetime synthetic lubricant
Sealed unit

Kit contains:
- Pre-assembled unit
- Bolts

SOLID INPUT SHAFT
Fits all size gearboxes
Lifetime lubricant
Sealed unit

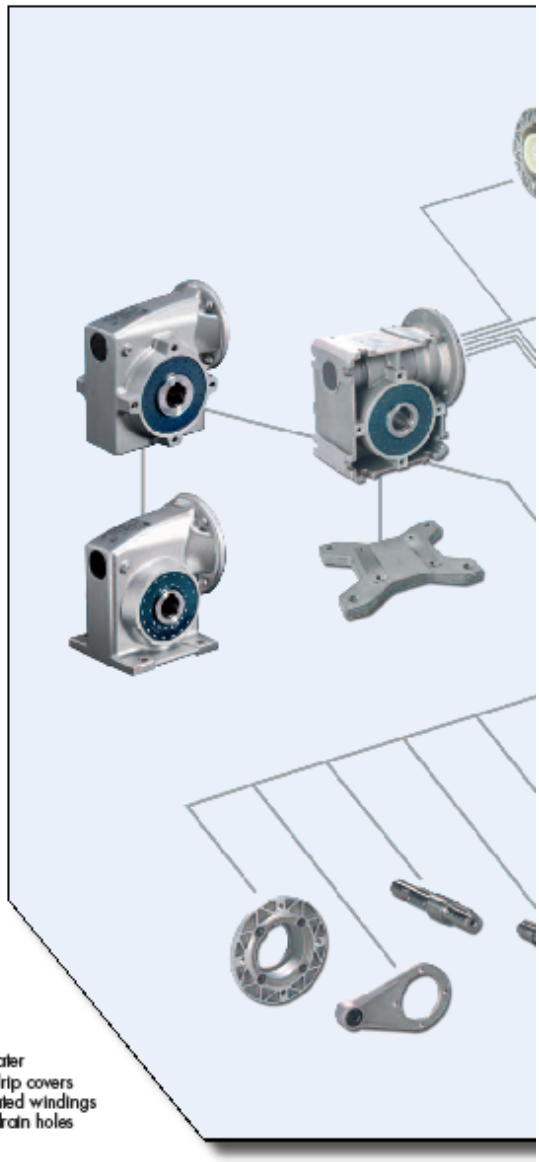
Kit contains:
- Pre-assembled unit
- Bolts

DOUBLE WORM ADAPTER
Mounts the SK1SI/SMI31 to the input of the larger SK1SI/SMI40 - SK1SI/SMI75 to produce a high reduction double worm gear unit

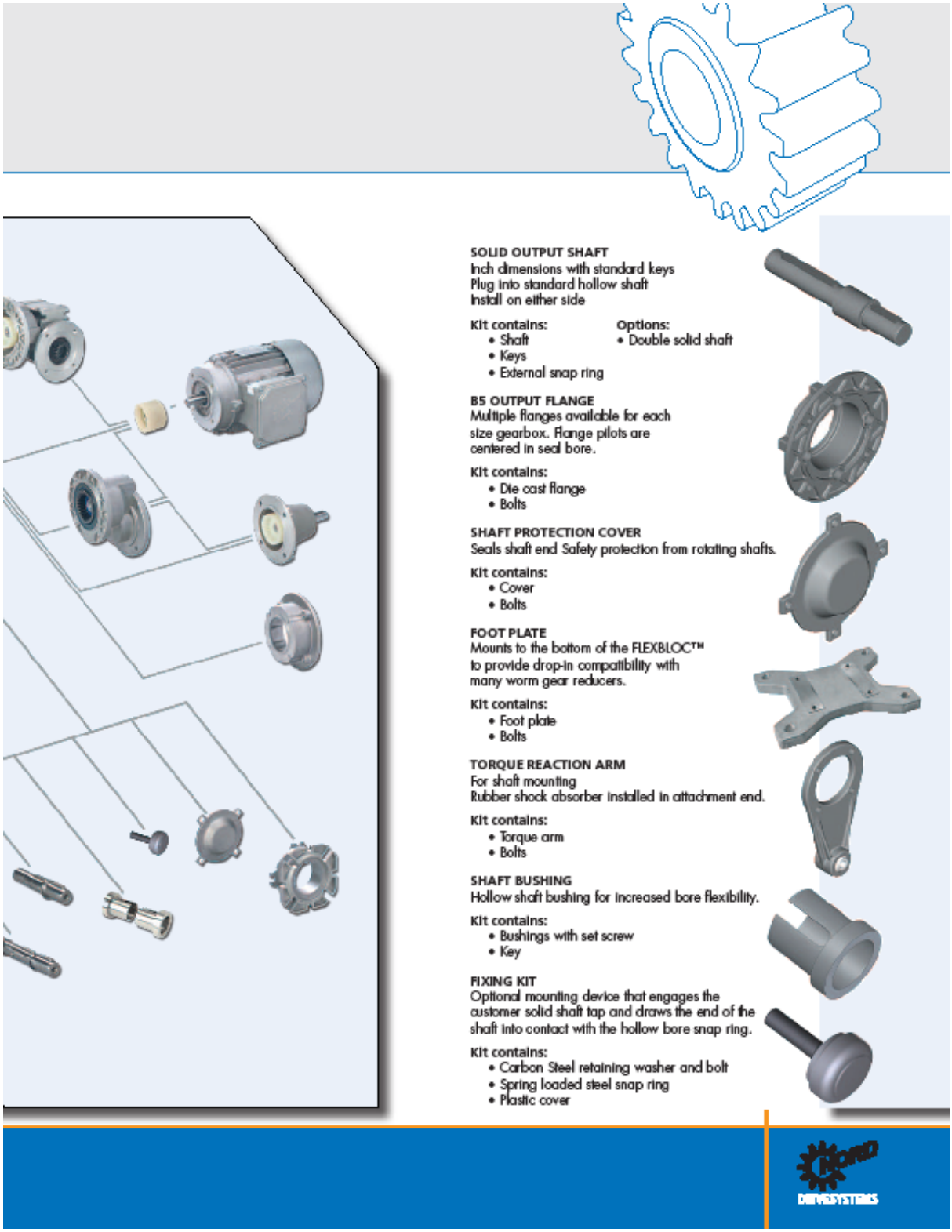
Kit contains:
- Adapter flange
- Coupling
- Shaft
- Keys
- Bolts

NORD C-FACE MOTORS & BRAKEMOTORS
3 phase, 230/460, 60 Hertz
3 phase, 575V, 60 Hertz

Options:
- Power off brake
- Numerous brake options
- Thermistor temperature sensors
- Thermostat temperature sensors
- Blower fan
- Encoders
- Space heater
- Canopy drip covers
- Encapsulated windings
- End bell drain holes



NORD DRIVESYSTEMS



SOLID OUTPUT SHAFT
Inch dimensions with standard keys
Plug into standard hollow shaft
Install on either side

Kit contains:
- Shaft
- Keys
- External snap ring

Options:
- Double solid shaft

B5 OUTPUT FLANGE
Multiple flanges available for each size gearbox. Flange pilots are centered in seal bore.

Kit contains:
- Die cast flange
- Bolts

SHAFT PROTECTION COVER
Seals shaft end Safety protection from rotating shafts.

Kit contains:
- Cover
- Bolts

FOOT PLATE
Mounts to the bottom of the FLEXBLOC™ to provide drop-in compatibility with many worm gear reducers.

Kit contains:
- Foot plate
- Bolts

TORQUE REACTION ARM
For shaft mounting
Rubber shock absorber installed in attachment end.

Kit contains:
- Torque arm
- Bolts

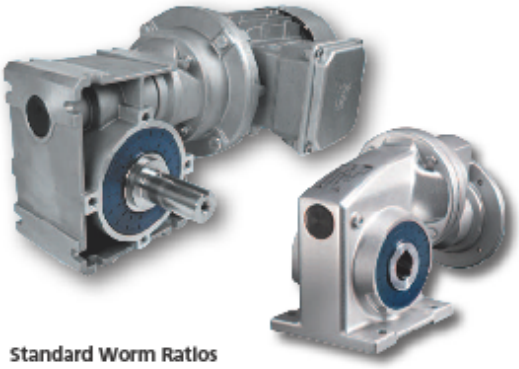
SHAFT BUSHING
Hollow shaft bushing for increased bore flexibility.

Kit contains:
- Bushings with set screw
- Key

FIXING KIT
Optional mounting device that engages the customer solid shaft tap and draws the end of the shaft into contact with the hollow bore snap ring.

Kit contains:
- Carbon Steel retaining washer and bolt
- Spring loaded steel snap ring
- Plastic cover

Gearbox Ratings



Standard Worm Ratios

- 5:1 - 100:1 single worm ratios.
- Up to 1000:1 with a 10:1 helical pre-stage option.
- Compound Unit ratios up to 10,000:1

Type	Ratio	Output RPM	Torque [lb-in]	Max Input HP
SK 1SI 31	5	350	204	1.30
	7.5	233	239	1.06
	10	175	230	0.80
SK 1SMI 31	12.5	140	212	0.61
	15	117	257	0.66
	20	88	239	0.49
	25	70	221	0.38
	30	58	266	0.44
	40	43	248	0.34
	50	35	230	0.27
	60	29	212	0.23
	80	22	195	0.18
	100	18	186	0.17

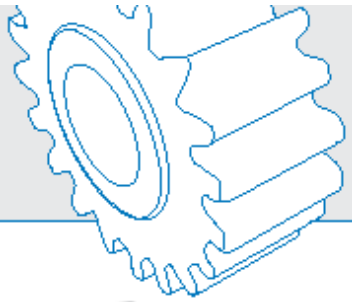
Type	Ratio	Output RPM	Torque [lb-in]	Max Input HP
SK 1SI 40	5	350	336	2.10
	7.5	233	389	1.69
	10	175	372	1.24
SK 1SMI 40	12.5	140	363	1.00
	15	117	434	1.06
	20	88	398	0.77
	25	70	372	0.60
	30	58	442	0.67
	40	43	407	0.51
	50	35	381	0.41
	60	29	354	0.34
	80	22	327	0.27
	100	18	301	0.23
SK 1SI 40/H10	50	35	549	0.38
SK 1SMI 40/H10	thru			
	1000	1.8	487	0.06
SK 1SI 40/31	150	12	655	0.30
SK 1SMI 40/31	thru			
	3000	0.6	876	0.06

Type	Ratio	Output RPM	Torque [lb-in]	Max Input HP
SK 1SI 50	5	350	584	3.56
SK 1SMI 50	7.5	233	690	2.90
	10	175	664	2.14
	12.5	140	637	1.69
	15	117	770	1.79
	20	88	717	1.30
	25	70	673	1.01
	30	58	796	1.11
	40	43	735	0.83
	50	35	681	0.65
	60	29	646	0.55
	80	22	593	0.43
	100	18	549	0.36
SK 1SI 50/H10	50	35	742	0.50
SK 1SMI 50/H10	thru			
	1000	1.8	894	0.09
SK 1SI 50/31	150	12	1177	0.49
SK 1SMI 50/31	thru			
	3000	0.6	1575	0.11

Type	Ratio	Output RPM	Torque [lb-in]	Max Input HP
SK 1SI 63	5	350	1044	6.30
SK 1SMI 63	7.5	233	1230	5.05
	10	175	1186	3.74
	12.5	140	1142	2.91
	15	117	1372	3.07
	20	88	1274	2.22
	25	70	1195	1.72
	30	58	1416	1.86
	40	43	1301	1.38
	50	35	1212	1.09
	60	29	1150	0.90
	80	22	1044	0.69
	100	18	974	0.57
SK 1SI 63/H10	50	35	751	0.50
SK 1SMI 63/H10	thru			
	1000	1.8	1584	0.16
SK 1SI 63/31	150	12	2097	0.83
SK 1SMI 63/31	thru			
	3000	0.6	2797	0.20

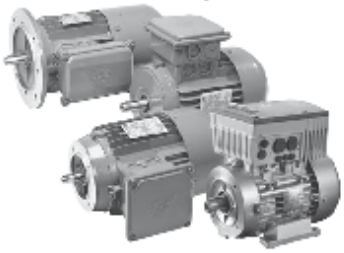
Type	Ratio	Output RPM	Torque [lb-in]	Max Input HP
SK 1SI 75	5	350	1735	10.36
	7.5	233	2071	8.41
	10	175	2009	6.2
SK 1SMI 75	12.5	140	1912	4.77
	15	117	2336	5.1
	20	88	2168	3.65
	25	70	2036	2.79
	30	58	1929	2.25
	40	43	2212	2.21
	50	35	2062	1.71
	60	29	1956	1.41
	80	22	1779	1.05
	100	18	1655	0.88
SK 1SI 75/40	150	12	2832	0.96
	thru			
	3000	0.60	3779	0.19

Motor Ratings



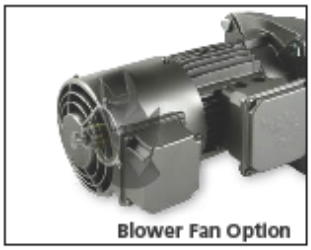
Motor Specifications

Inverter duty • TEFC
Synchronous speed 1800rpm @ 60Hz • 4-pole • Three-phase
1.15 Service Factor • Continuous Duty • 40°C Ambient
up to 3300ft Elevation • Class B temperature rise
Class F Insulation



230/460V or 200-208V or 575V – 60Hz

Power [hp]	Power [kW]	Speed [rpm]	Motor Type (Frame) Integral	Motor Type (Frame) NEMA C-Face
0.16	0.12	1700	63 S/4	63 S/4-56C
0.25	0.18	1680	63 L/4	63 L/4-56C
0.33	0.25	1710	71 S/4	71 S/4-56C
0.5	0.37	1720	71 L/4	71 L/4-56C
0.75	0.55	1710	80 S/4	80 S/4-56C
1	0.75	1650	80 L/4	80 L/4-56C



Blower Fan Option

230/460V+ or 575V – 60Hz | Energy Efficient (EPAct)

Power [hp]	Power [kW]	Speed [rpm]	Motor Type (Frame) Integral	Motor Type (Frame) NEMA C-Face
1	0.75	1750	80 LH/4	80 LH/4-56C
1	0.75	1750	80 LH/4	80 LH/4-143TC
1.5	1.1	1740	90 SH/4	90 SH/4-145TC
2	1.5	1745	90 LH/4	90 LH/4-145TC
3	2.2	1765	*	100 LH/4-182TC
5	3.7	1770	*	112 MH/4-184TC

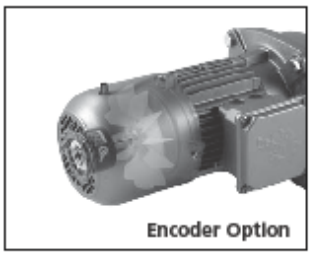
* Consider a gear unit with NEMA C-face input
+ 208-230/460V Rating Possible

Brakemotor with Fan

230/460V+ or 575V – 60Hz | Premium Efficient (EISA)

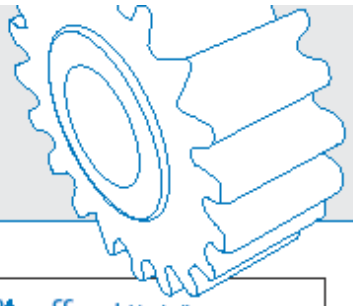
Power [hp]	Power [kW]	Speed [rpm]	Motor Type (Frame) Integral	Motor Type (Frame) NEMA C-Face
1	0.75	1750	80 LP/4	80 LP/4-56C
1	0.75	1750	80 LP/4	80 LP/4-143TC
1.5	1.1	1740	90 SP/4	90 SP/4-145TC
2	1.5	1745	90 LP/4	90 LP/4-145TC
3	2.2	1765	*	100 LP/4-182TC
5	3.7	1770	*	112 MP/4-184TC

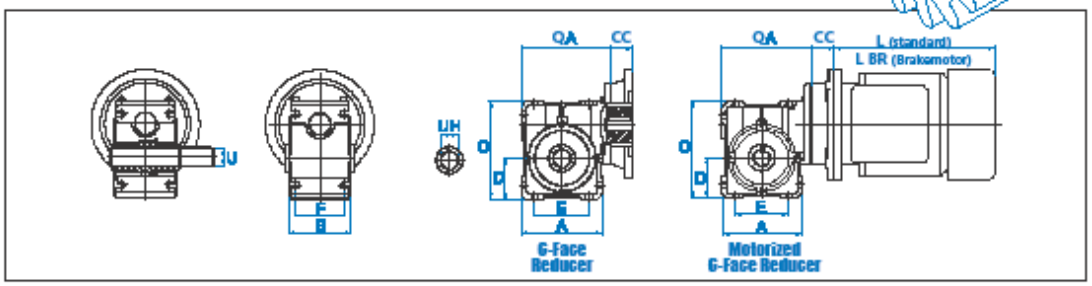
* Consider a gear unit with NEMA C-face input
+ 208-230/460V Rating Possible



Encoder Option

FLEXBLOC™ Worm Dimensions





DIMENSIONS

	A	B	D	E	F	O	QA	U	UH
SK 1SI 31	3.15	2.48	1.57	2.13	1.73	3.82	3.82	0.625	0.625
SK 1SI 40	3.94	3.07	1.97	2.76	2.36	4.78	4.69	0.750	1.000
SK 1SI 50	4.72	3.62	2.36	3.15	2.76	5.67	5.16	1.000	1.125
SK 1SI 63	5.67	4.41	2.83	3.94	3.35	6.85	6.22	1.125	1.4375
SK 1SI 75	6.77	5.12	3.39	4.72	3.54	8.08	7.87	1.375	1.9375

Metric Shaft available

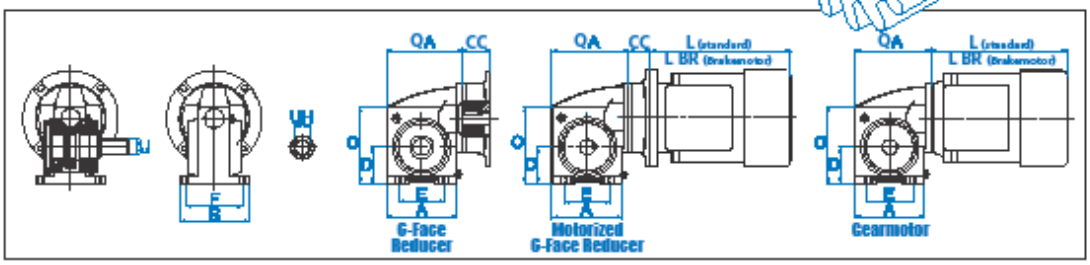
NEMA C-FACE DIMENSIONS

	48C		56C		140TC		180TC	
	Available	CC	Available	CC	Available	CC	Available	CC
SK 1SI 31	X	1.50	X	1.89	-	-	-	-
SK 1SI 40	-	-	X	1.46	X	1.93	-	-
SK 1SI 50	-	-	X	1.46	X	1.93	-	-
SK 1SI 63	-	-	X	1.46	X	1.93	X	3.06
SK 1SI 75	-	-	X	1.61	X	1.61	X	2.16

NEMA C-FACE GEARMOTOR DIMENSIONS

	56C-63S/L		56C-71S/L		56C-80S/L-LH-LP		140TC-80L-LH-LP		140TC-90LH-LP		180TC-100LH-LP		180TC-112MH-MP	
	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR
SK 1SI 31	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	-	-	-	-	-	-
SK 1SI 40	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	-	-	-	-
SK 1SI 50	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	-	-	-	-
SK 1SI 63	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	11.97	15.57	-	-
SK 1SI 75	-	-	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	11.97	15.57	13.56	17.26

MINICASE®
Worm Dimensions



GEARBOX & SHAFT DIMENSIONS

	A	B	D	E	F	O	QA	U	UH
SK 1SMI 31	3.27	3.54	1.57	2.56	2.95	3.54	3.82	0.500	0.625
SK 1SMI 40	3.78	4.72	2.09	3.15	3.94	4.53	4.69	0.750	1.000
SK 1SMI 50	4.72	4.72	2.48	3.15	3.94	5.24	5.16	1.000	1.125
SK 1SMI 63	5.67	5.31	2.95	3.94	4.33	6.34	6.18	1.250	1.4375
SK 1SMI 75	6.77	6.69	3.54	5.12	5.51	7.94	7.87	1.375	1.9375

Metric Shaft available

NEMA C-FACE DIMENSIONS

	48C		56C		140TC		180TC	
	Available	CC	Available	CC	Available	CC	Available	CC
SK 1SMI 31	X	1.50	X	1.89	-	-	-	-
SK 1SMI 40	-	-	X	1.46	X	1.93	-	-
SK 1SMI 50	-	-	X	1.46	X	1.93	-	-
SK 1SMI 63	-	-	X	1.46	X	1.93	X	3.06
SK 1SMI 75	-	-	X	1.61	X	1.61	X	2.16

INTEGRAL GEARMOTOR DIMENSIONS

	63S/L		71S/L		80S/L/SH/LH/SP/LP		90SH/LH/SP/LP		100LH/LP		112MH/MP	
	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR
SK 1SMID 31	7.57	9.78	8.44	10.72	-	-	-	-	-	-	-	-
SK 1SMID 40	7.59	9.79	8.44	10.72	9.31	11.83	-	-	-	-	-	-
SK 1SMID 50	-	-	8.44	10.72	9.31	11.83	10.84	13.80	-	-	-	-
SK 1SMID 63	-	-	-	-	9.31	11.83	10.84	13.80	-	-	-	-

NEMA C-FACE GEARMOTOR DIMENSIONS

	56C-63S/L		56C-71S/L		56C-80S/L-LH-LP		140TC-80L-LH-LP		140TC-90LH-LP		180TC-100LH-LP		180TC-112MH-MP	
	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR	L	L BR
SK 1SMI 31	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	-	-	-	-	-	-
SK 1SMI 40	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	-	-	-	-
SK 1SMI 50	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	-	-	-	-
SK 1SMI 63	7.57	9.78	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	11.97	15.57	-	-
SK 1SMI 75	-	-	8.44	10.72	9.46	11.98	9.46	11.98	11.00	13.95	11.97	15.57	13.56	17.26

Product Overview

UNICASE™ SPEED REDUCERS

HELICAL IN-LINE
- Foot or Flange Mount
- Torque up to 205,000 lb-in
- Gear ratios – 1.82:1 to over 300,000:1

NORDBLOC®.1 HELICAL IN-LINE
- Foot or Flange Mount
- Torque up to 26,550 lb-in
- Gear ratios – 1.88:1 to over 370:1

PARALLEL HELICAL CLINCHER™
- Shaft, Flange or Foot Mount
- Torque up to 797,000 lb-in
- Gear ratios – 4.26:1 to over 300,000:1

SCP SCREW CONVEYOR PACKAGE
- Shaft, or Flange Mount
- Torque up to 53,100 lb-in
- Gear ratios – 4.32:1 to over 1500:1

RIGHT ANGLE HELICAL-BEVEL 2-STAGE
- Foot, Flange or Shaft Mount
- Torque up to 5,840 lb-in
- Gear ratios – 4.1:1 to 72:1

RIGHT ANGLE HELICAL-BEVEL
- Foot, Flange or Shaft Mount
- Torque up to 283,000 lb-in
- Gear ratios – 8.04:1 to over 300,000:1

RIGHT ANGLE HELICAL-WORM
- Foot, Flange or Shaft Mount
- Torque up to 27,585 lb-in
- Gear ratios – 4.40:1 to over 300,000:1

HIGH PERFORMANCE MOTORS & BRAKEMOTORS

INVERTER/VECTOR DUTY
- Standard or Energy Efficient
- Integral, NEMA or Metric IEC
- 1/6 to 250 hp

UNICASE™ SPEED REDUCERS

MINICASE™ RIGHT ANGLE WORM
- Foot, Flange or Shaft Mount
- Torque up to 3,540 lb-in
- Gear ratios – 5:1 to 500:1

FLEXBLOC™ WORM
- Modular bolt-on options
- Torque up to 4,683 lb-in
- Gear ratios – 5:1 to 3,000:1

MAXXDRIVE™ LARGE INDUSTRIAL GEAR UNITS PARALLEL HELICAL
- Modular bolt-on options
- Torque up to 2,027,000 lb-in
- Gear ratios – 5:1 to 1,600:1

MAXXDRIVE™ LARGE INDUSTRIAL GEAR UNITS HELICAL-BEVEL
- Modular bolt-on options
- Torque up to 2,027,000 lb-in
- Gear ratios – 5:1 to 1,600:1

NORDAC AC VECTOR DRIVES

SK200E FAMILY
- Decentralized, high performance
- 380-480V, 3-phase to 10 hp
- 200-240V, 3-phase to 5 hp
- 200-240V, 1-phase to 1.5 hp
- 100-120V, 1-phase to 1 hp

SK500E FAMILY
- Compact, high performance
- 380-480V, 3-phase, to 50hp
- 200-240V, 3-phase, to 15hp
- 200-240V, 1-phase, to 3hp
- 110-120V, 1-phase, to 1.5hp

NORD DRIVESYSTEMS

www.nord.com

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MEMBER OF THE NORD DRIVESYSTEMS GROUP
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info.us@nord.com

NORD Gear Limited
MEMBER OF THE NORD DRIVESYSTEMS GROUP
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info.ca@nord.com

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MIDWEST
Waunakee, WI (Madison)
Phone: 608.849.7300

EAST
Charlotte, NC
Phone: 608.849.0140

CANADA
Brampton, ON (Toronto)
Phone: 905.796.3606

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Resistências Ceramicx

Product Guide

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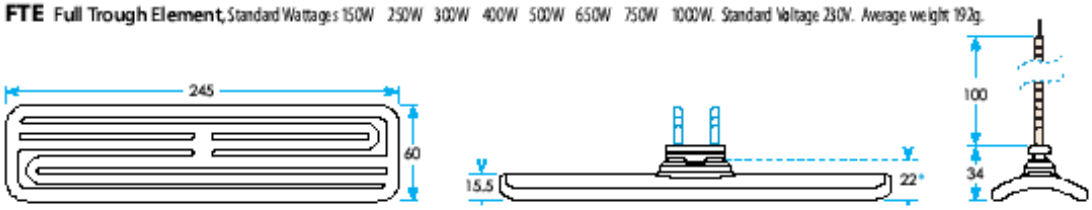
CERAMIC TROUGH ELEMENTS

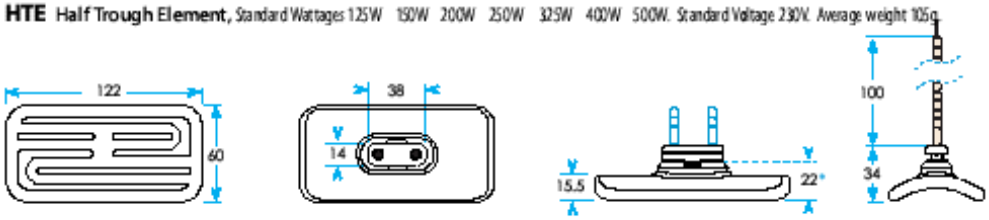
Useful wavelength range 2 to 10µm

(FTE/HTE/QTE) are industry standard curved ceramic infrared heaters used in a wide range of industrial, commercial and domestic applications. These solid cast elements consist of a high temperature FeCrAL resistance alloy embedded in a specially formulated ceramic body allowing operating temperatures up to 750°C and a maximum power of 1000W (FTE Model Only).

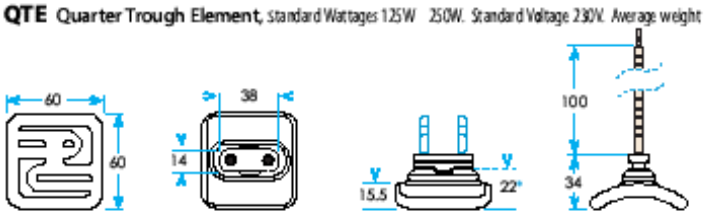
FTE Full Trough Element, Standard Wattages 150W 250W 300W 400W 500W 650W 750W 1000W. Standard Voltage 230V. Average weight 192g.



HTE Half Trough Element, Standard Wattages 125W 150W 200W 250W 325W 400W 500W. Standard Voltage 230V. Average weight 105g.



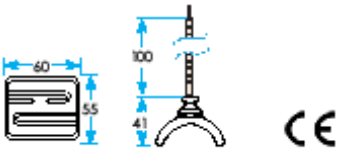
QTE Quarter Trough Element, standard Wattages 125W 250W. Standard Voltage 230V. Average weight 65g.



QCE Quarter Curved Element

Standard Wattages 150W 250W.

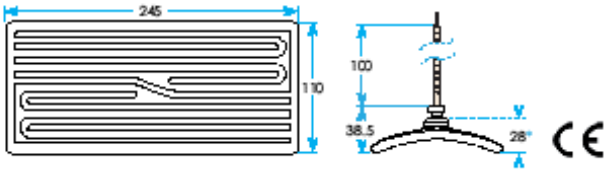
Standard Voltage 230V. Average weight 70g



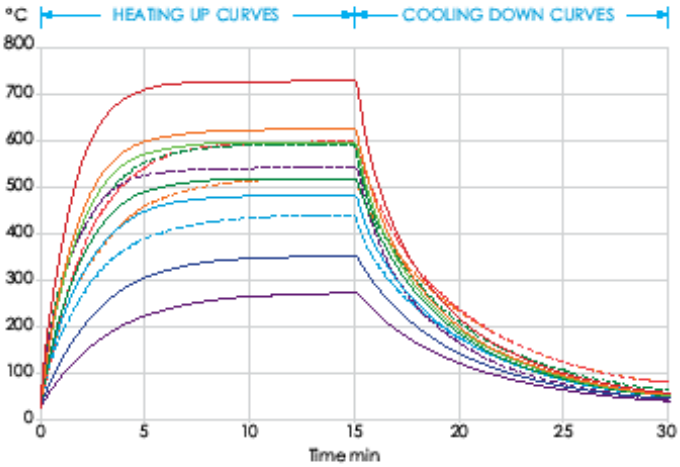
LFTE Large Full Trough element,

Standard Wattages 1000W 1500W.

Standard Voltage 230V. Average weight 356g



CERAMIC ELEMENTS



Heating up/cooling down curves based on FTE tests of average surface temperature with an infrared thermometer set at an emissivity of 0.9 (element mounted in an aluminised steel reflector, RAS)

FTE	HTE	QTE	
1000W	500W	250W	LFTE 1500W
750W			LFTE 1000W
650W	325W		
500W	250W	125W	QCE 250W
400W	200W		QCE 150W
250W	125W		
150W			FTEL-LN 1000W

Wattage	150W	250W	300W	400W	500W	650W	750W	1000W
Mean surface temperature	272 °C	351 °C	405 °C	480 °C	515 °C	596 °C	624 °C	726 °C
Max power density	9 kW/m²	15 kW/m²	18 kW/m²	24 kW/m²	30 kW/m²	39 kW/m²	45 kW/m²	60 kW/m²
Radiant Watt density at 100mm	0.10 W/cm²		0.26 W/cm²		0.48 W/cm²	0.69 W/cm²		1.14 W/cm²

Based on tests of average surface temperature with an infrared thermometer set at an emissivity of 0.95 (element mounted in an aluminised steel reflector, RAS)

Wattage	125W	150W	200W	250W	325W	500W
Mean surface temperature	351 °C	405 °C	480 °C	515 °C	596 °C	726 °C
Max power density	15 kW/m²	18 kW/m²	24 kW/m²	30 kW/m²	39 kW/m²	60 kW/m²
Radiant Watt density at 100mm		0.26 W/cm²			0.69 W/cm²	1.14 W/cm²

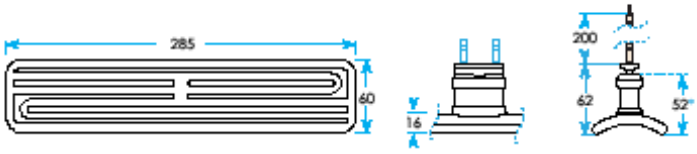
Based on tests of average surface temperature with an infrared thermometer set at an emissivity of 0.95 (element mounted in an aluminised steel reflector, RAS)

Wattage	125W	250W
Mean surface temperature	515 °C	726 °C
Max power density	30 kW/m²	60 kW/m²
Radiant Watt density at 100mm		1.14 W/cm²

Based on tests of average surface temperature with an infrared thermometer set at an emissivity of 0.95 (element mounted in an aluminised steel reflector, RAS)

FTEL-LN Full Trough Element Long - Long Neck,

Standard Wattage 1000W.
Standard Voltage 230V.



All dimensions mm Tolerances apply

resitec

Ceramic ProductGuide 37

Sensor Panasonic CX-412E

Panasonic

CX-412 | Compact Photoelectric Sensor CX-400 Ver.2

※Photo may vary from actual product.

Product Number	CX-412
Part Number	CX-412
Product	Compact Photoelectric Sensor
Details	Thru-beam(Long sensing range)
Product name	Compact Photoelectric Sensor CX-400 Ver.2
Features	Sensors that are environmentally and user friendly.

Spec Detail

As of September 11, 2019

Specifications and design of the products are subject to change without notice for the product improvement.

Item	Specifications
Product Number	CX-412
Part Number	CX-412
CE marking directive compliance	EMC Directive, RoHS Directive
Sensing range	10 to 40.2131 ft
Sensing object	Ø12 mm Ø0.472 in or more opaque object (Note) If slit masks (optional) are fitted, an object of Ø6.5 mm Ø0.236 in (using round slit mask) can be detected.
Hysteresis	-
Repeatability(perpendicular to sensing axis)	0.5 mm 0.020 in or less
Supply voltage	12 to 24 V DC plus or minus 10 % Ripple P-P 10 % or less
Current consumption	Emitter: 20 mA or less Receiver: 10 mA or less
Output	NPN open-collector transistor - Maximum sink current: 100 mA - Applied voltage: 30 V DC or less (between output and 0 V) - Residual voltage: 2 V or less (at 100 mA sink current), 1 V or less (at 16 mA sink current)
Output:Output operation	Switchable either Light-ON or Dark-ON
Output:Short-circuit protection	Incorporated
Response time	1 ms or less
Operation indicator	Orange LED(lights up when the output is ON) (Incorporated on the receiver for thru-beam type)
Stability indicator	Green LED(lights up under stable light received condition or stable dark condition) (Incorporated on the receiver for thru-beam type)
Power indicator	Green LED(lights up when the power is ON) (Incorporated on the emitter)
Sensitivity adjuster	Continuously variable adjuster(Incorporated on the receiver for thru-beam type)
Automatic interference prevention function	-
Protection	IP67 (IEC)
Ambient temperature	-25 to +55°C -13 to +131°C °F (No dew condensation or icing allowed), Storage: -30 to +70°C -22 to +158°C °F

Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH
Ambient illuminance	Incandescent light: 3,000 lx or less at the light-receiving face
Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure
Insulation resistance	20 MΩ or more, with 250 V DC megger between all supply terminals connected together and enclosure
Vibration resistance	10 to 500 Hz frequency, 1.5 mm 0.059 in amplitude (10 G approx.) in X, Y and Z directions for two hours each
Shock resistance	500 m/s² acceleration (50 G approx.) in X, Y and Z directions three times each
Emitting element (modulated)	Infrared LED
Emitting element (modulated) Peak emission wavelength	870 nm 0.034 mil
Material	Enclosure: PBT (polybutylene terephthalate) Lens: acrylic Indicator cover: acrylic
Cable	0.3 mm² 3-core (emitter: 3-core) cabtyre cable, 2 m 6.562 ft long
Cable extension	Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable (both emitter and receiver).
Weight	Net weight: 65 g approx. Gross weight: 180 g approx.
Accessory	-

Accessories

Product Number	CHX-SC2
Part Number	CHX-SC2
Product	Sensor Checker
Product name	Sensor Checker CHX-SC2

No image

Product Number	MS-AJ1
Part Number	MS-AJ1
Product name	Universal Sensor Mounting Stand MS-AJ

No image

Product Number	MS-AJ1-A
Part Number	MS-AJ1-A
Product name	Universal Sensor Mounting Stand MS-AJ

No image

Product Number	MS-AJ1-B
Part Number	MS-AJ1-B
Product name	Universal Sensor Mounting Stand MS-AJ

No image

Product Number	MS-AJ3
Part Number	MS-AJ3
Product name	Universal Sensor Mounting Stand MS-AJ

No image

Product Number	MS-AJ3-A
Part Number	MS-AJ3-A
Product name	Universal Sensor Mounting Stand MS-AJ

No image

Product Number	MS-AJ3-B
Part Number	MS-AJ3-B
Product name	Universal Sensor Mounting Stand MS-AJ

Product Number	MS-CX-4
Part Number	MS-CX-4
Product	Sensor head mounting bracket
Product name	Mounting bracket

No image

Product Number	MS-CX-4
Part Number	MS-CX-4
Product name	Mounting bracket

No image

No image

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Product Number	[illegible]	Product Number	[illegible]	Product Number	[illegible]
Part Number	[illegible]	Part Number	[illegible]	Part Number	[illegible]
Product name	Mounting bracket	Product name	Mounting bracket	Product name	Mounting bracket
No image		No image		No image	
Product Number	[illegible]	Product Number	[illegible]	Product Number	[illegible]
Part Number	[illegible]	Part Number	[illegible]	Part Number	[illegible]
Product name	[illegible]	Product name	[illegible]	Product name	[illegible]
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Part Number	[illegible]	Part Number	[illegible]	Part Number	[illegible]
Product name	[illegible]	Product name	[illegible]	Product name	[illegible]

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Sensor Sick GTB6-P1211

GTB6-P1211 | G6

BARREIRAS DE LUZ MINIATURA

Figura pode ser diferente

Informações do pedido

Tipo	Nº de artigo
GTB6-P1211	1052440

Outras versões do aparelho e acessórios → www.sick.com/G6

Dados técnicos em detalhe

Características

Princípio do sensor/ detecção	Sensor de luz de reflexão, Supressão do fundo
Dimensões (L x A x P)	12 mm x 31,5 mm x 21 mm
Forma da carcaça (saída de luz)	Retangular
Distância de comutação máx.	5 mm ... 250 mm [1]
Distância de comutação	35 mm ... 140 mm
Tipo de luz	Luz vermelha visível
Emissor de luz	LED PinPoint [2]
Tamanho do ponto de luz (distância)	Ø 6 mm (100 mm)
Comprimento de onda	650 nm
Ajuste	Dispositivo de ajuste mecânico, 5 voltas

[1] Objeto a ser detectado com 90% de luminosidade (com base no padrão branco, DIN 5033).
[2] Vida útil média: 100.000 h a T_U = +25 °C.

Mecânica/sistema elétrico

Tensão de alimentação	10 V DC ... 30 V DC [1]
Ondulação residual	± 10 % [2]

[1] Valores-limite na operação em rede protegida contra curto-circuitos máx. 8 A.
[2] Não pode estar acima ou abaixo das tolerâncias U_V.
[3] Sem carga.
[4] Em caso de Uv > 24 V, IA máx = 50 mA.
[5] Tempo de funcionamento do sinal com carga óhmica.
[6] Com proporção sombra/luz 1:1.
[7] Não dobrar o cabo se ele estiver a uma temperatura abaixo de 0 °C.
[8] A = conexões protegidas contra inversão de pólos U_V.
[9] B = Entradas e saídas protegidas contra polaridade inversa.
[10] D = Saídas protegidas contra sobrecorrente e curto-circuito.
[11] Estabilidade de temperatura após ajuste +/-10 °C.

Consumo de corrente	30 mA [3]
Saída de comutação	PNP
Tipo de ligação	Comutação por sombra/luz
Tipo de comutação selecionável	Selecionável, com comutação por sombra/luz
Tensão de sinal PNP HIGH/LOW	U_V - (≤ 3 V)/aprox. 0 V
Corrente de saída $I_{max.}$	≤ 100 mA [4]
Tempo de resposta	< 625 µs [5]
Frequência de comutação	1.000 Hz [6]
Tipo de conexão	Cabo, 3 fios, 2 m [7]
Material do cabo	PVC
Seção transversal do condutor	0,14 mm^2
Circuitos de proteção	A [8] B [9] D [10]
Classe de proteção	III
Peso	60 g
Material da carcaça	Plástico, ABS/PC
Material, lente	Plástico, PMMA
Grau de proteção	IP67
Temperatura ambiente, operação	-25 °C ... +55 °C [11]
Temperatura ambiente, depósito	-40 °C ... +70 °C
Nº arquivo UL	NRKH.E348498 & NRKH7.E348498

[1] Valores-limite na operação em rede protegida contra curto-circuitos máx. 8 A.
[2] Não pode estar acima ou abaixo das tolerâncias U_V.
[3] Sem carga.
[4] Em caso de U_V > 24 V, IA máx = 50 mA.
[5] Tempo de funcionamento do sinal com carga ôhmica.
[6] Com proporção sombra/luz 1:1.
[7] Não dobrar o cabo se ele estiver a uma temperatura abaixo de 0 °C.
[8] A = conexões protegidas contra inversão de pólos U_V.
[9] B = Entradas e saídas protegidas contra polaridade inversa.
[10] D = Saídas protegidas contra sobrecorrente e curto-circuito.
[11] Estabilidade de temperatura após ajuste +/-10 °C.

Classificações

ECl@ss 5.0	27270904
ECl@ss 5.1.4	27270904
ECl@ss 6.0	27270904
ECl@ss 6.2	27270904
ECl@ss 7.0	27270904
ECl@ss 8.0	27270904
ECl@ss 8.1	27270904
ECl@ss 9.0	27270904
ETIM 5.0	EC002719

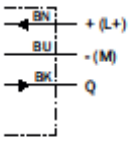
GTB6-P1211 | G6

BARREIRAS DE LUZ MINIATURA

ETIM 6.0	EC002719
UNSPSC 16.0901	39121528

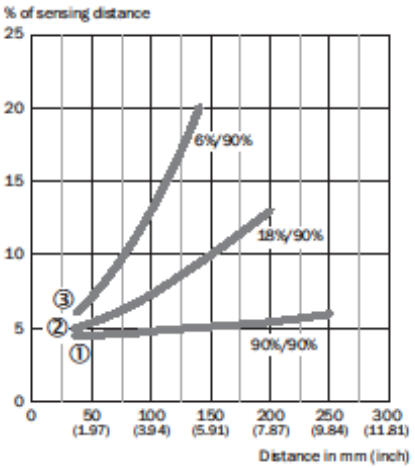
Esquema de conexão

Cd-043



Curva característica

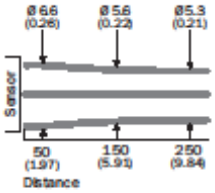
GTB6



① Objeto com remissão de 90% (com base no branco Standard DIN 5033)
② Distância de comutação sobre cinza, remissão 18%
③ Distância de comutação sobre preto, remissão 6%

Tamanho do ponto de luz

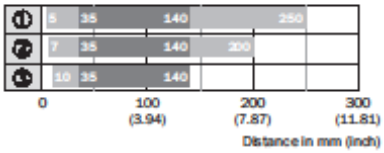
GTB6



All dimensions in mm (inch)

Gráfico de distância de comutação

GTB6

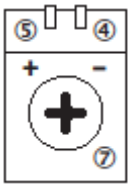


Sensing range max. Sensing range

① Objeto com remissão de 90% (com base no branco Standard DIN 5033)
② Distância de comutação sobre cinza, remissão 18%
③ Distância de comutação sobre preto, remissão 6%

Opções de ajuste

Opção de configuração

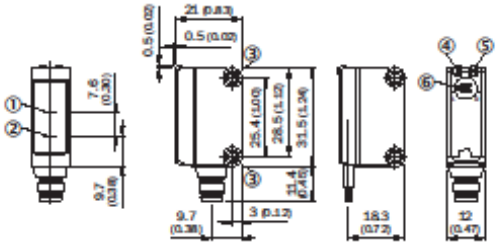


④ LED indicador, verde: tensão de alimentação ativa
⑤ LED indicador amarelo: status recepção luminosa
⑦ Ajuste de sensibilidade: potenciômetro

GTB6-P1211 | G6

BARREIRAS DE LUZ MINIATURA

Desenho dimensional (Dimensões em mm)



① Eixo do sistema óptico, receptor
② Eixo do sistema óptico, emissor
③ Furos de montagem M3
④ LED indicador, verde: tensão de alimentação ativa
⑤ LED indicador amarelo: status recepção luminosa
⑥ Comutador luz / sombra: L = comutação por luz, D = comutação por sombra

Acessório recomendado

Outras versões do aparelho e acessórios → www.sick.com/G6

	Descrição resumida	Tipo	Nº de artigo
Sistemas de fixação universais			
	Bloco de aperto para a fixação de sensores G6 e W16 nas barras redondas de 10 mm, fixação de até no máx. 4 mm de espessura de chapa, Alumínio (bloco de fixação), Aço inoxidável (cantoneira de fixação), Bloco de fixação com dispositivo para fixação de barras redondas, cantoneira de fixação, material de fixação	BEF-KHS-ISG6	2075080
Cantoneiras e placas de fixação			
	Aço inoxidável (1.4301)	BEF-WN-G6	2062909
Proteção do aparelho (mecânica)			
	Aço inoxidável 1.4301 (SVS 304), manga de proteção de 3 mm de espessura para G6, Aço inoxidável 1.4301, incl. material de fixação	BEF-SG-G6-01	2069044
Diafragma			
	Diafragmas longitudinais de ranhura, ranhuras verticais, larguras das ranhuras 1,0 mm, 2 peças, preto, Alumínio, Diafragma de ranhura (2 unidades)	BEF-SLIT MASK-G6	2075254

Tela Transportadora

Process and Conveyor Belts

Technical datasheet

PTFE Mesh 30-89 Glass 4x4 Brown

Ammeraal Beltech

Article code: PPFO000001

General information		
Product group	Peak Products	

Belt construction		
Fabric tension layer	Fibreglass	
Color	beige	

Characteristics		
Food Grade (FG)	yes	According: yes
Anti-static (AS)	no	

Technical data						
Belt thickness			0.76	mm	0.03	in.
Weight			0.47	kg/m²	0.1	lbs/ft²
PTFE content			32	%		
Operating temperature	continuous	from/to	-73 / 260	°C	-99.4 / 500	°F
	short	from/to	-73 / 300	°C	-99.4 / 572	°F
Belt length	maximum		100000	mm	3937.01	in.
Belt width	standard		3200	mm	125.98	in.
	maximum		5000	mm	196.85	in.

Fabrication	
Recommended splice method	Peak Products

Additional information
The information applies at approx. 20 °C (68 °F). Keep the belt tension to a practical working minimum for maximum belt and machine life.
Store loose and wrapped in plastic. The allowable product temperature may vary. Consult our specialists is case of questions or remarks.

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Modified: Wednesday 19 June 2019 , Printed: Wednesday 26 June 2019

Page:1 / 1

Interruptor Telegrom Calibre 1

serie T

T
Interruptor trascuadro 1P a 12P

Calibre 1
A 16|25|32|40

T

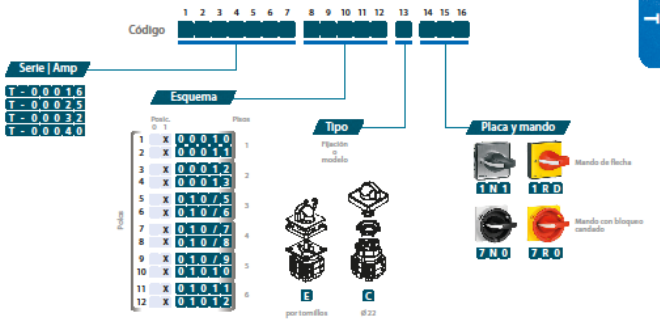
Información técnica

Según IEC 60947-3
UL508 - CAN/CSA C22.2 Nº 14

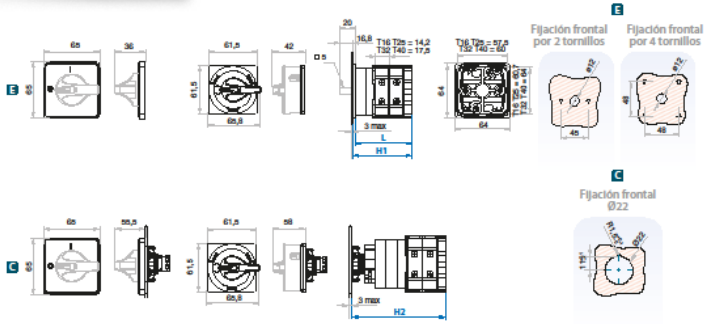
Según IEC 60947-3				T16	T25	T32	T40
Intensidad térmica	Ith		A	25	32	40	50
Tensión de aislamiento	Ui		V	600	600	600	600
Tensión de impulso	Uimp		kV	6	6	8	8
Intensidad de empleo AC	Ie	Ue 415V AC21A	A	25	32	40	50
		Ue 415V AC22A	A	25	32	40	50
		Ue 415V AC23A	A	16	20	25	32
Intensidad de cortocircuito condicional			kA	10	10	10	10
Intensidad máxima fusibles	gL-gG		A	32	32	50	50
Poder de corte	400V; cos φ=0,45		A	160	200	256	320
Intensidad de corta duración (1 sg.)			A	500	650	800	800
Duración mecánica (conforme a norma, para otros valores consultar)				10000	10000	10000	10000
Conductor rígido de cobre			mm²	2x6	2x6	2x10	2x10
Conductor flexible de cobre			mm²	2x4	2x4	2x6	2x6
Según UL508 - CAN / CSA C22.2 Nº 14				**T16**	**T25**	**T32**	**T40**
Intensidad térmica	Ith		A	16	25	32	40
Características usos generales			Vac	600	600	600	600
Potencias de empleo AC		3x240V	HP	5	7,5	10	15
		3x480V	HP	10	15	20	25
		3x600V	HP	10	15	20	25

Condiciones normales de servicio:
Temperatura ambiente (ºC): -5º...+40º. Altitud máxima: 2.000 m. Humedad máxima: 90%. Grado de contaminación: 3 (típica para aplicaciones industriales). Frecuencia asignada en las categorías de empleo AC: 50/60 Hz.
Servicios asignados en las categorías de empleo AC21A, AC22A y AC23A: Continuo (8 horas); ininterrumpido.

serie T



Dimensiones (mm)



Serie T	Pisos	1□	2□	3□	4□	5□	6□
T16 T25	L	46,4	60,6	74,8	89	103,2	117,4
	H1	49,6	63,8	78	92,2	106,4	120,6
	H2	75,5	89,5	103,7	117,9	132,1	146,3
T32 T40	L	49,8	67,3	84,8	102,3	119,8	137,3
	H1	53	70,5	88	105,5	123	140,5
	H2	78,8	96,3	113,8	131,3	148,8	166,3

» Para mayor información de esta serie; accesorios, ver pág 24-31 | esquemas, ver pág 34-43

Termopar RS Pro

ENGLISH

Datasheet

IEC Mineral Insulated Thermocouples with Threaded Pot

Type 'K' with threaded pot & tails – 310 stainless steel or Inconel® Alloy 600 sheath

- Mineral insulated Type 'K' Thermocouple
- Choice of 310 stainless steel or Inconel® Alloy 600 sheath
- Highly flexible, sheath can be bent/formed to suit many applications and processes
- 0.5mm diameter fast response option, other diameters include 1.0, 1.5, 3.0 & 6.0mm
- Insulated hot junction
- Probe temperature range -40°C to +1100°C
- M8 x 1.0mm fine pitch threaded pot seal (200°C)
- M8 locknuts available as an option (see below)
- 100mm tails, PFA twin twisted 7/0.2mm, colour coded to IEC 584

Specifications

Sensor type:	Type 'K' (Nickel Chromium/Nickel Aluminium) to IEC 584
Construction:	Flexible mineral insulated probe with 310 stainless steel or Inconel® Alloy 600 sheath with M8 x 1.0mm fine pitch threaded pot seal & tails
Element/hot junction:	Single element, junction insulated from sheath (offers protection against spurious electrical signals)
Termination:	100mm PFA twin twisted 7/0.2mm tails, +green/-white colour coded in accordance with IEC 584
Probe temperature range:	-40°C to +1100°C >1.0mm diameter -40°C to +750°C – 1.0mm diameter and below
Pot seal rating:	200°C

RS014/0816

310 stainless steel: Good corrosion & oxidation resistance to suit a wide range of processes, satisfactorily operates in sulphur bearing atmospheres
Typical applications include brick & cement kilns, glass industry, heat treatment & annealing furnaces, power stations, flues, heat exchangers etc.

T/C Type	Probe Dia. (mm)	Probe Length (mm)	+Positive tail wire	-Negative tail wire	Allied code	RS order code
K	0.5	150	Green	White	70644208	444-1231
K	0.5	250	Green	White	70644209	444-1247
K	0.5	500	Green	White	70644210	444-1253
K	0.5	1000	Green	White	70653318	787-7866
K	1.0	150	Green	White	70653304	787-7822
K	1.0	250	Green	White	70653305	787-7826
K	1.0	500	Green	White	70653308	787-7835
K	1.0	1000	Green	White	70641611	219-4359
K	1.0	1500	Green	White	70653309	787-7838
K	1.0	2000	Green	White	70653307	787-7832
K	1.5	150	Green	White	70641663	228-7445
K	1.5	250	Green	White	70641664	228-7451
K	1.5	500	Green	White	70641612	219-4365
K	1.5	1000	Green	White	70641613	219-4371
K	1.5	1500	Green	White	70653310	787-7841
K	1.5	2000	Green	White	70653311	787-7844
K	3.0	150	Green	White	70641665	228-7467
K	3.0	250	Green	White	70641666	228-7489
K	3.0	500	Green	White	70641614	219-4387
K	3.0	1000	Green	White	70641615	219-4393
K	3.0	1500	Green	White	70653312	787-7848
K	3.0	2000	Green	White	70641616	219-4416
K	4.5	150	Green	White	70653315	787-7857
K	4.5	250	Green	White	70653313	787-7850
K	4.5	500	Green	White	70653314	787-7854
K	4.5	1000	Green	White	70653317	787-7863
K	6.0	250	Green	White	70641667	228-7495
K	6.0	500	Green	White	70641668	228-7502
K	6.0	1000	Green	White	70641617	219-4422
K	6.0	2000	Green	White	70641618	219-4438

RS014/0816

Inconel® Alloy 600: Excellent oxidation resistance to 1100°C (not suitable for sulphur bearing atmospheres above 550°C)
Typical applications include heat treatment processes, annealing furnaces, chemical reactors, man -made fibre & synthetic material production, steam boilers, paper industry etc.

T/C Type	Probe Dia. (mm)	Probe Length (mm)	+Positive tail wire	-Negative tail wire	Allied code	RS order Code
K	0.5	500	Green	White	70644211	444-1269
K	1.0	1000	Green	White	70641619	219-4450
K	1.5	500	Green	White	70641620	219-4466
K	1.5	1000	Green	White	70641621	219-4472
K	3.0	500	Green	White	70641622	219-4488
K	3.0	1000	Green	White	70641623	219-4494
K	3.0	2000	Green	White	70641624	219-4501
K	3.0	3000	Green	White	70644335	455-3750
K	6.0	1000	Green	White	70641625	219-4517
K	6.0	2000	Green	White	70641626	219-4523

Optional M8 x 1 fine pitch threaded Locknuts:

Brass:

Thread	Allied Code	RS order code
Brass M8 x 1mm	70651753	762-1162

Stainless Steel:

Thread	Allied Code	RS order code
S/Steel M8 x 1mm	70651761	762-1187

RS014/0816

Stainless Steel Compression Glands – Parallel, Tapered & M16 Thread

(BSP, BSPT, M16)

(BSP parallel example - 381-7362, see below for other sizes)

(BSPT tapered example – 286-787, see below for other sizes)

- Thermocouple installation fittings
- To suit a wide range of mineral insulated and other probe type sensors offered by RS
- Male in-line stainless steel compression type with nut & olive
- 1/8", 1/4", & 1/2" BSP parallel or BSPT tapered threads available. 1/2" M16 thread also available.
- Suits 1.0mm, 1.5mm, 3.0mm, 4.0mm, 4.5mm, 6.0mm ,8.0mm, 1/8", 1/4" or 3/16" probe diameters
- Stainless steel locknuts also available (see below)

BSP Parallel:

Type	Thread Size	Thread Type	Suits Probe Ø	Allied code	RS order code
St/Steel	1/8"	BSP Parallel	1.0mm	70654828	804-7975
St/Steel	1/8"	BSP Parallel	1.5mm	70643728	381-7334
St/Steel	1/8"	BSP Parallel	3.0mm	70643729	381-7340
St/Steel	1/8"	BSP Parallel	4.0mm	70657784	839-9566
St/Steel	1/8"	BSP Parallel	4.5mm	70657785	839-9569
St/Steel	1/8"	BSP Parallel	6.0mm	70643730	381-7356
St/Steel	1/8"	BSP Parallel	1/4"		110-4476
St/Steel	1/8"	BSP Parallel	1/8"	70657782	839-9557
St/Steel	1/8"	BSP Parallel	3/16"	70657783	839-9563
St/Steel	1/4"	BSP Parallel	3.0mm	70643731	381-7362
St/Steel	1/4"	BSP Parallel	4.5mm	70657786	839-9572
St/Steel	1/4"	BSP Parallel	6.0mm	70643732	381-7378
St/Steel	1/4"	BSP Parallel	1/4"	70657787	839-9575
St/Steel	1/4"	BSP Parallel	3/16"	70657779	839-9547
St/Steel	1/2"	BSP Parallel	3.0mm	70657788	839-9579
St/Steel	1/2"	BSP Parallel	4.5mm	70657791	839-9588
St/Steel	1/2"	BSP Parallel	6.0mm	70643735	381-7407
St/Steel	1/2"	BSP Parallel	8.0mm	70657789	839-9581

BSPT Tapered:

Type	Thread Size	Thread Type	Suits Probe Ø	Allied code	RS order code
St/Steel	1/8"	BSPT Tapered	1.0mm	70654831	804-7984

RS014/0816

St/Steel	1/8"	BSPT Tapered	1.5mm	70637825	286-743
St/Steel	1/8"	BSPT Tapered	3.0mm	70636461	158-610
St/Steel	1/8"	BSPT Tapered	4.5mm	70637826	286-759
St/Steel	1/8"	BSPT Tapered	6.0mm	70657792	839-9591
St/Steel	1/8"	BSPT Tapered	1/4"		110-4475
St/Steel	1/8"	BSPT Tapered	1/8"	70657793	839-9594
St/Steel	1/8"	BSPT Tapered	3/16"	70657794	839-9597
St/Steel	1/4"	BSPT Tapered	3.0mm	70643733	381-7384
St/Steel	1/4"	BSPT Tapered	4.5mm	70657796	839-9604
St/Steel	1/4"	BSPT Tapered	6.0mm	70643734	381-7390
St/Steel	1/4"	BSPT Tapered	1/4"	70657797	839-9608
St/Steel	1/4"	BSPT Tapered	1/8"	70657795	839-9601
St/Steel	1/4"	BSPT Tapered	3/16"	70657790	839-9585
St/Steel	1/2"	BSPT Tapered	3.0mm	70657777	839-9541
St/Steel	1/2"	BSPT Tapered	4.5mm	70637828	286-787
St/Steel	1/2"	BSPT Tapered	6.0mm	70637829	286-793
St/Steel	1/2"	BSPT Tapered	8.0mm	70657780	839-9550
M16					
St/Steel	1/2"	M16	3.0mm	70657800	839-9617
St/Steel	1/2"	M16	6.0mm	70657798	839-9610
St/Steel	1/2"	M16	8.0mm	70657799	839-9614

Stainless Steel locknuts also available:

Thread	Allied code	RS order code
S/Steel 1/8" BSPP	70651759	762-1180
S/Steel 1/4" BSPP	70651760	762-1184
S/Steel 1/2" BSPP	70651762	762-1193

RS014/0816

Brass Compression Glands – Parallel, Tapered & NPT Thread

BSP, BSPT & NPT

- Thermocouple installation fittings
- To suit a wide range of mineral insulated and other probe type sensors offered by RS
- Male in-line brass compression type with nut & olive
- 1/8" & 1/4"BSP parallel thread to suit 1.5, 3.0, 4.0, 4.5 & 6.0mm. 3/16 also available.
- ½", ¼" & 1/8" BSPT tapered thread to suit 1.5mm. 3.0mm, 4.5mm, 6.0mm, 1/8" & 3/16"
- Brass locknuts also available

BSPP Parallel:

Type	Thread Size	Thread Type	Suits Probe Ø	Allied code	RS order code
Brass	1/8"	BSP Parallel	1.5mm	70657765	839-9496
Brass	1/8"	BSP Parallel	3.0mm	70643725	381-7277
Brass	1/8"	BSP Parallel	4.0mm	70657764	839-9490
Brass	1/8"	BSP Parallel	4.5mm	70657766	839-9500
Brass	1/8"	BSP Parallel	6.0mm	70657768	839-9507
Brass	1/8"	BSP Parallel	3/16	70657767	839-9503
Brass	1/4"	BSP Parallel	3.0mm	70643727	381-7306
Brass	1/4"	BSP Parallel	4.5mm	70657770	839-9519
Brass	1/4"	BSP Parallel	3/16	70657769	839-9513

BSPT Tapered:

Brass	1/8"	BSPT Tapered	1.5mm	70637822	286-715
Brass	1/8"	BSPT Tapered	3.0mm	70637823	286-721
Brass	1/8"	BSPT Tapered	4.5mm	70637824	286-737
Brass	1/8"	BSPT Tapered	6.0mm	70657773	839-9529
Brass	1/8"	BSPT Tapered	1/8	70657771	839-9522
Brass	1/8"	BSPT Tapered	3/16	70657772	839-9525
Brass	1/4"	BSPT Tapered	3.0mm	70657774	839-9531
Brass	1/4"	BSPT Tapered	6.0mm	70657778	839-9544
Brass	1/4"	BSPT Tapered	1/4mm	70657776	839-9538
Brass	1/4"	BSPT Tapered	3/16	70657775	839-9535
Brass	1/2"	BSPT Tapered	6.0mm	70657781	286-771

NPT

Brass	1/8"	NPT	1.5mm	70657781	839-9553

Brass locknuts also available:

Thread	Allied code	RS order code
Brass 1/8" BSPP	70651756	762-1171
Brass 1/4" BSPP	70651757	762-1174
Brass 1/2" BSPP	70651758	762-1178

RS014/0816

Interruptor Diferencial Hager CDC440P

Ficha técnica de produto
CDC440P

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Inter. dif. 4P 40A 30mA tipo AC 4M

Arquitectura

Posição do neutro	Esquerda
Nº de pólos	4 P
Tipo de pólos	4 P
Modo de fixação	Calha DIN

Voltagem

Tensão estipulada de resistência ao choque	4000 V

Corrente eléctrica

Sensibilidade diferencial	30 mA
Resistência às ondas de choque	0,25 kA
Poder de fecho e de corte	630 A
Corriente condicional de curtocircuito atribuida Inc de acordo com EN 61008-1	6 kA

Corrente / temperatura

Corrente nominal a -15°C	40 A
Corrente nominal a -20°C	40 A
Corrente atribuida a 0°C	40 A
Corrente nominal a 10°C	40 A
Corrente nominal a -10°C	40 A
Corrente nominal a 15°C	40 A
Corrente estipulada a 20°C	40 A
Corrente nominal a 25°C	40 A
Corrente nominal a -25°C	40 A
Corrente estipulada a 30°C	40 A
Corrente estipulada a 35°C	40 A
Corrente estipulada a 40°C	40 A
Corrente estipulada a 45°C	40 A
Corrente nominal a 5°C	40 A
Corrente nominal a -5°C	40 A
Corrente estipulada a 50°C	40 A
Corrente estipulada a 55°C	40 A
Corrente estipulada a 60°C	40 A
Corrente nominal a 65°C	40 A
Corrente estipulada a 70°C	40 A

Potência

Potência total dissipada em IN	6,5 W

Disparador

Disparo rápido (Short time)	não

Resistência

Nº de manobras eléctricas em ciclos	2000
Nº de manobras mecânicas	4000

1 Características técnicas sujeitas a modificação sem aviso prévio

Ficha técnica de produto
CDC440P

:hager

Dimensões

Profundidade produto instalado	70 mm
Altura produto instalado	83 mm
Largura produto instalado	70 mm
Dimensões da construção (DIN 43880)	1

Instalação, montagem

Binário de aperto	2,8Nm
Tipo de clip de fixação sobre calha DIN para aparelhos modulares	metálico
Tipo de tranca alta para produtos modulares	não aplicável
Desmontabilidade inferior para aparelhos modulares	não
Elevada desmontagem para produtos modulares	não

Equipamento

Acessoriável	não
Tipo selectivo	não

Padrões

texto	EN 61008-1
Directiva Europeia WEEE	em conformidade

Segurança

Índice de protecção IP	IP20
Tipo de protecção diferencial	AC

Condições de utilização

Grau de poluição de acordo com a IEC 60664 / IEC 60947-2	2
Altitude	2000 m
Temperatura de armazenamento	-55 a 70 °C

Disjuntor Hager NFN104

Ficha técnica de produto
NFN104

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NFN104

Disjuntor 1P 4A C 6/10kA 1M

Arquitectura

Posição do neutro	Sem neutro
Número de polos protegidos	1
Nº de pólos	1 P
Tipo de pólos	1 P
Curva	C

Conectividade

Alinhamento dos bornes inferiores para aparelhos modulares	Terminais alinhados
Alinhamento dos bornes superiores para aparelhos modulares	Terminal alinhado

Principais características eléctricas

Tipo de tensão de alimentação	AC
Tensão alternada estipulada de utilização	230/400 V

Voltagem

Tensão estipulada de isolamento	500 V
Tensão estipulada de resistência ao choque	6000 V

Corrente eléctrica

Poder de corte estipulado 230V 50Hz	6 kA
Poder de corte asignado Icn a 240V AC de acordo com IEC 60898-1	6 kA
Poder de corte de serviço conforme EN60898	6 kA
Pdc limite em c.a. 230V (EN 60947-2)	10 kA
Pdc último em c.a. 240V (NF EN 60947-2)	10 kA
Valor nível min/máx de funcionamento magnético em alternada	5/10 In
Valor do nível min./máx. de funcionamento magnético em DC	7/15 In
Valor nível min/máx de funcionamento térmico em alternada	1,13/1,45 In
Valor do nível min./máx. de funcionamento térmico em DC	1,13/1,45 In

1 Características técnicas sujeitas a modificação sem aviso prévio

Ficha técnica de produto
NFN104

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Corrente / temperatura

Corrente nominal a -15°C	4,99 A
Corrente nominal a -20°C	5,09 A
Corrente atribuida a 0°C	4,68 A
Corrente nominal a 10°C	4,47 A
Corrente nominal a -10°C	4,89 A
Corrente nominal a 25°C	4,12 A
Corrente nominal a -25°C	5,18 A
Corrente estipulada a 30ºC	4 A
Corrente estipulada a 35ºC	3,87 A
Corrente estipulada a 40ºC	3,74 A
Corrente estipulada a 45ºC	3,61 A
Corrente nominal a 5°C	4,58 A
Corrente nominal a -5°C	4,79 A
Corrente estipulada a 50ºC	3,47 A
Corrente estipulada a 55ºC	3,33 A
Corrente estipulada a 60ºC	3,17 A
Corrente nominal a 65°C	3,01 A
Corrente estipulada a 70ºC	2,85 A
Corrente atribuida a 0°C de acordo com IEC 60947-2	5,4 A
Corrente nominal a 10°C de acordo com IEC 60947-2	5,15 A
Corrente nominal a -10°C de acordo com IEC 60947-2	5,63 A
Corrente nominal a 15°C de acordo com IEC 60947-2	5,02 A
Corrente nominal a -15°C de acordo com IEC 60947-2	5,75 A
Corrente nominal a 20°C de acordo com IEC 60947-2	4,89 A
Corrente nominal a -20°C de acordo com IEC 60947-2	5,86 A
Corrente nominal a 25°C de acordo com IEC 60947-2	4,75 A
Corrente nominal a -25°C de acordo com IEC 60947-2	5,97 A
Corrente nominal a 30°C de acordo com IEC 60947-2	4,61 A
Corrente nominal a 35°C de acordo com IEC 60947-2	4,46 A
Corrente nominal a 40°C de acordo com IEC 60947-2	4,32 A
Corrente nominal a 45°C de acordo com IEC 60947-2	4,16 A
Corrente nominal a 5°C de acordo com IEC 60947-2	5,27 A
Corrente nominal a -5°C de acordo com IEC 60947-2	5,52 A
Corrente nominal a 50°C de acordo com IEC 60947-2	4 A
Corrente nominal a 55°C de acordo com IEC 60947-2	3,83 A
Corrente nominal a 60°C de acordo com IEC 60947-2	3,66 A
Corrente nominal a 65°C de acordo com IEC 60947-2	3,47 A
Corrente nominal a 70°C de acordo com IEC 60947-2	3,28 A

Coeficiente de correção de corrente

Coeficiente de correção do disparo magnético a 100I tz	1,1
Coeficiente de correção do disparo magnético a 200I tz	1,2
Coeficiente de correção do disparo magnético a 400I tz	1,5
Coeficiente de correção do disparo magnético a 60I tz	1
Coeficiente de correção da corrente nominal para 2 aparelhos justapostos	1
Coeficiente de correção da corrente nominal para 3 aparelhos justapostos	0,95
Coeficiente de correção da corrente nominal para 4 e 5 aparelhos justapostos	0,9
Coeficiente de correção da corrente nominal para 6 aparelhos justapostos	0,85

Ficha técnica de produto
NFN104

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Potência

Potência dissipada por pólo	2,62 W
Potência activa máxima dissipada por pólo de acordo com norma de produto	3 W
Potência total dissipada em IN	2,62 W

Resistência

Nº de manobras eléctricas em ciclos	4000
Nº de manobras mecânicas	20000

Dimensões

Profundidade produto instalado	70 mm
Altura produto instalado	83 mm
Largura produto instalado	17,5 mm

Instalação, montagem

Tipo de conexão para produtos modulares	com parafuso
Binário de aperto	2,8Nm
Tipo de clip de fixação sobre calha DIN para aparelhos modulares	plástico
Tipo de tranca alta para produtos modulares	não aplicável
Tipo de ligação inferior para aparelhos modulares	Terminal Diconnect
Desmontabilidade inferior para aparelhos modulares	sim
Elevada desmontagem para produtos modulares	sim
Adaptado para montagem encastrada	sim

Ligação

Posição das gaiolas a montante para a entrega	abertos
Posição das gaiolas a jusante para a entrega	abertos
Secção máx.de ligação dos term. a jusante, ligações a parafuso, p/cabo flexível	1/25 mm²
Capacidade de ligação de terminais de parafuso a montante com cabo flexível	1/25 mm²
Secção de ligação dos bornes a jusante com parafusos, em cabo rígido	1/35 mm²
Secção de ligação dos bornes a montante com parafusos, em cabo rígido	1/35 mm²

Equipamento

Acessoriável	sim

Padrões

texto	EN 60898-1, IEC 60947-2
Directiva Europeia WEEE	em conformidade

Segurança

Índice de protecção IP	IP20

Condições de utilização

Grau de poluição de acordo com a IEC 60664 / IEC 60947-2	2
Classe de limitação da energia I²t	3
Altitude	2000 m
Temperatura de armazenamento	-25 a 80 °C

Ficha técnica de produto
NFN104

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Temperatura	
Temperatura de calibração	50 °C

Disjuntor Hager NFN116

Ficha técnica de produto
NFN116

:hager

NFN116

Disjuntor 1P 16A C 6/10kA 1M

Arquitectura

Posição do neutro	Sem neutro
Número de polos protegidos	1
Nº de pólos	1 P
Tipo de pólos	1 P
Curva	C

Conectividade

Alinhamento dos bornes inferiores para aparelhos modulares	Terminais alinhados
Alinhamento dos bornes superiores para aparelhos modulares	Terminal alinhado

Principais características eléctricas

Tipo de tensão de alimentação	AC
Tensão alternada estipulada de utilização	230/400 V

Voltagem

Tensão estipulada de isolamento	500 V
Tensão estipulada de resistência ao choque	6000 V

Corrente eléctrica

Poder de corte estipulado 230V 50Hz	6 kA
Poder de corte asignado Icn a 240V AC de acordo com IEC 60898-1	6 kA
Poder de corte de serviço conforme EN60898	6 kA
Pdc limite em c.a. 230V (EN 60947-2)	10 kA
Pdc último em c.a. 240V (NF EN 60947-2)	10 kA
Valor nível min/máx de funcionamento magnético em alternada	5/10 In
Valor do nível min./máx. de funcionamento magnético em DC	7/15 In
Valor nível min/máx de funcionamento térmico em alternada	1,13/1,45 In
Valor do nível min./máx. de funcionamento térmico em DC	1,13/1,45 In

1 Características técnicas sujeitas a modificação sem aviso prévio

Ficha técnica de produto
NFN116

:hager

Corrente / temperatura

Corrente nominal a -15°C	19,75 A
Corrente nominal a -20°C	20,12 A
Corrente atribuida a 0°C	18,58 A
Corrente nominal a 10°C	17,76 A
Corrente nominal a -10°C	19,37 A
Corrente nominal a 25°C	16,46 A
Corrente nominal a -25°C	20,49 A
Corrente estipulada a 30ºC	16 A
Corrente estipulada a 35ºC	15,53 A
Corrente estipulada a 40ºC	15,04 A
Corrente estipulada a 45ºC	14,54 A
Corrente nominal a 5°C	18,18 A
Corrente nominal a -5°C	18,98 A
Corrente estipulada a 50ºC	14,02 A
Corrente estipulada a 55ºC	13,48 A
Corrente estipulada a 60ºC	12,91 A
Corrente nominal a 65°C	12,32 A
Corrente estipulada a 70ºC	11,7 A
Corrente atribuida a 0°C de acordo com IEC 60947-2	21,21 A
Corrente nominal a 10°C de acordo com IEC 60947-2	20,28 A
Corrente nominal a -10°C de acordo com IEC 60947-2	22,11 A
Corrente nominal a 15°C de acordo com IEC 60947-2	19,79 A
Corrente nominal a -15°C de acordo com IEC 60947-2	22,54 A
Corrente nominal a 20°C de acordo com IEC 60947-2	19,3 A
Corrente nominal a -20°C de acordo com IEC 60947-2	22,97 A
Corrente nominal a 25°C de acordo com IEC 60947-2	18,79 A
Corrente nominal a -25°C de acordo com IEC 60947-2	23,39 A
Corrente nominal a 30°C de acordo com IEC 60947-2	18,26 A
Corrente nominal a 35°C de acordo com IEC 60947-2	17,73 A
Corrente nominal a 40°C de acordo com IEC 60947-2	17,17 A
Corrente nominal a 45°C de acordo com IEC 60947-2	16,59 A
Corrente nominal a 5°C de acordo com IEC 60947-2	20,75 A
Corrente nominal a -5°C de acordo com IEC 60947-2	21,66 A
Corrente nominal a 50°C de acordo com IEC 60947-2	16 A
Corrente nominal a 55°C de acordo com IEC 60947-2	15,38 A
Corrente nominal a 60°C de acordo com IEC 60947-2	14,74 A
Corrente nominal a 65°C de acordo com IEC 60947-2	14,06 A
Corrente nominal a 70°C de acordo com IEC 60947-2	13,36 A

Coeficiente de correção de corrente

Coeficiente de correção do disparo magnético a 100I tz	1,1
Coeficiente de correção do disparo magnético a 200I tz	1,2
Coeficiente de correção do disparo magnético a 400I tz	1,5
Coeficiente de correção do disparo magnético a 60I tz	1
Coeficiente de correção da corrente nominal para 2 aparelhos justapostos	1
Coeficiente de correção da corrente nominal para 3 aparelhos justapostos	0,95
Coeficiente de correção da corrente nominal para 4 e 5 aparelhos justapostos	0,9
Coeficiente de correção da corrente nominal para 6 aparelhos justapostos	0,85

Ficha técnica de produto
NFN116

:hager

Potência

Potência dissipada por pólo	2,62 W
Potência activa máxima dissipada por pólo de acordo com norma de produto	3,5 W
Potência total dissipada em IN	2,62 W

Resistência

Nº de manobras eléctricas em ciclos	4000
Nº de manobras mecânicas	20000

Dimensões

Profundidade produto instalado	70 mm
Altura produto instalado	83 mm
Largura produto instalado	17,5 mm

Instalação, montagem

Tipo de conexão para produtos modulares	com parafuso
Binário de aperto	2,8Nm
Tipo de clip de fixação sobre calha DIN para aparelhos modulares	plástico
Tipo de tranca alta para produtos modulares	não aplicável
Tipo de ligação inferior para aparelhos modulares	Terminal Diconnect
Desmontabilidade inferior para aparelhos modulares	sim
Elevada desmontagem para produtos modulares	sim
Adaptado para montagem encastrada	sim

Ligação

Posição das gaiolas a montante para a entrega	abertos
Posição das gaiolas a jusante para a entrega	abertos
Secção máx.de ligação dos term. a jusante, ligações a parafuso, p/cabo flexível	1/25 mm²
Capacidade de ligação de terminais de parafuso a montante com cabo flexível	1/25 mm²
Secção de ligação dos bornes a jusante com parafusos, em cabo rígido	1/35 mm²
Secção de ligação dos bornes a montante com parafusos, em cabo rígido	1/35 mm²

Equipamento

Acessoriável	sim

Padrões

texto	EN 60898-1, IEC 60947-2
Directiva Europeia WEEE	em conformidade

Segurança

Índice de protecção IP	IP20

Condições de utilização

Grau de poluição de acordo com a IEC 60664 / IEC 60947-2	2
Classe de limitação da energia I²t	3
Altitude	2000 m
Temperatura de armazenamento	-25 a 80 °C

Ficha técnica de produto
NFN116

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Temperatura	
Temperatura de calibração	50 °C

Autómato

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Data sheet **6ES7214-1BG31-0XB0**

SIMATIC S7-1200, CPU 1214C, compact CPU, AC/DC/relay, onboard I/O: 14 DI 24 V DC; 10 DO relay 2 A; 2 AI 0-10 V DC, Power supply: AC 85-264 V AC at 47-63 Hz, Program/data memory 75 KB

General information	
Product type designation	CPU 1214C AC/DC/relay
Engineering with	
• Programming package	STEP 7 V11 SP2 or higher
Supply voltage	
Rated value (AC)	
• 120 V AC	Yes
• 230 V AC	Yes
permissible range, lower limit (AC)	85 V
permissible range, upper limit (AC)	264 V
Line frequency	
• permissible range, lower limit	47 Hz
• permissible range, upper limit	63 Hz
Input current	
Current consumption (rated value)	100 mA at 120 V AC; 50 mA at 240 V AC
Inrush current, max.	20 A; at 264 V
Output current	

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for backplane bus (5 V DC), max.	1 600 mA; Max. 5 V DC for SM and CM
Encoder supply	
24 V encoder supply	
• 24 V	Permissible range: 20.4V to 28.8V
Power loss	
Power loss, typ.	14 W
Memory	
Work memory	
• integrated	75 kbyte
• expandable	No
Load memory	
• integrated	4 Mbyte
Backup	
• present	Yes; maintenance-free
• without battery	Yes
CPU processing times	
for bit operations, typ.	0.085 µs; / instruction
for word operations, typ.	1.7 µs; / instruction
for floating point arithmetic, typ.	2.5 µs; / instruction
CPU-blocks	
Number of blocks (total)	DBs, FCs, FBs, counters and timers. The maximum number of addressable blocks ranges from 1 to 65535. There is no restriction, the entire working memory can be used
OB	
• Number, max.	Limited only by RAM for code
Data areas and their retentivity	
Retentive data area (incl. timers, counters, flags), max.	10 kbyte
Flag	
• Number, max.	8 kbyte; Size of bit memory address area
Address area	
I/O address area	
• Inputs	1 024 byte
• Outputs	1 024 byte
Process image	
• Inputs, adjustable	1 kbyte
• Outputs, adjustable	1 kbyte
Hardware configuration	
Number of modules per system, max.	3 comm. modules, 1 signal board, 8 signal modules

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Time of day	
Clock	
• Hardware clock (real-time)	Yes
• Backup time	480 h; Typical
• Deviation per day, max.	60 s/month at 25 °C
Digital inputs	
Number of digital inputs	14; Integrated
• of which inputs usable for technological functions	6; HSC (High Speed Counting)
Source/sink input	Yes
Number of simultaneously controllable inputs	
all mounting positions	
— up to 40 °C, max.	14
Input voltage	
• Rated value (DC)	24 V
• for signal "0"	5 V DC at 1 mA
• for signal "1"	15 V DC at 2.5 mA
Input current	
• for signal "1", typ.	1 mA
Input delay (for rated value of input voltage)	
for standard inputs	
— parameterizable	0.2 ms, 0.4 ms, 0.8 ms, 1.6 ms, 3.2 ms, 6.4 ms and 12.8 ms, selectable in groups of four
— at "0" to "1", min.	0.2 ms
— at "0" to "1", max.	12.8 ms
for interrupt inputs	
— parameterizable	Yes
for technological functions	
— parameterizable	Yes; Single phase : 3 at 100 kHz & 3 at 30 kHz, differential: 3 at 80 kHz & 3 at 30 kHz
Cable length	
• shielded, max.	500 m; 50 m for technological functions
• unshielded, max.	300 m; for technological functions: No
Digital outputs	
Number of digital outputs	10; Relays
Short-circuit protection	No; to be provided externally
Switching capacity of the outputs	
• with resistive load, max.	2 A
• on lamp load, max.	30 W with DC, 200 W with AC
Output delay with resistive load	
• "0" to "1", max.	10 ms; max.
• "1" to "0", max.	10 ms; max.

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Switching frequency	
• of the pulse outputs, with resistive load, max.	1 Hz
Relay outputs	
• Number of relay outputs	10
• Number of operating cycles, max.	mechanically 10 million, at rated load voltage 100 000
Cable length	
• shielded, max.	500 m
• unshielded, max.	150 m

Analog inputs	
Number of analog inputs	2
Input ranges	
• Voltage	Yes
Input ranges (rated values), voltages	
• 0 to +10 V	Yes
• Input resistance (0 to 10 V)	≥100k ohms
Cable length	
• shielded, max.	100 m; twisted and shielded

Analog outputs	
Number of analog outputs	0

Analog value generation for the inputs	
Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	10 bit
• Integration time, parameterizable	Yes
• Conversion time (per channel)	625 µs

Encoder	
Connectable encoders	
• 2-wire sensor	Yes

1. Interface	
Interface type	PROFINET
Physics	Ethernet
Isolated	Yes
automatic detection of transmission rate	Yes
Autonegotiation	Yes
Autocrossing	Yes
Protocols	
• PROFINET IO Controller	Yes

Protocols	
Supports protocol for PROFINET IO	Yes
PROFIBUS	Yes

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AS-Interface	Yes
Protocols (Ethernet)	
• TCP/IP	Yes
Open IE communication	
• TCP/IP	Yes
• ISO-on-TCP (RFC1006)	Yes
• UDP	Yes
Web server	
• supported	Yes
• User-defined websites	Yes
Further protocols	
• MODBUS	Yes
Communication functions	
S7 communication	
• supported	Yes
• as server	Yes
• as client	Yes
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Variables	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters
Forcing	
• Forcing	Yes
Diagnostic buffer	
• present	Yes
Integrated Functions	
Number of counters	6
Counting frequency (counter) max.	100 kHz
Frequency measurement	Yes
controlled positioning	Yes
PID controller	Yes
Number of alarm inputs	4
Potential separation	
Potential separation digital inputs	
• Potential separation digital inputs	500V AC for 1 minute
• between the channels, in groups of	1
Potential separation digital outputs	
• Potential separation digital outputs	Relays
• between the channels	No
• between the channels, in groups of	2

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Permissible potential difference	
between different circuits	500 V DC between 24 V DC and 5 V DC
EMC	
Interference immunity against discharge of static electricity	
• Interference immunity against discharge of static electricity acc. to IEC 61000-4-2	Yes
— Test voltage at air discharge	8 kV
— Test voltage at contact discharge	6 kV
Interference immunity to cable-borne interference	
• Interference immunity on supply lines acc. to IEC 61000-4-4	Yes
• Interference immunity on signal cables acc. to IEC 61000-4-4	Yes
Interference immunity against voltage surge	
• on the supply lines acc. to IEC 61000-4-5	Yes
Interference immunity against conducted variable disturbance induced by high-frequency fields	
• Interference immunity against high-frequency radiation acc. to IEC 61000-4-6	Yes
Emission of radio interference acc. to EN 55 011	
• Limit class A, for use in industrial areas	Yes; Group 1
• Limit class B, for use in residential areas	Yes; When appropriate measures are used to ensure compliance with the limits for Class B according to EN 55011
Degree and class of protection	
Degree of protection acc. to EN 60529	
• IP20	Yes
Standards, approvals, certificates	
CE mark	Yes
CSA approval	Yes
UL approval	Yes
cULus	Yes
FM approval	Yes
RCM (formerly C-TICK)	Yes
Marine approval	Yes
Ambient conditions	
Free fall	
• Fall height, max.	0.3 m; five times, in product package
Ambient temperature during operation	
• min.	-20 °C
• max.	60 °C
• horizontal installation, min.	-20 °C
• horizontal installation, max.	60 °C

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• vertical installation, min.	-20 °C
• vertical installation, max.	50 °C
Ambient temperature during storage/transportation	
• min.	-40 °C
• max.	70 °C
Air pressure acc. to IEC 60068-2-13	
• Operation, min.	795 hPa
• Operation, max.	1 080 hPa
• Storage/transport, min.	660 hPa
• Storage/transport, max.	1 080 hPa
Altitude during operation relating to sea level	
• Installation altitude, min.	-1 000 m
• Installation altitude, max.	2 000 m
Relative humidity	
• Operation, max.	95 %; no condensation
Vibrations	
• Vibration resistance during operation acc. to IEC 60068-2-6	2 g (m/s²) wall mounting, 1 g (m/s²) DIN rail
• Operation, tested according to IEC 60068-2-6	Yes
Shock testing	
• tested according to IEC 60068-2-27	Yes; IEC 68, Part 2-27 half-sine: strength of the shock 15 g (peak value), duration 11 ms
Pollutant concentrations	
• SO2 at RH < 60% without condensation	S02: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% condensation-free
Configuration	
Programming	
Programming language	
— LAD	Yes
— FBD	Yes
— SCL	Yes
Cycle time monitoring	
• adjustable	Yes
Dimensions	
Width	110 mm
Height	100 mm
Depth	75 mm
Weights	
Weight, approx.	455 g
last modified:	08/15/2019

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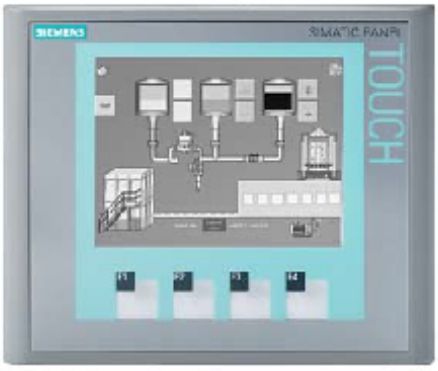
Data sheet **6AV6647-0AA11-3AX0**

SIMATIC HMI KTP400 Basic mono PN, Basic Panel, Key/touch operation, 4" STN display, 4 gray levels, PROFINET interface, configurable as of WinCC flexible 2008 SP2 Compact/ WinCC Basic V10.5/ STEP 7 Basic V10.5, contains open-source software, which is provided free of charge see enclosed CD



General information	
Product type designation	KTP400 Basic mono PN
Display	
Design of display	STN
Screen diagonal	3.8 in
Display width	76.8 mm
Display height	57.6 mm
Number of colors	4; Grayscales
Resolution (pixels)	
• Horizontal image resolution	320 Pixel
• Vertical image resolution	240 Pixel
Backlighting	
• MTBF backlighting (at 25 °C)	30 000 h
• Backlight dimmable	No
Control elements	
Keyboard fonts	
• Function keys	
— Number of function keys	4

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— Number of function keys with LEDs	0
• Keys with LED	No
• System keys	No
• Numeric keyboard	Yes; Onscreen keyboard
• alphanumeric keyboard	Yes; Onscreen keyboard
Touch operation	
• Design as touch screen	Yes
Installation type/mounting	
Mounting position	vertical
Mounting in portrait format possible	Yes
Mounting in landscape format possible	Yes
maximum permissible angle of inclination without external ventilation	35°
Supply voltage	
Type of supply voltage	DC
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Input current	
Current consumption (rated value)	0.1 A
Starting current inrush I^2t	0.5 A^2·s
Power	
Active power input, typ.	3 W
Processor	
Processor type	RISC 32 bit
Memory	
Flash	Yes
RAM	Yes
Memory available for user data	1 Mbyte
Type of output	
Acoustics	
• Buzzer	Yes
• Speaker	No
Time of day	
Clock	
• Hardware clock (real-time)	No
• Software clock	Yes
• retentive	No
• synchronizable	Yes

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Interfaces	
Number of industrial Ethernet interfaces	1
Number of RS 485 interfaces	0
Number of RS 422 interfaces	0
Number of RS 232 interfaces	0
Number of USB interfaces	0
Number of 20 mA interfaces (TTY)	0
Number of parallel interfaces	0
Number of other interfaces	0
Number of SD card slots	0
With software interfaces	No
Industrial Ethernet	
• Industrial Ethernet status LED	2

Protocols	
PROFINET	Yes
Supports protocol for PROFINET IO	No
IRT	No
PROFIBUS	No
MPI	No
Protocols (Ethernet)	
• TCP/IP	Yes
• DHCP	Yes
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
WEB characteristics	
• HTTP	No
• HTML	No
Further protocols	
• CAN	No
• EtherNet/IP	Yes
• MODBUS	Yes; Modicon (MODBUS TCP/IP)

Interrupts/diagnostics/status information	
Diagnostic messages	
• Diagnostic information readable	No

Degree and class of protection	
IP (at the front)	IP65
Enclosure Type 4 at the front	Yes
Enclosure Type 4x at the front	Yes
IP (rear)	IP20

Standards, approvals, certificates

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CE mark	Yes
cULus	Yes
RCM (formerly C-TICK)	Yes
KC approval	Yes
Use in hazardous areas	
• ATEX Zone 2	No
• ATEX Zone 22	No
• cULus Class I Zone 1	No
• cULus Class I Zone 2, Division 2	No
• FM Class I Division 2	No
Marine approval	
• Germanischer Lloyd (GL)	Yes
• American Bureau of Shipping (ABS)	Yes
• Bureau Veritas (BV)	Yes
• Det Norske Veritas (DNV)	Yes
• Lloyds Register of Shipping (LRS)	Yes
• Nippon Kaiji Kyokai (Class NK)	Yes
• Polski Rejestr Statkow (PRS)	Yes
Ambient conditions	
Ambient temperature during operation	
• Operation (vertical installation)	
— For vertical installation, min.	0 °C
— For vertical installation, max.	50 °C
• Operation (max. tilt angle)	
— At maximum tilt angle, min.	0 °C
— At maximum tilt angle, min.	40 °C
• Operation (vertical installation, portrait format)	
— For vertical installation, min.	0 °C
— For vertical installation, max.	50 °C
• Operation (max. tilt angle, portrait format)	
— At maximum tilt angle, min.	0 °C
— At maximum tilt angle, min.	40 °C
Ambient temperature during storage/transportation	
• min.	-20 °C
• max.	60 °C
Relative humidity	
• Operation, max.	90 %; no condensation
Operating systems	
proprietary	Yes
pre-installed operating system	
• Windows CE	No

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Configuration	
Message indicator	Yes
Alarm system (incl. buffer and acknowledgment)	Yes
Process value display (output)	Yes
Process value default (input) possible	Yes
Recipe management	Yes
Configuration software	
• STEP 7 Basic (TIA Portal)	Yes; via integrated WinCC Basic (TIA Portal)
• STEP 7 Professional (TIA Portal)	Yes; via integrated WinCC Basic (TIA Portal)
• WinCC flexible Compact	Yes
• WinCC flexible Standard	Yes
• WinCC flexible Advanced	Yes
• WinCC Basic (TIA Portal)	Yes
• WinCC Comfort (TIA Portal)	Yes
• WinCC Advanced (TIA Portal)	Yes
• WinCC Professional (TIA Portal)	Yes
Languages	
Online languages	
• Number of online/runtime languages	5
Project languages	
• Languages per project	32
Functionality under WinCC (TIA Portal)	
Libraries	Yes
Task planner	
• time-controlled	No
• task-controlled	Yes
Help system	
• Number of characters per info text	320
Message system	
• Number of alarm classes	32
• Bit messages	
— Number of bit messages	200
• Analog messages	
— Number of analog messages	15
• System messages HMI	Yes
• Number of characters per message	80
• Number of process values per message	8
• Message indicator	Yes
• Message buffer	
— Number of entries	256
— Circulating buffer	Yes

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— retentive	Yes
— maintenance-free	Yes
Recipe management	
• Number of recipes	5
• Data records per recipe	20
• Entries per data record	20
• Size of internal recipe memory	40 kbyte
• Recipe memory expandable	No
Variables	
• Number of variables per device	250
• Number of variables per screen	30
• Limit values	Yes
• Multiplexing	Yes
• Structures	No
• Arrays	Yes
Images	
• Number of configurable images	50
• Permanent window/default	Yes
• Global image	Yes
• Image selection by PLC	Yes
• Image number in the PLC	Yes
Image objects	
• Number of objects per image	30
• Text fields	Yes
• I/O fields	Yes
• Graphic I/O fields (graphics list)	Yes
• Symbolic I/O fields (text list)	Yes
• Date/time fields	Yes
• Switches	Yes
• Buttons	Yes
• Graphic display	Yes
• Icons	Yes
• Geometric objects	Yes
Complex image objects	
• Number of complex objects per screen	5
• Alarm view	Yes
• Trend view	Yes
• User view	Yes
• Status/control	No
• Sm@rtClient view	No
• Recipe view	Yes

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• f(x) trend view	No
• System diagnostics view	No
• Media Player	No
• Bar graphs	Yes
• Sliders	No
• Pointer instruments	No
• Analog/digital clock	No
Lists	
• Number of text lists per project	150
• Number of entries per text list	30
• Number of graphics lists per project	100
• Number of entries per graphics list	30
Archiving	
• Number of archives per device	0
Security	
• Number of user groups	50
• Number of user rights	32
• Number of users	50
• Password export/import	No
• SIMATIC Logon	No
Character sets	
• Keyboard fonts	
— US English	Yes
Transfer (upload/download)	
• MPI/PROFIBUS DP	No
• USB	No
• Ethernet	Yes
• using external storage medium	No
Process coupling	
• S7-1200	Yes
• S7-1500	Yes
• S7-200	Yes
• S7-300/400	Yes
• LOGO!	Yes
• WinAC	Yes
• SINUMERIK	No
• SIMOTION	No
• Allen Bradley (EtherNet/IP)	Yes
• Allen Bradley (DF1)	No
• Mitsubishi (MC TCP/IP)	Yes
• Mitsubishi (FX)	No

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• OMRON (FINS TCP)	No
• OMRON (LINK/Multilink)	No
• Modicon (Modbus TCP/IP)	Yes
• Modicon (Modbus)	No
Service tools/configuration aids	
• Backup/Restore manually	Yes
• Backup/Restore automatically	No
• Simulation	Yes
• Device switchover	Yes

Peripherals/Options	
Peripherals	
• Printer	No
• SIMATIC HMI MM memory card: Multi Media Card	No
• SIMATIC HMI SD memory card: Secure Digital memory card	No
• USB memory	No

Mechanics/material	
Enclosure material (front)	
• Plastic	Yes
• Aluminum	No
• Stainless steel	No

Dimensions	
Width of the housing front	140 mm
Height of housing front	116 mm
Mounting cutout, width	123 mm
Mounting cutout, height	99 mm
Overall depth	40 mm

Weights	
Weight without packaging	0.32 kg
Weight incl. packaging	0.53 kg

last modified:	08/27/2019

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Módulo de Comunicação

SIEMENS

Data sheet **6GK7277-1AA10-0AA0**

Compact Switch Module CSM 1277 for connecting SIMATIC S7-1200 and up to 3 further nodes to Industrial Ethernet with 10/100 Mbit/s; unmanaged switch, 4 RJ45 ports, ext. 24 V DC power supply LED diagnostics, S7-1200 module incl. electronic Equipment Manual on CD-ROM

Product type designation	**SCALANCE CSM 1277**
Transmission rate	
Transfer rate	10 Mbit/s, 100 Mbit/s
Interfaces / for communication / integrated	
Number of electrical connections	
• for network components or terminal equipment	4
Number of 100 Mbit/s SC ports	
• for multimode	0
Number of 1000 Mbit/s LC ports	
• for multimode	0
• for single mode (LD)	0
Interfaces / others	
Number of electrical connections	
• for power supply	1
Type of electrical connection	
• for power supply	3-pole terminal block
Supply voltage, current consumption, power loss	

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Type of voltage / of the supply voltage	DC
Supply voltage	
• external	24 V
• external / minimum	19.2 V
• external / maximum	28.8 V
Product component / fusing at power supply input	Yes
Fuse protection type / at input for supply voltage	0.5 A / 60 V
Consumed current / maximum	0.07 A
Power loss [W]	
• at DC / at 24 V	1.6 W
Permitted ambient conditions	
Ambient temperature	
• during operation	0 ... 60 °C
• during storage	-40 ... +70 °C
• during transport	-40 ... +70 °C
Relative humidity	
• at 25 °C / without condensation / during operation / maximum	95 %
Protection class IP	IP20
Design, dimensions and weight	
Design	SIMATIC S7-1200 device design
Width	45 mm
Height	100 mm
Depth	75 mm
Net weight	0.15 kg
Mounting type	
• 35 mm DIN rail mounting	Yes
• wall mounting	Yes
• S7-300 rail mounting	No
• S7-1500 rail mounting	No
Product functions / management, configuration	
Product function	
• multiport mirroring	No
Product function / switch-managed	No
Product functions / Redundancy	
Product function	
• Parallel Redundancy Protocol (PRP)/operation in the PRP-network	Yes
• Parallel Redundancy Protocol (PRP)/Redundant Network Access (RNA)	No
Standards, specifications, approvals	

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Standard	
• for FM	FM3611: Class 1, Divison 2, Group A, B, C, D / T.., CL.1, Zone 2, GP. IIC, T.. Ta
• for hazardous zone	EN 600079-15:2005, EN 600079-0:2006, II 3 G Ex nA II T4, KEMA 08 ATEX 0003 X
• for safety / from CSA and UL	UL 508, CSA C22.2 No. 142
• for emitted interference	EN 61000-6-4 (Class A)
• for interference immunity	EN 61000-6-2
Standards, specifications, approvals / CE	
Certificate of suitability / CE marking	Yes
Standards, specifications, approvals / miscellaneous	
Certificate of suitability	EN 61000-6-2, EN 61000-6-4
• C-Tick	Yes
• KC approval	No
Standards, specifications, approvals / ship classification	
Marine classification association	
• American Bureau of Shipping Europe Ltd. (ABS)	Yes
• Bureau Veritas (BV)	Yes
• Det Norske Veritas (DNV)	Yes
• Germanische Lloyd (GL)	No
• Lloyds Register of Shipping (LRS)	Yes
• Nippon Kaiji Kyokai (NK)	Yes
• Polski Rejestr Statkow (PRS)	No
• Royal Institution of Naval Architects (RINA)	No
Standards, specifications, approvals / product conformity	
MTBF	273 y
Further Information / Internet Links	
Internet-Link	
• to website: Selector SIMATIC NET SELECTION TOOL	http://www.siemens.com/snst
• to website: Industrial communication	http://www.siemens.com/simatic-net
• to website: Industry Mall	https://mall.industry.siemens.com
• to website: Information and Download Center	http://www.siemens.com/industry/infocenter
• to website: Image database	http://automation.siemens.com/bilddb
• to website: CAx Download Manager	http://www.siemens.com/cax
• to website: Industry Online Support	https://support.industry.siemens.com
Security information	

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Standard	
• for FM	FM3611: Class 1, Divison 2, Group A, B, C, D / T.., CL.1, Zone 2, GP. IIC, T.. Ta
• for hazardous zone	EN 600079-15:2005, EN 600079-0:2006, II 3 G Ex nA II T4, KEMA 08 ATEX 0003 X
• for safety / from CSA and UL	UL 508, CSA C22.2 No. 142
• for emitted interference	EN 61000-6-4 (Class A)
• for interference immunity	EN 61000-6-2
Standards, specifications, approvals / CE	
Certificate of suitability / CE marking	Yes
Standards, specifications, approvals / miscellaneous	
Certificate of suitability	EN 61000-6-2, EN 61000-6-4
• C-Tick	Yes
• KC approval	No
Standards, specifications, approvals / ship classification	
Marine classification association	
• American Bureau of Shipping Europe Ltd. (ABS)	Yes
• Bureau Veritas (BV)	Yes
• Det Norske Veritas (DNV)	Yes
• Germanische Lloyd (GL)	No
• Lloyds Register of Shipping (LRS)	Yes
• Nippon Kaiji Kyokai (NK)	Yes
• Polski Rejestr Statkow (PRS)	No
• Royal Institution of Naval Architects (RINA)	No
Standards, specifications, approvals / product conformity	
MTBF	273 y
Further Information / Internet Links	
Internet-Link	
• to website: Selector SIMATIC NET SELECTION TOOL	http://www.siemens.com/snst
• to website: Industrial communication	http://www.siemens.com/simatic-net
• to website: Industry Mall	https://mall.industry.siemens.com
• to website: Information and Download Center	http://www.siemens.com/industry/infocenter
• to website: Image database	http://automation.siemens.com/bilddb
• to website: CAx Download Manager	http://www.siemens.com/cax
• to website: Industry Online Support	https://support.industry.siemens.com
Security information	

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Security information	Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates. For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action(e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit http://www.siemens.com/industrialsecurity. To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit http://support.automation.siemens.com. (V3.4)
last modified:	08/27/2019

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Signal Board

SIEMENS

Data sheet **6ES7231-5QA30-0XB0**

SIMATIC S7-1200, Analog input, SB 1231 TC, 1 AI thermocouples
Type J or K

General information	
Product type designation	SB 1231, AI 1x16 bit TC
Supply voltage	
Rated value (DC)	24 V
Input current	
Current consumption, typ.	5 mA
from backplane bus 5 V DC, typ.	20 mA
Power loss	
Power loss, typ.	0.5 W
Analog inputs	
Number of analog inputs	1; Thermocouples
permissible input voltage for current input (destruction limit), max.	±35 V
permissible input voltage for voltage input (destruction limit), max.	±35 V
Technical unit for temperature measurement adjustable	Degrees Celsius/degrees Fahrenheit
Input ranges	

6ES7231-5QA30-0XB0
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• Voltage	Yes
• Current	No
• Thermocouple	Yes; J, K, T, E, R & S, B, N, C, TXK/XK(L); voltage range: ±80 mV
• Resistance thermometer	No
• Resistance	No
Input ranges (rated values), voltages	
• -80 mV to +80 mV	Yes
• Input resistance (-80 mV to +80 mV)	≥1 MOhm
Input ranges (rated values), thermocouples	
• Type J	Yes
• Input resistance (type J)	1 200 °C
• Type K	Yes
• Input resistance (Type K)	1 372 °C
Thermocouple (TC)	
Temperature compensation	
— parameterizable	No

Analog outputs	
Number of analog outputs	0
Cable length	
• shielded, max.	100 m; shielded, twisted pair

Analog value generation for the inputs	
Measurement principle	integrating
Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	15 bit; + sign
• Integration time, parameterizable	No
• Interference voltage suppression for interference frequency f1 in Hz	85 dB at 10 / 50 / 60 / 400 Hz
Smoothing of measured values	
• parameterizable	Yes

Errors/accuracies	
Temperature error (relative to input range), (+/-)	25 °C ±0.1%, to 55 °C ±0.2% total measurement range
Repeat accuracy in steady state at 25 °C (relative to output range), (+/-)	0.5 %
Interference voltage suppression for f = n x (f1 +/- 1 %), f1 = interference frequency	
• Common mode interference, min.	120 dB

Interrupts/diagnostics/status information	
Alarms	Yes
Diagnostics function	Yes; Can be read out
Alarms	
• Diagnostic alarm	Yes

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• Voltage	Yes
• Current	No
• Thermocouple	Yes; J, K, T, E, R & S, B, N, C, TXK/XK(L); voltage range: ±80 mV
• Resistance thermometer	No
• Resistance	No
Input ranges (rated values), voltages	
• -80 mV to +80 mV	Yes
• Input resistance (-80 mV to +80 mV)	≥1 MOhm
Input ranges (rated values), thermocouples	
• Type J	Yes
• Input resistance (type J)	1 200 °C
• Type K	Yes
• Input resistance (Type K)	1 372 °C
Thermocouple (TC)	
Temperature compensation	
— parameterizable	No

Analog outputs	
Number of analog outputs	0
Cable length	
• shielded, max.	100 m; shielded, twisted pair

Analog value generation for the inputs	
Measurement principle	integrating
Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	15 bit; + sign
• Integration time, parameterizable	No
• Interference voltage suppression for interference frequency f1 in Hz	85 dB at 10 / 50 / 60 / 400 Hz
Smoothing of measured values	
• parameterizable	Yes

Errors/accuracies	
Temperature error (relative to input range), (+/-)	25 °C ±0.1%, to 55 °C ±0.2% total measurement range
Repeat accuracy in steady state at 25 °C (relative to output range), (+/-)	0.5 %
Interference voltage suppression for f = n x (f1 +/- 1 %), f1 = interference frequency	
• Common mode interference, min.	120 dB

Interrupts/diagnostics/status information	
Alarms	Yes
Diagnostics function	Yes; Can be read out
Alarms	
• Diagnostic alarm	Yes

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Diagnostic messages	
• Wire-break	Yes
Diagnostics indication LED	
• for status of the inputs	Yes
• for maintenance	Yes
Standards, approvals, certificates	
CE mark	Yes
CSA approval	Yes
UL approval	Yes
cULus	Yes
FM approval	Yes
RCM (formerly C-TICK)	Yes
KC approval	Yes
Marine approval	Yes
Ambient conditions	
Free fall	
• Fall height, max.	0.3 m; five times, in product package
Ambient temperature during operation	
• min.	-20 °C
• max.	60 °C
• horizontal installation, min.	-20 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	-20 °C
• vertical installation, max.	50 °C
Ambient temperature during storage/transportation	
• min.	-40 °C
• max.	70 °C
Air pressure acc. to IEC 60068-2-13	
• Operation, min.	795 hPa
• Operation, max.	1 080 hPa
• Storage/transport, min.	660 hPa
• Storage/transport, max.	1 080 hPa
Relative humidity	
• Operation at 25 °C without condensation, max.	95 %
Pollutant concentrations	
• SO2 at RH < 60% without condensation	S02: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% condensation-free
Connection method	
required front connector	Yes
Mechanics/material	
Enclosure material (front)	
• Plastic	Yes

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Dimensions	
Width	38 mm
Height	62 mm
Depth	21 mm

Weights	
Weight, approx.	35 g

last modified:	08/16/2019

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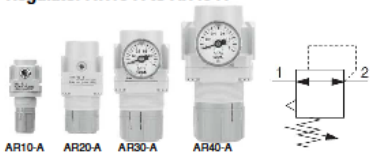
Regulador de pressão

AR-SMV42EN

SMC

ORIGINAL INSTRUCTIONS

Instruction Manual
Regulator AR10-A to AR40-A



The intended use of this product is to regulate the air pressure in the pneumatic circuit.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger."
They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)[*1], and other safety regulations.

[*1] ISO 4414: Pneumatic fluid power - General rules relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety.etc.

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

⚠ Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
⚠ Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ Warning

- **Always ensure compliance with relevant safety laws and standards.**
  All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

2 Specifications

2.1 Standard Specifications

Series	AR□-A
Construction	Relieving type
Fluid	Air
Ambient and fluid temperature	-5 to +60 °C (No freezing)
Proof pressure	1.5 MPa
Max. operating pressure	1.0 MPa
Set pressure range	0.05 to 0.7 MPa
Pressure gauge port size	Refer to Table 2
Lubrication	Not required (Refer to 3.4)
Filtration	5 μm filtration or smaller
Weight	Refer to Table 2
Port size	Refer to Table 2
Shock resistance Note 1	300 m/s² (nominal pulse 6 ms)
Vibration resistance Note 2	50 m/s²

Table 1

Note 1) two axes (horizontal and vertical) and two directions were tested 3 times and no malfunction of the regulator occurred (pulse shape : sine shape), test sample mounted with bracket.

2 Specifications - continued

Note 2) No malfunction occurred in a sweep cycle test between 10 to 150 Hz at vibration sweep 0.35mm.
The test was performed in the two axes and two directions, 7 min per cycle (20 cycles), 20 times.

2.2 Weight and Port Size

Model	Weight [kg]	Port size	Pressure gauge port size
AR10-A	0.06	M5 x 0.8	1/16 Note)
AR20-A	0.17	1/8, 1/4	1/8
AR25-A	0.19	1/4, 3/8	
AR30-A	0.34	1/4, 3/8	
AR40-A	0.58	1/4, 3/8, 1/2	
AR40-06-A	0.60	3/4	

Table 2

Note) Use a bushing (part number 131368) when connecting the R1/8 pressure gauge to the Rc1/16.

2.3 Selection

⚠ Warning

- Although exhaust of the residual pressure to the inlet side is possible when eliminating the inlet pressure, exhaust is not possible when the set pressure is 0.15 MPa or less. Use the regulator with backflow function.
- Set pressure of outlet pressure shall be 85% or less of inlet pressure. Pressure over 85% makes operation susceptible to flow and inlet pressure and may lead to unstable operation.

$$P_2 < P_1 \times 0.85$$

3 Installation

3.1 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

⚠ Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.

3.3 Piping

⚠ Caution

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

3.4 Lubrication

⚠ Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

3.5 Mounting / Adjustment

⚠ Warning

- Set the regulator while verifying the displayed values of the inlet and outlet pressure gauges. Turning the regulator knob excessively can cause damage to the internal parts.
- Do not use tools on the pressure regulator knob as this may cause damage. It must be operated manually.

3 Installation - continued

⚠ Caution

- Be sure to unlock the knob before adjusting the pressure and lock it after setting the pressure. Failure to follow this procedure can cause damage to the knob and the outlet pressure may fluctuate.
  - Pull the pressure regulator knob to unlock. (You can visually verify this with the "orange mark" that appears in the gap)
  - Push the pressure regulator knob to lock. When the knob is not easily locked, turn it left and right a little and then push it (when the knob is locked, the "orange mark", i.e., the gap will disappear).
- Pulsation will be generated when the difference between the inlet and the outlet pressure is large. In this case, reduce the pressure difference between the inlet and the outlet. Please consult with SMC if the pulsation problem is not resolved.

4 How to Order

Refer to catalogue for 'How to Order'.

5 Outline Dimensions (mm)

Refer to catalogue for outline dimensions.

Panel fitting dimensions

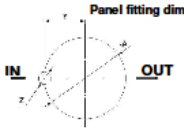


Plate thickness
AR10-A:Max. 3.5
AR20-A to AR25-A: Max. 4
AR30-A to AR40-06-A: Max 8

Model	Panel mount		
	W	Y	Z
AR10-A	18.5	–	–
AR20-A	36.5	17.5	6
AR25-A	36.5	17.5	6
AR30-A	45.5	22.5	7
AR40-A	52.5	26	7
AR40-06-A	52.5	26	7

Table 3

6 Maintenance

General Maintenance

⚠ Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous. Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions
- Check periodically adjustment of the regulators.

⚠ Warning

When using the regulator between a solenoid valve and an actuator, check the pressure gauge periodically. Sudden pressure fluctuations may shorten the durability of the pressure gauge. A digital pressure gauge is recommended for such situation or as deemed necessary.

7 Limitations of Use

Limited warranty and Disclaimer/Compliance Requirements
Refer to Handling Precautions for SMC Products.

⚠ Warning

- The system designer should determine the effect of the possible failure states on the system.
- Regulator is not to be used as a pressure relief valve, apply additional measure to relieve large volume of pressurised air.

8 Contacts

Refer to www.smcworld.com for contacts.

SMC Corporation

URL : http://www.smcworld.com (Global) http// www.smcpu.com (Europe)
SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101 0021
Specifications are subject to change without prior notice from the manufacturer.
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Template DKP50047-F-085H

Page 1 of 1

Válvulas 2/2

0424/Eng

Installation and Maintenance Manual
Series VQ20/30 2 Port Solenoid Valves

For future reference, please keep this manual in a safe place

This manual should be read in conjunction with the current valve catalogue

Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage.These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO4414 Note1, JIS B 8370 Note2 and other safety practices.
Note 1: ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems.
Note 2: JIS B 8370: Pneumatic system axiom.

⚠ **CAUTION :** *Operator error could result in injury or equipment damage.*

⚠ **WARNING:** *Operator error could result in serious injury or loss of life.*

⚠ **DANGER :** *In extreme conditions, there is a possible result of serious injury or loss of life.*

⚠ WARNING

1. **The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**
   Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.
2. **Only trained personnel should operate pneumatically operated machinery and equipment.**
   Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
3. **Do not service machinery/equipment or attempt to remove component until safety is confirmed.**
   1) Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
   2) When equipment is to be removed, confirm the safety process as mentioned above. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
   3) Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Bleed air into the system gradually to create back-pressure, i.e. incorporate a soft-start valve).
4. **Contact SMC if the product is to be used in any of the following conditions:**
   1) Conditions and environments beyond the given specifications, or if product is used outdoors.
   2) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
   3) An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

⚠ CAUTION

Ensure that the air supply system is filtered to 5 micron.

Specifications (Fig 1)

	Series		VQ20		VQ30
Valve specification	Valve type		Pilot type 2 port poppet type		
	Fluid		Air, inert gas		
	Min. operating pressure		0.01MPa (0.1 kgf/cm²)		
	Max. operating pressure		0.6MPa (6.1 kgf/cm²)		0.5MPa (5.1 kgf/cm²)
	Effective area (Cv/Effective orifice)	C6	7.2mm² (Cv0.4ø3)	C10	14.4mm² (Cv0.8ø4.3)
		C8	9mm² (Cv0.5ø3.4)	C12	17.5mm² (Cv1ø4.8)
	Body orifice		ø6		ø13.8
	Response time Note 1)		5ms or less		20ms or less
	Max. operating frequency		100cps		30cps
	Ambient and fluid temperature		-10 to 50°C, Note 2)		
	Lubrication		Not required		
	Manual override		Locking type (tool type) Note 3)		
	Shock resistance/Vibration resistance		150/30m/s² Note 4)		
	Enclosure		IP65 Note 5)		
	Mounting position		Free		
	Weight		46g		80g
Solenoid specification	Coil rated voltage		12, 24VDC, 100VAC Note 6)		
	Allowable voltage		±10% of rated voltage		
	Coil insulance		Class B		
	Power consumption (Current value)	24VDC	2.5WDC (100mA)		
		12VDC	2.5WDC (200mA)		
		100VAC	Inrush: 2VA (20mA) Holding: 2VA (20mA)		
	Electrical entry		Grommet, DIN terminal		

Note 1: Subject to JIS B8375-1981. Supply pressure 0.5MPa (5.1 kgf/cm²) value is without light and surge suppressor.
Note 2: Use dry air to prevent dew condensation when operating at low temperature.
Note 3: Manual override is available only for DIN terminal type.
Note 4: Vibration resistance - - - - - -No malfunction from test with 8.3 to 2000Hz 1 sweep, to axis and right angle direction of main valve and armature, each one time when energised and de-energised.
Shock resistance - - - - - - -No malfunction from test using drop impact tester, to axis and right angle direction of main valve and armature, each one time when energised and de-energised.
Note 5: DIN terminal type: Dust tight, jet proof (equivalent to IP65).
Note 6: Coil rated voltage 100VAC for DIN terminal type only.

Installation

⚠ WARNING

Ensure all air and power supplies are ISOLATED before commencing installation.
Do not install these valves in explosive atmospheres.
If a valve is to be exposed to oil and/or water droplets ensure that they are protected.
If it is intended to energise a valve for an extended period of time please consult SMC.
Since the valve may have a slight internal air leakage, it may NOT be suitable for holding pressure/vacuum in a vessel.
This valve is NOT intended to be used as an emergency 'Dump Valve'.

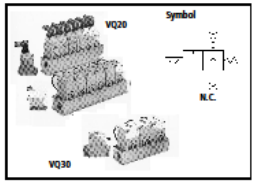
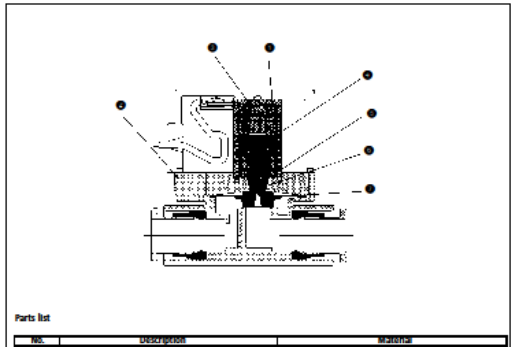


Fig 1

Construction (Fig 2)



Parts list

No.	Description	Material
1	Solenoid coil	
2	Body	Resin
3	Fixed armature	Stainless steel
4	Operating armature	Stainless steel
5	Return spring	Stainless steel
6	Poppet	NBR
7	Diaphragm assembly	NBR/Resin

Fig 2

⚠ CAUTION

Leakage voltage (Fig 3)

Note that where a C-R device is used in parallel with a switching element, voltage leakage will increase due to the fact that current leakage passes through the C-R element.

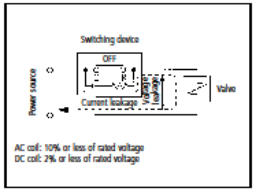


Fig 3

Manual override (Fig 4)

Locking (Fig 4)

⚠ WARNING

Before operating any manual override button ensure ALL safety precautions are in place as connected equipment will commence operation.
Push down on the manual override button (Fig 4), with a small screwdriver until it stops. Continue to hold the button down whilst turning the button through 90° clockwise.
Remove the screwdriver.

⚠ WARNING

In this position the manual override is 'held' in the ON condition.

Un-Locking (Fig 4)
Replace small screwdriver into the slot in the override button.
Turn the screwdriver through 90° anti-clockwise.
Remove the screwdriver and the override will be un-locked.

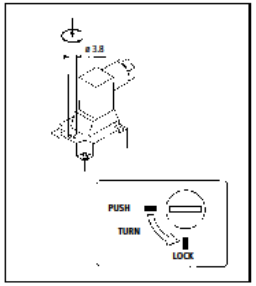


Fig 4

⚠ CAUTION

Electrical connection (Fig 5)

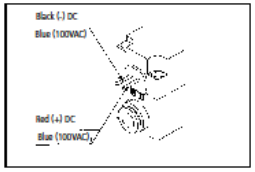


Fig 5

Wiring the DIN Connector Fig 6 (ISO 43650C 8mm pin centres)

Unscrew the top screw (Fig 6) and remove the connector housing from the spade terminals.
Remove the housing screw and insert a screwdriver into the slot area on the underside of the DIN cap and carefully separate block and housing.
Loosen the terminal screws (Fig 6) of the block and insert stripped lead wires in accordance with the wiring diagram. Secure each wire by re-tightening the terminal screws.
Tighten the housing grommet nut to secure the cable wire.

Note: Once the housing is separated from the terminal block it can be rotated in any direction through 90° increments to change the orientation of the electrical entry.

⚠ CAUTION

1. When using the indicator light option exercise care so as NOT to damage the light with the lead wires.
2. Ensure that the connector is pulled out from the housing in a straight line and never at an angle.

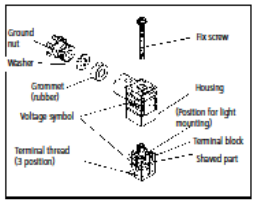


Fig 6

DIN connector circuit with LED (Fig 7)

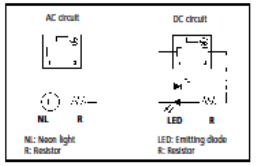


Fig 7

Lamp and surge voltage suppresser circuit (Fig 8)

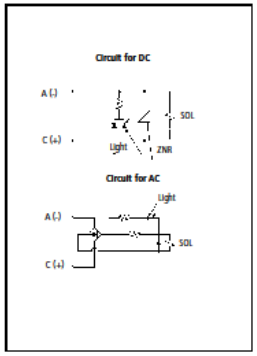


Fig 8

⚠ CAUTION

Manifold version

DIN rail removal/fitting (Fig 9)

To mount manifold to DIN rail place the hook of the DIN rail bracket on the 'B' side of the of the DIN rail (Fig 9).
Push side 'A' onto the DIN rail and tighten the clamp screw.
Tightening torque is 0.3 to 0.4Nm (3 to 4 kgf/cm).

Removing from a manifold (Fig 9)

Loosen the clamp screw on the 'A' side of both ends of the manifold.
Lift the 'A' side of the manifold off of the DIN rail and slide in the direction of the 'B' side.

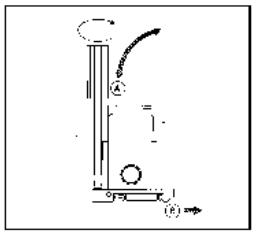


Fig 9

Valve mounting (Fig 10)

Confirm that the gasket is correctly placed under the valve.
Tighten the valve retaining screws to the appropriate torque (0.2 to 0.23Nm).

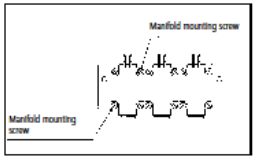


Fig 10

⚠ CAUTION

Maximum number of valves that can be operated simultaneously

Series	P port one side supply	P port both sides supply
VQ20	4	8
VQ30	2	4

If the max. number of valves simultaneously operated exceeds the numbers above, the effective flow rates will be reduced.

For additional information please contact your local SMC office.

When you enquire about the product, please contact the following
SMC Corporation:

ENGLAND	Phone 01908-563888	TURKEY	Phone 212-2211512
ITALY	Phone 02-92711	GERMANY	Phone 6103-402-0
HOLLAND	Phone 020-5318888	FRANCE	Phone 01-64-76-10-00
SWITZERLAND	Phone 052-34-0022	SWEDEN	Phone 08-603 07 00
SPAIN	Phone 945-184100	AUSTRIA	Phone 02262-62-280
	Phone 902-255255	IRELAND	Phone 01-4501822
GREECE	Phone 01-3436076	DENMARK	Phone 8738-0800
FINLAND	Phone 09-68 10 21	NORWAY	Phone 67-12 90 20
BELGIUM	Phone 03-3551464	POLAND	Phone 48-22-4131847

Válvulas 3/2

VP300-SMW25EN

SMC

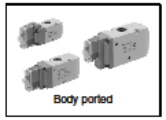
ORIGINAL INSTRUCTIONS

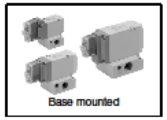
Instruction Manual

Refer to Declaration of Conformity for relevant Directives

3 Port solenoid valve

Series VP300/500/700





The intended use of this valve is to control the movement of an actuator.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to international Standards (ISO/IEC) [*1], and other safety regulations.

[*1] ISO 4414: Pneumatic fluid power - General rules relating to systems.
ISO 4413: Hydraulic fluid power - General rules relating to systems.
IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety, etc.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

⚠ Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
⚠ Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ Warning

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

2 Specifications

2.1 General Specifications

Fluid		Air
Type of actuation		N.C. or N.O. (Convertible)
Internal pilot operating pressure range (MPa)	Standard	0.2 to 0.7
	High-pressure type	0.2 to 1.0
External pilot operating pressure range (MPa)	Standard	-100 kPa to 0.7
	High-pressure type	-100 kPa to 1.0
	Pilot pressure range	Same as operating pressure (Min. 0.2 MPa)
Ambient and fluid temperature (°C)		-10 to 50 (No freezing)
Max. operating frequency (Hz)		5
Minimum operating frequency		Once every 30 days
Duty cycle		Contact SMC
Manual override		Non-locking push type
		Push-turn locking slotted type
		Push-turn locking lever type
Pilot exhaust type		Individual exhaust
Lubrication		Not required (See also 3.4)
Mounting orientation		Unrestricted
Impact/Vibration resistance (m/s²) [Note 1]		300/50
Response Time		Refer to catalogue
Flow		Refer to catalogue

2 Specifications - continued

Filtration	5 μm filtration or smaller
Enclosure	Dust-tight (IP65 for D, Y, T)

Table 1

Notes:

Note 1) Impact resistance: No malfunction occurred when tested in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states once for each condition. (Values at the initial period)

Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Test was performed in both energized and de-energized states in the axial direction and at the right angles to the main valve and armature. (Values at the initial period)

2.2 Solenoid Specifications

Electrical entry		Grommet (G), (H) L-type plug connector (L) M-type plug connector (M)	DIN terminal (D) DIN (EN175301-803) terminal (Y) Conduit terminal (T)
Coil rated voltage (V)	DC	24, 12	
	AC (50/ 60 Hz)	24, 100, 110, 200, 220, 240	
Allowable voltage fluctuation		±10% of rated voltage [Note 2, 3, 4]	
Power consumption (W), DC	Standard	1.5 (With light: 1.55)	1.5 (With light: 1.75)
	With power saving circuit	0.55 (With light only) [Starting 1.55, Holding 0.55]	0.75 (With light only) [Starting 1.75, Holding 0.75]
Apparent power (VA) [Note 1], AC	24 V	1.5 (With light: 1.55)	1.5 (With light: 1.75)
	100 V	1.55 (With light: 1.65)	1.55 (With light: 1.7)
	110 V [115 V]		
	200 V		
	220 V [230 V]		
	240 V		
Surge voltage suppressor		Diode (Non-polar type: Varistor)	
Indicator light		LED (Neon bulb is used for AC mode of D, Y, T)	

Table 2

Notes:

Note 1) It is in common between 110 VAC and 115 VAC, and between 220 VAC and 230 VAC.

Note 2) Allowable voltage fluctuation is -15% to +5% of the rated voltage for 115 VAC or 230 VAC.

Note 3) Since voltage drops due to the internal circuit in S, Z, T types (with power saving circuit), the allowable voltage fluctuation should be within the following range.
24 V DC: -7% to +10%
12 V DC: -4% to +10%

Note 4) Valve state is not defined if electrical input is outside the specified operating range.

2.3 Pneumatic symbols

Refer to catalogue for pneumatic symbols.

2.4 Indicators

Options 'Z' and 'U' include LED indication of coil energization.
Note: Neon bulb is used for AC models D, Y, T.

Figure 1

The LED is located on the pilot valve assembly, see Figure 1. When the solenoid is energized, the valve switches and the LED remains illuminated while the solenoid is energized.

⚠ Warning

Special products might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Installation

3.1 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.

3 Installation - continued

3.2 Environment

⚠ Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover. Note that the valve is not for outdoor use.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- If using in an atmosphere where there is possible contact with water drop-lets, oil, weld spatter, etc., take suitable preventative measures.
- When the solenoid valve is mounted in a control panel or is energized for a long time, make sure that the ambient temperature is within the valve's specified range.
- Do not use in high humidity environment where condensation can occur.
- Contact SMC for altitude limitations.

⚠ Caution

- **Temperature of ambient environment**

Use the valve within the range of the ambient temperature specification of each valve. In addition, pay attention when using the valve in environments where the temperature changes drastically.

- **Humidity of ambient environment**

When using the valve in environments with low humidity, take measures to prevent static.
If the humidity rises, take measures to prevent adhesion of water droplets on the valve.

3.3 Piping

⚠ Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- When connecting piping to a product, refer to its instruction manual to avoid mistakes regarding the supply port, etc.

- Tighten fittings to the specified tightening torque.

3.3.1 Connection of piping and fittings

When screwing the piping or fitting into the valve, tighten it as follows.

For the fitting with sealant R or NPT, first, tighten it by hand, then use a wrench appropriate for the hexagon flats of the body to tighten it a further two or three turns. For a tightening torque guide, refer to the table below.

Connection threads	Proper tightening torque N·m
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20
1/2	20 to 25

Table 3

Note) Excessive tightening may damage the thread portion or deform the gasket and cause air leakage. Insufficient tightening may loosen the threads, or cause air leakage.

- When using a fitting other than SMC fitting, follow the instructions given by relevant fitting manufacturer.

3.4 Lubrication

⚠ Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

3.5 Light/Surge Voltage Suppressor

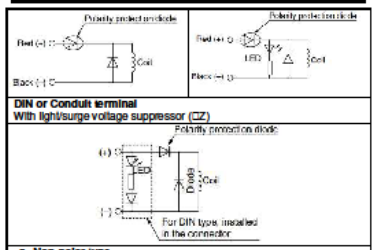
⚠ Caution

If a valve type without suppression is used, suppression should be provided as close as possible to the valve by the host controller.

3.5.1 DC

▪ Polar type	
With surge voltage suppressor (□S)	**Grommet or L/M-type plug connector** With light/surge voltage suppressor (□Z)

3 Installation – continued



- Please connect correctly the lead wires to + (positive) and – (negative) indications on the connector. (For non-polar type, the lead wires can be connected to either one.)
- When the valve with polarity protection diode is used, the voltage will drop by approx. 1 V. Therefore, pay attention to the allowable voltage fluctuation (For details, refer to the solenoid specification of each type of valve).
- Solenoids, whose lead wires have been pre-wired: + (positive) side red and – (negative) side black.

▪ **With power saving circuit**

Power consumption is decreased by approx. 1/3 by reducing the wattage required to hold the valve in an energized state. (Effective energizing time is over 40 ms at 24 VDC.)

- Since the voltage will drop by approx. 0.5 V due to the transistor, pay attention to the allowable voltage fluctuation. (For details, refer to the solenoid specifications of each type of valve.)

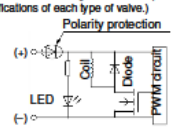
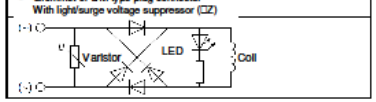


Figure 2

3.5.2 AC

There is no S option, since a rectifier prevents surge voltage generation.

- Grommet or L/M-type plug connector
  With light/surge voltage suppressor (□Z)



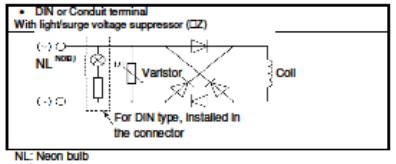
Page 1 of 2

VP300-SMW25EN

3 Installation – continued

- DIN or Conduit terminal

With light/surge voltage suppressor (□Z)



NL: Neon bulb
Note) LED for 24 VAC.

3.6 Residual voltage of the surge voltage suppressor

Caution

Note) If a varistor or diode surge voltage suppressor is used, there is some residual voltage to the protection element and rated voltage. Therefore, refer to the table below and pay attention to the surge voltage protection on the controller side. Also, since the response time does change, refer to the specifications in Section 2.

Residual voltage

Surge voltage suppressor	DC		AC
	24	12	
S, Z	Approx. 1 V		Approx. 1 V
R, U	Approx. 47 V	Approx. 32 V	–

Table 4

3.7 Countermeasure for surge voltage

Caution

At times of sudden interruption of the power supply, the energy stored in a large inductive device may cause non-polar type valves in a de-energised state to switch.
When installing a breaker circuit to isolate the power, consider a valve with polarity (with polarity protection diode), or install a surge absorption diode across the output of the breaker.

3.8 Extended periods of continuous energization

Caution

Refer to '3, 4, 5 port solenoid valves precautions' for more details.

- When solenoid valves are mounted in a control panel, employ measures to radiate excess heat, so that temperatures remain within the valve specification range. Use special caution when three or more stations sequentially aligned on the manifold are continuously energized since this will cause a drastic temperature rise.

3.9 Wiring

Caution

- **External force applied to lead wire**

If an excessive force is applied to the lead wire, this may cause faulty wiring. Take appropriate measures so that a force of 30 N or more is not applied to the lead wire. When instructions are given to the Specific Product Precautions, follow these specifications.

3.10 How to Use L/M-Type Plug Connector

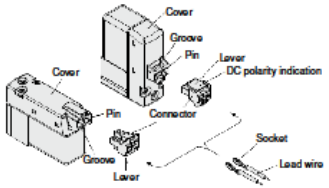


Figure 4

Refer to Specific Product Precautions in the catalogue for more details.

3 Installation – continued

3.11 How to Use DIN Terminal

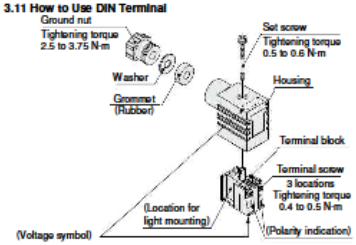


Figure 5

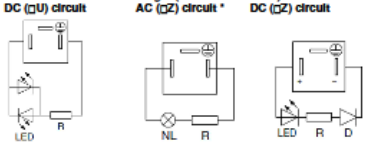
Refer to Specific Product Precautions in the catalogue for more details.

3.12 DIN (EN175301-803) Terminal

Y type DIN terminal corresponds to the DIN connector with terminal pitch 10 mm, which complies with EN175301-803B. Since the terminal pitch is different from the D type DIN connector, these two types are not interchangeable.
Refer to Specific Product Precautions in the catalogue for more details.

3.13 Circuit with indicator light (Built-in connector)

DC (□U) circuit **AC (□Z) circuit *** **DC (□Z) circuit**



LED: Light emitting diode
R: Resistor

NL: Neon bulb
R: Resistor

LED
R: Resistor
D: Protective diode

** Note) The 24 VAC specifications are the same as those in the DC.*

Figure 6

3.14 How to Use Conduit Terminal

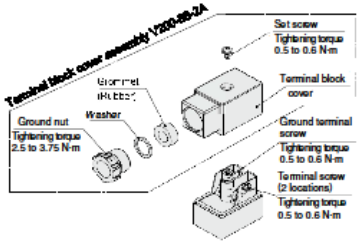


Figure 7

Refer to Specific Product Precautions in the catalogue for more details.

3.15 Solenoid Valve for AC Specification

Warning

AC specification solenoid valves with grommet or L/M-type plug connector have a built-in rectifier circuit in the pilot section to operate the DC coil. With AC specification pilot valves, this built-in rectifier generates heat when energized. The surface may become hot depending on the energized condition; therefore, do not touch the solenoid valves.

3.16 Air supply

Warning

Use clean air

3 Installation – continued

If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas etc., it can lead to damage or malfunction.

Caution

Install an air filter
Install an air filter at the upstream side of the valve. Filtration degree should be 5 µm or less.

3.17 Effect of back pressure when using a manifold

Use caution when valves are used on a manifold, because an actuator may malfunction due to back-pressure.

3.18 Manual Override

Warning

Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.
Locked manual overrides might prevent the valve responding to being electrically de-energised or cause unexpected movement in the equipment.
Refer to the catalogue for details of manual override operation.

4 Settings

4.1 Changing type of Actuation

Warning

When changing the actuation or restarting the valve after the change, make sure that safety is fully assured and pay great attention.

Example: Changing N.C. to N.O.

Refer to Specific Product Precautions in the catalogue for more details.

5 How to Order

5.1 Standard products

Refer to catalogue for 'How to Order'.

5.2 Special products

Refer to drawings for 'How to Order' of special products.

6 Outline Dimensions (mm)

Refer to catalogue for outline dimensions.

7 Maintenance

7.1 General Maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- Low frequency operation
  Valves should be operated at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)
- **If the volume of air leakage increases or the valve does not operate normally, do not use the valve.**
  Perform periodic maintenance of the valve to confirm the operating condition, and if there is any air leakage.
- **Removal of equipment, and supply/exhaust of compressed air**
  When components are removed, first confirm that measures are in place to prevent workpieces from dropping, run-away equipment, etc. Then, cut off the supply air and electric power, and exhaust all air pressure from the system using the residual pressure release function.

8 Limitations of Use

Warning

The system designer should determine the effect of the possible failure states on the system.

8.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

Caution

8.2 Leakage voltage

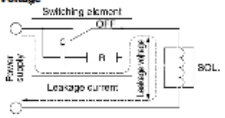


Figure 3

Take note that the leakage voltage will increase when a resistor is used in parallel with switching element or a C-R circuit (surge voltage suppressor) is used to protect a switching device because of the passing leakage voltage through the C-R circuit. The suppressor residual leakage voltage should be as follows.
DC coil: 3% or less of the rated voltage
AC coil: 8% or less of the rated voltage

8.3 Low temperature operation

Unless otherwise indicated in the specifications for each valve, operation is possible to -10 °C, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

8.4 External pilot

Use external pilot in the following cases:

- For vacuum or for low pressure 0.2 MPa or less.
- Please consult SMC for use in a vacuum hold application.
- When having P port downsized in diameter.
- When using A port as the atmospheric releasing port, e.g. air blower.
- If manifold, external pilot piping can be centralized in manifold base.

Warning

8.5 Air/spring returned spool valves

8.5.1 Internal pilot type

For internal pilot type, the main valve returns to the original (de-energized) position by means of the spring when the air supply is cut.
When only the electrical power is cut, the return is by means of the pilot pressure and spring force.

8.5.2 External pilot type

For external pilot type, the main valve returns to the original (de-energized) position by means of the spring when the main air supply, and the external pilot supply, is cut.
When only the electrical power is cut, the return is by means of the external pilot pressure and spring force.

8.6 Safety relays

If a safe output from a safety relay or PLC is used to operate this valve, ensure that any output test pulse duration is shorter than 1 ms to avoid the valve solenoid responding.

9 Contacts

Refer to Declaration of Conformity and www.smcworld.com for contacts.

SMC Corporation

URL: http://www.smcworld.com (Global) http://www.smceu.com (Europe)
SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101 0021
Specifications are subject to change without prior notice from the manufacturer.
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Template DKP50047-F-085H

Válvulas 5/2

SY5000-TFQ07EN

SMC

ORIGINAL INSTRUCTIONS

Instruction Manual

Refer to Declaration of Conformity for relevant Directives.

5 Port Solenoid Valve - Body Ported

Series SY3000/5000/7000/9000

The intended use of the valve is to control the movement of an actuator.

Refer to how to order for CE marked and/or validated components.

Validated according to ISO13849, see section 2.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger".
They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) [*1], and other safety regulations.

[*1] ISO 4414: Pneumatic fluid power - - General rules relating to systems.
ISO 4413: Hydraulic fluid power - - General rules relating to systems.
IEC 60204-1: Safety of machinery - - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety. etc.

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

⚠ Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
⚠ Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ Warning

- **The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**
- Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- **Only personnel with appropriate training should operate machinery and equipment.**
  The product specified here may become unsafe if handled incorrectly.

1 Safety Instructions - continued

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

- **Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
  1) The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
  2) When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
  3) Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- **Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
  1) Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
  2) Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustions and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specification described in the product catalogue.
  3) An application which could have negative effects on people, property, or animals requiring special safety analysis [outside the scope of ISO 13849 described in this document].
  4) Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.
- **Always ensure compliance with relevant safety laws and standards.**
- All electrical work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

⚠ Caution

The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

- Ensure that the air supply quality meets the specification in section 2, 3.

2 Specifications

2.1 Valve Specifications

Series		SY3000	SY5000	SY7000	SY9000
Fluid		air			
Internal pilot operating pressure range (MPa)	2 position single	0.15 to 0.7			
	2 position double	0.1 to 0.7			
	3 position	0.2 to 0.7			
Ambient and fluid temperature (°C)		-10 to 50 (no freezing)			
Max. operating frequency (Hz)	2 position single, double	10	5	5	5
	3 position	3	3	3	3
Min. operating frequency		1 cycle/ 30 days			
Manual override (Manual operation) Note 1)		Non-locking push type, Push-turn locking slotted type, Push turn locking lever type			
Pilot exhaust method		Common exhaust type for main and pilot valve			
Lubrication		Not required Note 2)			
Mounting orientation		Unrestricted			
Impact/Vibration resistance (m/s²)		150/30 Note 3)			
Air quality		5 μm filtration or better			
Enclosure		Dust proof (DIN terminal and M8 connector: IP65 Note 4))			
Standards Note 1)		Complies with the basic and well-tried safety principles of ISO 13849-2:2012			
B_{10d} Note 5)	Single, Double	47 million cycles			
	3 position	27 million cycles			
B_{10D} Note 5)	Single, Double	94 million cycles			
	3 position	54 million cycles			

Table 1

2 Specifications - continued

Notes:
Note 1) For validated types refer to section 5 'How to order'.
Note 2) If lubrication is used in the system, use class 1 turbine oil (no additive), ISO VG32
Note 3) **Impact resistance**: No malfunction occurred when it is tested in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition. (Values at the initial period)
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Test was performed at both energized and de-energized states in the axial direction and at the right angles to the main valve and armature. (Values at the initial period)
Note 4) Based on IEC60529
Note 5) The B_{10} figure is estimated from SMC life tests under SMC test conditions. The B_{10D} figure is derived from B_{10} using the assumption in ISO 13849-1:2015 Annex C. Contact SMC for details.

2.2 Solenoid Specifications

Electrical entry			Grommet (G), (H) DIN terminal (D), (Y) L plug connector (L) M plug connector (M) M8 connector (W), (WA)	
			G, H, L, M, W, WA	D, Y
Coil rated voltage (V)	DC		24, 12, 6, 5, 3	24, 12
	AC 50/60 Hz		100, 110, 200, 220	
Allowable voltage fluctuation			±10 % of rated voltage Note 1)	
Power consumption (W)	DC	Standard	0.35 (With indicator light: 0.4 DIN terminal with indicator light: 0.45)	
		With power saving circuit	0.1 (With indicator light only) Note 1) [Starting 0.4, Holding 0.1]	
Apparent power (VA) Note 2)	AC	100 V	0.78 (With indicator light: 0.81)	0.78 (With indicator light: 0.87)
		110 V [115 V]	0.86 (With indicator light: 0.89) [0.94 (With indicator light: 0.97)]	0.86 (With indicator light: 0.97) [0.94 (With indicator light: 1.07)]
		200 V	1.18 (With indicator light: 1.22)	1.15 (With indicator light: 1.30)
		220 V [230 V]	1.30 (With indicator light: 1.34) [1.42 (With indicator light: 1.46)]	1.27 (With indicator light: 1.46) [1.39 (With indicator light: 1.60)]
Surge voltage suppressor			Diode (Varistor is for DIN terminal and Non-polar type.)	
Indicator light			LED (AC of DIN connector is neon light.)	

Table 2

Notes:
Note 1) In common between 110 VAC and 115 VAC, and between 220 VAC and 230 VAC.

- For 115 VAC and 230 VAC, the allowable voltage is -15 % to +5 % of rated voltage.
- S, Z and T type (with power saving circuit) should be used within the following allowable voltage fluctuation range due to a voltage drop caused by the internal circuit.
  S and Z type: 24 VDC: -7 % to +10 %
  12 VDC: -4 % to +10 %
  T type: 24 VDC: -8 % to +10 %
  12 VDC: -6 % to +10 %

2 Specifications - continued

Note 2) DIN terminal and M8 connector with power saving circuit are not available.

- For details, refer to the catalogue.

2.3 Port Size

Series			SY3000	SY5000	SY7000	SY9000
P, EA, EB Port size		M5	*	–	–	–
		1/8	–	*	* (EA,EB)	–
		1/4	–	–	* (P)	*
		3/8	–	–	–	–
		1/2	–	–	–	–
A, B port size		M5	*	–	–	–
		1/8	–	*	–	–
		1/4	–	–	*	*
		3/8	–	–	–	*
		1/2	–	–	–	–
	One-touch fitting	C4	*	*	–	–
		C6	*	*	–	–
		C8	–	*	*	*
		C10	–	–	*	*
		C12	–	–	–	*
		N3	*	*	–	–
		N7	*	*	–	–
		N9	–	*	*	*
		N11	–	–	*	*

Table 3

2.4 Flow Characteristics

Series	Flow Characteristics			
	C [dm³/(s·bar)]	b	C_v	Q[l/min(ANR)]
SY3000	0.77	0.34	0.21	201
SY5000	2.2	0.46	0.61	625
SY7000	4.3	0.23	0.97	1048
SY9000	8.9	0.34	2.2	2323

Table 4

Note: The values given in this table vary depending on the different types of actuation.

2.5 Response Time

SY3000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
2 position single	12 or less	15 or less	12 or less
2 position double	10 or less	13 or less	10 or less
3 position	15 or less	20 or less	16 or less

Table 5

SY5000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
2 position single	19 or less	26 or less	19 or less
2 position double	18 or less	22 or less	18 or less
3 position	32 or less	38 or less	32 or less

Table 6

SY7000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
2 position single	31 or less	38 or less	33 or less
2 position double	27 or less	30 or less	28 or less
3 position	50 or less	56 or less	50 or less

Table 7

Page 1 of 6

2 Specifications - continued

SY9000

Type of actuation	Response time (ms) (at the pressure of 0.5 MPa)		
	Without light/surge voltage suppressor	With light/surge voltage suppressor	
		Type S, Z	Type R, U
2 position single	35 or less	41 or less	35 or less
2 position double	35 or less	41 or less	35 or less
3 position	62 or less	64 or less	62 or less

Table 8

2.6 Symbol

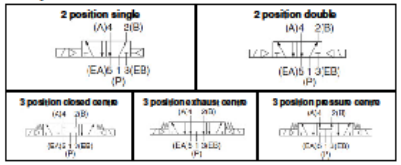


Figure 1

Caution

Special products might have specifications different from those shown in this section. Contact SMC for specific drawings. These drawings will give the appropriate specification details and compliance with the safety principles of ISO 13849, if applicable.

3 Installation

3.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact. Check the product specifications.
- Do not mount in a location exposed to radiant heat.
- Products with IP65 enclosures (based on IEC60529) are protected against dust & water; however, these products cannot be used in water.
- Products compliant to IP65 satisfy the specifications through mounting.
- If using in an atmosphere where there is possible contact with water drop-lets, oil, weld spatter, etc., take suitable preventive measures.
- When the solenoid valve is mounted in a control panel or it is energized for a long time, make sure that the ambient temperature is within the specification of the valve.

3.3 Air supply

Caution

- **When extremely dry air is used as the fluid, degradation of the lubrication properties inside the equipment may occur, resulting in reduced reliability (or reduced service life) of the equipment.**
  Please contact SMC.
- **Install an air filter**
  Install an air filter upstream near the valve. Select an air filter with a filtration size of 5 µm or smaller.
- **Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.**
  Compressed air that contains a large amount of drainage can cause malfunction of pneumatic equipment such as valves. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer or water separator.

3 Installation - continued

3.4 Piping

Caution

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Thread	Tightening Torque (N·m)
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30

Table 9

3.5 Lubrication

Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

3.6 Tubing attachment / detachment for One-touch fittings

Caution

Tube attachment

- Take a tube having no flaws on its periphery and cut it off at a right angle. When cutting the tube, use tube cutters TK-1, 2 or 3. Do not use pincers, nippers or scissors etc. If cutting is done with tools other than tube cutters, the tube may be cut diagonally or become flattened. This makes a secure installation impossible, and causes problems such as air leakage or the tube being pulled out after installation. Allow some extra length in the tube.
- Grasp the tube and push it in slowly, inserting it securely all the way into the fitting.
- After inserting the tube, pull on it lightly to confirm that it will not come out. Problems such as air leakage or the tube being pulled out can occur if the tube is not inserted securely all the way into the fittings.

Tube detachment

- Push in the release bushing and the collar at the same time.
- Pull out the tube while holding down the release bushing so that it does not come out. If the release bushing is not pressed down sufficiently there will be increased bite on the tube and it will become more difficult to pull out.
- When the removed tube is to be used again, cut off the portion which has been chewed before reusing it. If this is not done then the chewed portion of the tube can cause problems such as air leakage or difficulty in removing the tube from the fitting.

3.7 Precautions on other tube brands

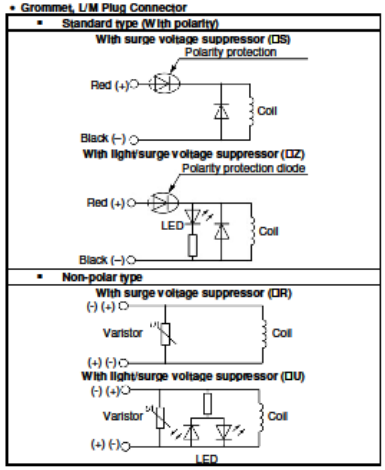
Caution

- When using non-SMC brand tubes, confirm that the following specifications are satisfied with respect to the outside diameter tolerance of the tube.
  - Nylon tube ±0.1mm
  - Soft nylon tube ±0.1mm
  - Polyurethane tube +0.15mm; -0.2mm
- Do not use tubing that does not meet these outside diameter tolerances. It may not be possible to connect them, or they may cause other problems, such as air leakage or the tubing pulling out after connection.

3 Installation – continued

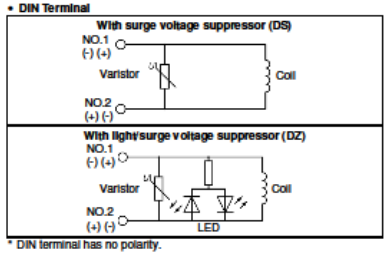
3.8 Indicator Light/Surge Voltage Suppressor

- **Grommet, L/M Plug Connector**



- Connect the standard type in accordance with the +, - polarity indication. (The non-polar type can be used with the connections made either way.)
- Since voltage specifications other than standard 24 VDC and 12 VDC do not have diodes for polarity protection, be careful not to make errors in the polarity.
- Please use caution regarding the allowable fluctuation because there is about a 1 volt drop for a valve with polarity protection. (For details, refer to the solenoid specification.)
- When wiring is done at the factory, positive (+) is red and negative (-) is black.

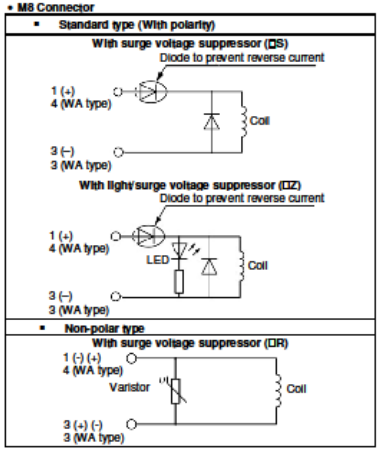
- **DIN Terminal**

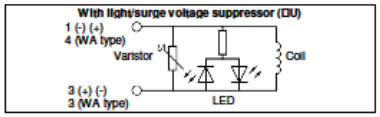


* DIN terminal has no polarity.

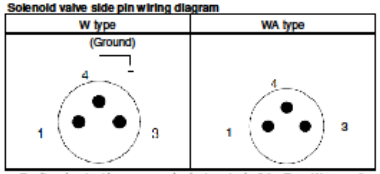
3 Installation – continued

- **M8 Connector**





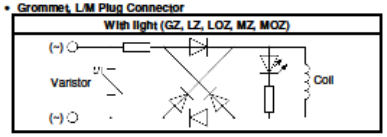
Solenoid valve side pin wiring diagram



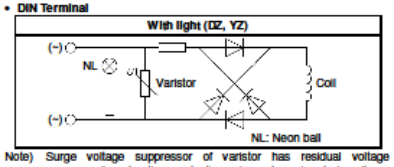
- For the standard type, connect + to 1 and – to 3 for Type W according to polarity, while + to 4 and – to 3 for Type WA.
- For DC voltages other than 12 V and 24 V, incorrect wiring will cause damage to the surge suppressor circuit.
- Please use caution regarding the allowable voltage fluctuation because there is about a 1 Volt drop for a valve with polarity protection. (For details, refer to the solenoid specifications.)
- The WA-type valve cannot be grounded.

3 Installation – continued

- **<For AC>**
(There is no "S" option, because the generation of surge voltage is prevented by a rectifier.)
- **Grommet, L/M Plug Connector**



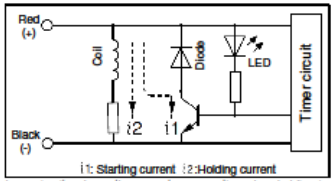
- **DIN Terminal**



Note) Surge voltage suppressor of varistor has residual voltage corresponding to the protective element and rated voltage; therefore, protect the controller side from the surge voltage. The residual voltage of the diode is approximately 1 V.

3.9 With power saving circuit

Power consumption is decreased to 1/4 by reducing the wattage required to hold the valve in an energized state.
(Effective energizing time is over 62 ms at 24 VDC.)



The above circuit reduces the current consumption when holding in order to save energy. Refer to the electrical power waveform as shown below.

<Electrical power waveform with power saving circuit>

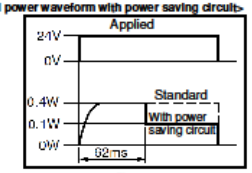


Figure 2

- Please be careful not to reverse the polarity, since a diode to prevent the reversed current is not provided for the power saving circuit.
- Please use caution regarding the allowable voltage fluctuation because there is about a 0.5 volt drop due to the transistor. (For details, refer to the solenoid specifications of each type of valve.)

3.10 Residual voltage of the surge voltage suppressor

If a varistor or diode surge voltage suppressor is used, there is some residual voltage to the protection element and rated voltage.

3 Installation – continued

3.11 Valve Mounting

Caution

Mount it so that there is no slippage or deformation in gaskets, and tighten with the tightening torque as shown below.

Model	Thread size	Tightening torque
SY3000	M2	0.16 N·m
SY5000	M3	0.8 N·m
SY7000	M4	1.4 N·m
SY9000	M3	0.8 N·m

Table 10

3.12 Manual override

Warning

Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Connected actuator is started by manual operation. Use the manual override after confirming that there is no danger.

■Non-locking push type (Standard)
Press in the direction of the arrow.

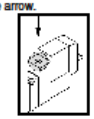


Figure 3

■Push-turn locking slotted type [Type D] Note 1)

Caution

Push down on the manual override with a small flat head screwdriver until it stops. Turn it clockwise by 90° to lock it. Turn it counterclockwise to release it.
If it is not turned, it can be operated the same way as the non-locking type.
Do not apply excessive torque when turning the manual override [0.1 N·m].

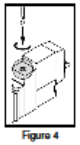


Figure 4

■Push-turn locking lever type [Type E] Note 1)
Push down on the manual override by finger until it stops, and then turn it 60° clockwise. The manual override is then locked. To release it, turn it counterclockwise. If it is not turned, it can be operated the same way as the non-locking type.

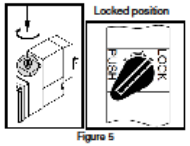


Figure 5

Note 1) Locking type is not allowed in safety applications.

Caution

When locking the manual override on the push-turn locking types (D, E), be sure to push it down before turning.
Turning without first pushing it down can cause damage to the manual override and trouble such as air leakage, etc.

3 Installation – continued

3.13 How to Use Plug Connector

Caution

1. **Attaching and detaching connectors**
   - To attach a connector, hold the lever and connector unit between your fingers and insert straight onto the pins of the solenoid valve so that the lever's pawl is pushed into the groove and locks.
   - To detach a connector, remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.

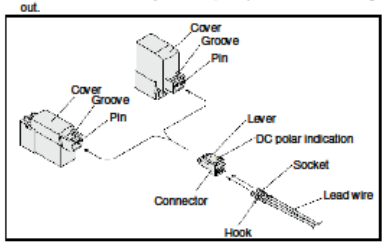


Figure 6

2. **Crimping connection of lead wire and socket**
   Strip 3.2 to 3.7 mm at the end of lead wires, insert the end of the core wires evenly into the sockets, and then crimp it by a crimping tool. When this is done, take care that the coverings of the lead wires do not enter the core wire crimping area.
   (Please contact SMC for the dedicated crimping tools.)

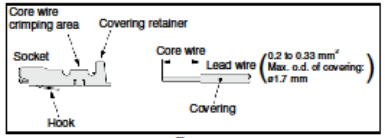


Figure 7

3. **Attaching and detaching lead wires with sockets**
   - **Attaching**
     Insert the sockets into the square holes of the connector (+, - indication), and continue to push the sockets all the way in until the lock by hooking into the seats in the connector.
     (When they are pushed in, their hooks open and they are locked automatically.) Then confirm that they are locked by pulling lightly on the lead wires.
   - **Detaching**
     To detach a socket from a connector, pull out the lead wire while pressing the socket's hook with a stick having a thin tip (approx. 1 mm).
     If the socket will be used again, first spread the hook outward.

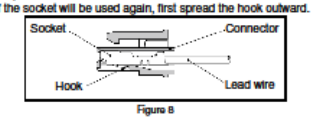


Figure 8

3 Installation – continued

3.14 How to Use DIN Terminal

Caution

Connection
1. Loosen the holding screw and pull the connector out of the solenoid valve terminal block.
2. After removing the holding screw insert a flat head screwdriver, etc. into the notch on the bottom of the terminal block and pry it open, separating the terminal block and the housing.
3. Loosen the terminal screws (slotted screws) on the terminal block, insert the cores of the lead wires into the terminals according to the connection method, and fasten them securely with the terminal screws.
4. Secure the cord by fastening the ground nut.

Caution

When making connections, take note that using other than the supported size (ø3.5 to ø7) heavy duty cord will not satisfy IP 65 (enclosure) standards. Also, be sure to tighten the ground nut and holding screw within their specified torque ranges.

Changing the entry direction
After separating the terminal block and housing, the cord entry can be changed by attaching the housing in the desired direction (4 directions at 90° intervals).
* When equipped with a light, be careful not to damage the light with the cord's lead wires.

Precautions
Plug in and pull out the connector vertically without tilting to one side.

Compatible cable
Cord O.D.: ø3.5 to ø7
(Reference) 0.5 mm², 2-core or 3-core, equivalent to JIS C 3306

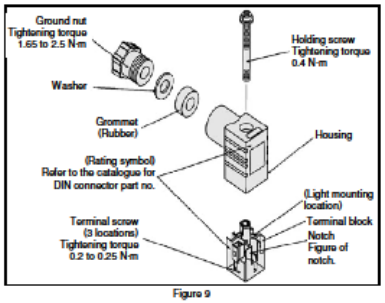


Figure 9

Type "Y"
DIN connector type Y is a DIN connector that conforms to the DIN EN 175301-803 (DIN pitch 8-mm standard).
- D type DIN connector with 9.4 mm pitch between terminals is not interchangeable.
- To distinguish from the D type DIN connector, "N" is listed at the end of voltage symbol. (For connector parts without lights, "N" is not indicated. Please refer to the name plate to distinguish.)
- Dimensions are completely the same as D type DIN connector.

3 Installation – continued

3.14.1 Series SY3000

Caution

- SMC can provide a DIN style terminal connector for the series SY3000. This cannot be assembled to a standard manifold and sub-plate since the DIN connector width (15.8 mm) exceeds that of the valve body (10 mm). Contact SMC if you wish to use with a manifold and sub-plate.
- The DIN style terminal connector and single manifold unit have no external pilot specifications.

4 Settings

4.1 Exhaust Throttle

Caution

The SY series pilot valve and main valve share a common exhaust inside the valve. Therefore, do not block the exhaust port when arranging the piping.

4.2 Use as a 3-Port Valve

Caution

In case of using a 5-port valve as a 3-port valve

Series SY3000/5000/7000/9000 can be used as normally closed (N.C.) or normally open (N.O.) 3-port port valves by closing one of the cylinder ports (A or B) with a plug. However, they should be used with the exhaust ports kept open.

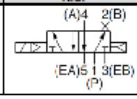
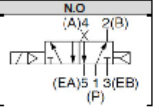
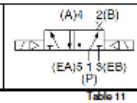
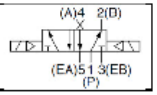
Plug position		B port	A port
Configuration		N.C.	N.O
Number of solenoids	Single		
	Double		

Table 11

4.3 Changing Port Block Assembly

If using body port type, both A and B port sizes can be changed by replacing the port block assembly mounted on the body. When changing this block assembly, the correct screw torque must be achieved to avoid possible air leakage.

With the one-touch fitting port block assembly, it is only necessary to change the fitting and not the whole block.

For SY5000

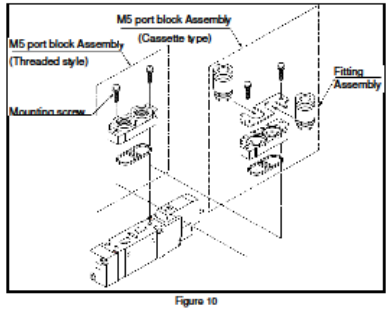


Figure 10

4 Settings - continued

Caution

Mounting screw tightening torques:

Model	Thread size	Tightening torques
SY3000	M2	0.12 N·m
SY5000	M3	0.6 N·m
SY7000	M3	0.6 N·m
SY9000	M4	1.4 N·m

Table 12

- One-touch fitting (Metric size)

Applicable series	Port size
SY3000	One-touch fitting for Ø4
	One-touch fitting for Ø6
SY5000	One-touch fitting for Ø4
	One-touch fitting for Ø6
	One-touch fitting for Ø8
SY7000	One-touch fitting for Ø8
	One-touch fitting for Ø10
SY9000	One-touch fitting for Ø8
	One-touch fitting for Ø10
	One-touch fitting for Ø12

Table 13

- One-touch fitting (Inch size)

Applicable series	Port size
SY3000	One-touch fitting for Ø5/32"
	One-touch fitting for Ø1/4"
SY5000	One-touch fitting for Ø5/32"
	One-touch fitting for Ø1/4"
	One-touch fitting for Ø5/16"
SY7000	One-touch fitting for Ø5/16"
	One-touch fitting for Ø3/8"
SY9000	One-touch fitting for Ø5/16"
	One-touch fitting for Ø3/8"

Table 14

SY5000-TFQ07EN

5 How to Order

SY 5 1 20 □ – 5 L □ □ – 01 □ – □ – □ – □

Series

3	SY3000
5	SY5000
7	SY7000
9	SY9000

Type of actuation

		Validated *
1	2 position single (A)4 2(B) (EA)5 1 3(EB) (P)	●
2	2 position double (A)4 2(B) (EA)5 1 3(EB) (P)	–
3	3 position closed centre (A)4 2(B) (EA)5 1 3(EB) (P)	●
4	3 position exhaust centre (A)4 2(B) (EA)5 1 3(EB) (P)	●
5	3 position pressure centre (A)4 2(B) (EA)5 1 3(EB) (P)	●

Note) For details about Symbol of the 3 position type of series SY9000, refer to the catalogue.

Coil specifications

–	Standard
T	With power saving circuit (24 VCD, 12 VDC only)

* Power saving circuit is not available in the case of D, Y, DO, YO, W□ or WA□ type.

Rated voltage

For DC

		Validated *
5	24 VDC	●
6	12 VDC	●
V	6 VDC	●
S	5 VDC	●
R	3 VDC	●

For AC (50/60 Hz)

		Validated *
1	100 VAC	–
2	200 VAC	–
3	110 VAC [115 VAC]	–
4	220 VAC [230 VAC]	–

* DC specifications of type D, Y, DO and YO is only available with 12 and 24 VDC.
* For Type W□/WA□, DC voltage is only available.

Note) AC-type models that are CE-compliant have DIN terminals only.

Manual override

–	D	E
Non-locking push type	Push-turn locking slotted type	Push-turn locking lever type
Validated * ●	–	–

Light/surge voltage suppressor

Electrical entry for G, H, L, M, W

–	Without light/surge voltage suppressor
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
R	With surge voltage suppressor (Non-polar type)
U	With light/surge voltage suppressor (Non-polar type)

* For AC voltage valves there is no "S" option. It is already built-in to the rectifier circuit.
* For "R" and "U", DC voltage is only available
* Power saving circuit is only available in the "Z" type.

Electrical entry for D, Y

–	Without light/surge voltage suppressor
S	With surge voltage suppressor (Non-polar type)
Z	With light/surge voltage suppressor (Non-polar type)

* DOZ and YOZ are not available.
* For AC voltage valves there is no "S" option. It is already built-in to the rectifier circuit.

Electrical entry

	24, 12, 6, 5, 3 VDC / 100, 110, 200, 220 VAC				24, 12 VDC, 100, 110, 200, 220 VAC	24, 12, 6, 5, 3 VDC	
	Grommet	L plug connector	M plug connector		DIN terminal	M8 connector	
	G: Lead wire length 300 mm	L: With lead wire (Length 300 mm)	M: With lead wire (Length 300 mm)	MN: Without lead wire	D, Y: With connector	WO: Without connector cable	WAO: Without connector cable
	H: Lead wire length 600 mm	LN: Without lead wire	LO: Without connector	MO: Without connector	DO, YO: Without connector	W□: With connector cable Note)	WA□: With connector cable Note)
CE-compliant DC	●	●		●	●		●
CE-compliant AC	–	–		–	●		–

* LN, MN type: with 2 sockets
* For DIN terminal of SY3000 series, refer to the catalogue.
* "Y" type is a DIN terminal conforming to EN-175301-803C (former DIN43650C). For details, refer to the catalogue.
* For connector cable of M8 connector, refer to the catalogue.
* M8 connector conforming to IEC60947-5-2 standard is also available. Refer to the catalogue for details.
* Refer to the catalogue for the lead wire length of L and M plug connectors.
* Refer to the catalogue for the connector assembly with cover for L and M plug connectors.

Note) Enter the cable length symbols in □. Please be sure to fill in the blank referring to the catalogue.
Note) When ordering single unit of the cassette type solenoid valve, the bushing assembly is included.

Bracket

–	Without bracket
F1	With foot bracket (2 position single only)
F2	With side bracket

* SY9000 has no bracket.

Thread type

-	Rc
F	G
N	NPT
T	NPTF

* Except for M5

CE-compliant

		Validated *
–	–	–
Q	CE-compliant	●

Note) AC-type models that are CE-compliant have DIN terminals only.

❖ Note: AC variants, 2 position double and locking override types are not validated according to ISO 13849.

Made to Order

–	–
X20	Body ported external pilot Note)
X90	Main valve fluoro rubber Note)

Note) Refer to the catalogue.

Note) When placing an order for body ported solenoid valve as a single unit, mounting screw for manifold and gasket are not attached. Order them separately, if necessary. (For details, refer to the catalogue.)

A, B port size

Thread piping

Symbol	Port size	Applicable series
M5	M5 x 0.8	SY3000
01	1/8	SY5000
02	1/4	SY7000
02	1/4	SY9000
03	3/8	

One-touch fitting (Metric size)

Symbol	Port size	Applicable series
C4	One-touch fitting for ø4	SY3000
C6	One-touch fitting for ø6	
C4	One-touch fitting for ø4	
C6	One-touch fitting for ø6	SY5000
C8	One-touch fitting for ø8	
C8	One-touch fitting for ø8	SY7000
C10	One-touch fitting for ø10	
C8	One-touch fitting for ø8	SY9000
C10	One-touch fitting for ø10	
C12	One-touch fitting for ø12	

One-touch fitting (Inch size)

Symbol	Port size	Applicable series
N3	One-touch fitting for ø5/32"	SY3000
N7	One-touch fitting for ø1/4"	
N3	One-touch fitting for ø5/32"	SY5000
N7	One-touch fitting for ø1/4"	
N9	One-touch fitting for ø5/16"	SY7000
N9	One-touch fitting for ø5/16"	
N11	One-touch fitting for ø3/8"	SY9000
N9	One-touch fitting for ø5/16"	
N11	One-touch fitting for ø3/8"	

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6 Outline Dimensions (mm)

Refer to the catalogue.

7 Maintenance

7.1 General Maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous. Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.

7 Maintenance - continued

- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- When the 3-position closed centre type is in its rest position, air can be trapped between the valve and the cylinder. Exhaust this air pressure before removing piping or performing any maintenance.
- When the equipment is operated after remounting or replacement, first confirm that measures are in place to prevent lurching of actuators, etc. Then, confirm that the equipment is operating normally.

- **Low frequency operation**
  Valves should be operated at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)

7.2 Throttle

- The pilot valve and the main valve share exhausts, therefore care must be taken to ensure that the piping does not become restricted.

7.3 Supply air

Warning

Use clean air
If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas etc., it can lead to damage or malfunction.

Caution

Install an air filter
Install an air filter at the upper streamside of the valve. Filtration degree should be 5 μm or less.

8 Limitations of Use

8.1 Limited warranty and Disclaimer/Compliance Requirements

- **The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements". Read and accept them before using the product.**
- **Limited warranty and Disclaimer**
  1) The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first[1]. Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

8 Limitations of Use - continued

2) For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3) Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.
[1] Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

- **Compliance Requirements**
  1) The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
  2) The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

8.2 Limitations

Caution

- **SMC products are not intended for use as instruments for legal metrology.**
  Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.
  Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.
- **Leakage voltage**
  The suppressor residual voltage should be 3 % or less of the rated voltage.

- **Surge voltage suppressor**
  If a surge protection circuit contains non-ordinary diodes such as zener diodes or varistor, a residual voltage will remain that is in proportion to the protective elements & the rated voltage. Therefore, give consideration to surge voltage protection of the controller. In the case of diodes, the residual voltage is approximately 1 V.
- **Low temperature operation**
  Unless otherwise indicated in the specifications for each valve, operation is possible to -10°C, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.
- **Mounting orientation**
  Mounting orientation is universal.

Warning

Any use in an ISO 13849 system must be within the specified limits and application conditions. The user is responsible for the specification, design, implementation, validation and maintenance of the safety system (SRP/CS).

The use of 2-position single valves with air returned or air/spring returned spools has to be carefully considered.
The return of the valve spool into the safe position depends on the pilot pressure. If the pilot pressure drops below the specified operating pressure the following might occur:

- Unexpected movement of the actuator when the pilot air pressure is restored.
- Prevention or delay of a stopping or reversing of movement
- An uncommanded change of the original position (without an input signal).

The design of the safety system must take into account such behaviour.
Additional measures might be necessary. For example, the installation of an additional air tank to maintain the pilot pressure. Such measures must be evaluated by risk assessment within the validation process.

8 Limitations of Use - continued

8.3 Safety relays

Warning

If a safe output from a safety relay or PLC is used to operate this valve, ensure that any output test pulse duration is shorter than 1 ms to avoid the valve solenoid responding.

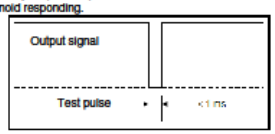

Figure 11

9 Contacts

AUSTRIA	SMC Pneumatik GmbH,Girakstrasse 8, AT-2100 Korneuburg, Austria
BELGIUM	SMC Pneumatics N.V./S.A. Nijverheidsstraat 20, B-2160 Wommelgem, Belgium
BULGARIA	SMC Industrial Automation Bulgaria EOOD, Business Park Sofia, Building 8-6th floor, BG-1715 Sofia, Bulgaria
CROATIA	SMC IndustrijskaAutomatikad.o.o. ZagrebačkaAvenija 104,10 000 Zagreb
CZECH REP.	SMC Industrial Automation CZ s.r.o. Hudcova 78a, CZ-61200 Brno, Czech Republic
DENMARK	SMC Pneumatik A/S,Egeskovvej 1, DK-8700 Horsens, Denmark
ESTONIA	SMC Pneumatics Estonia OÜ,Laki 12, EE-10621 Tallinn, Estonia
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PORTUGAL	SMC España S.A. Zuazobidea 14, 01015 Vitoria, Spain
ROMANIA	SMC Romania S.r.l. Str-runcu 29, Sector 2, Bucharest, Romania
RUSSIA	SMC Pneumatik LLC. Business centre, building 3, 15 Kondratjevskij prospect, St.Petersburg, Russia, 195197
SLOVAKIA	SMC PriemyselnáAutomatizáciaSpols.r.o. Fantranská 1223, Teplickanadvahom, 01301, Slovakia
SLOVENIA	SMC IndustrijskaAvtomatikad.o.o. Mirnskacesta 7, SLO-8210 Trebnje, Slovenia
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SWEDEN	SMC Pneumatics Sweden AB,Ekhagsvägen 29-31, SE-141 71 Segeltorp, Sweden
SWITZERLAND	SMC Pneumatik AG,Dorfstrasse 7, Postfach, 8484 Weisslingen, Switzerland
TURKEY	SMC PnömatikSanayiTicaretveServis A.Ş. GülbaharCaddesi, Aydın Plaza, No: 9/4 Güneşli – 34212 , Istanbul
UK	SMC Pneumatics (U.K.) Ltd. Vincent Avenue, Crownhill, Milton Keynes, Buckinghamshire MK8 0AN, United Kingdom

SMC Corporation

URL : http// www.smcworld.com (Global) http// www.smcpu.com (Europe)
SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101 0021
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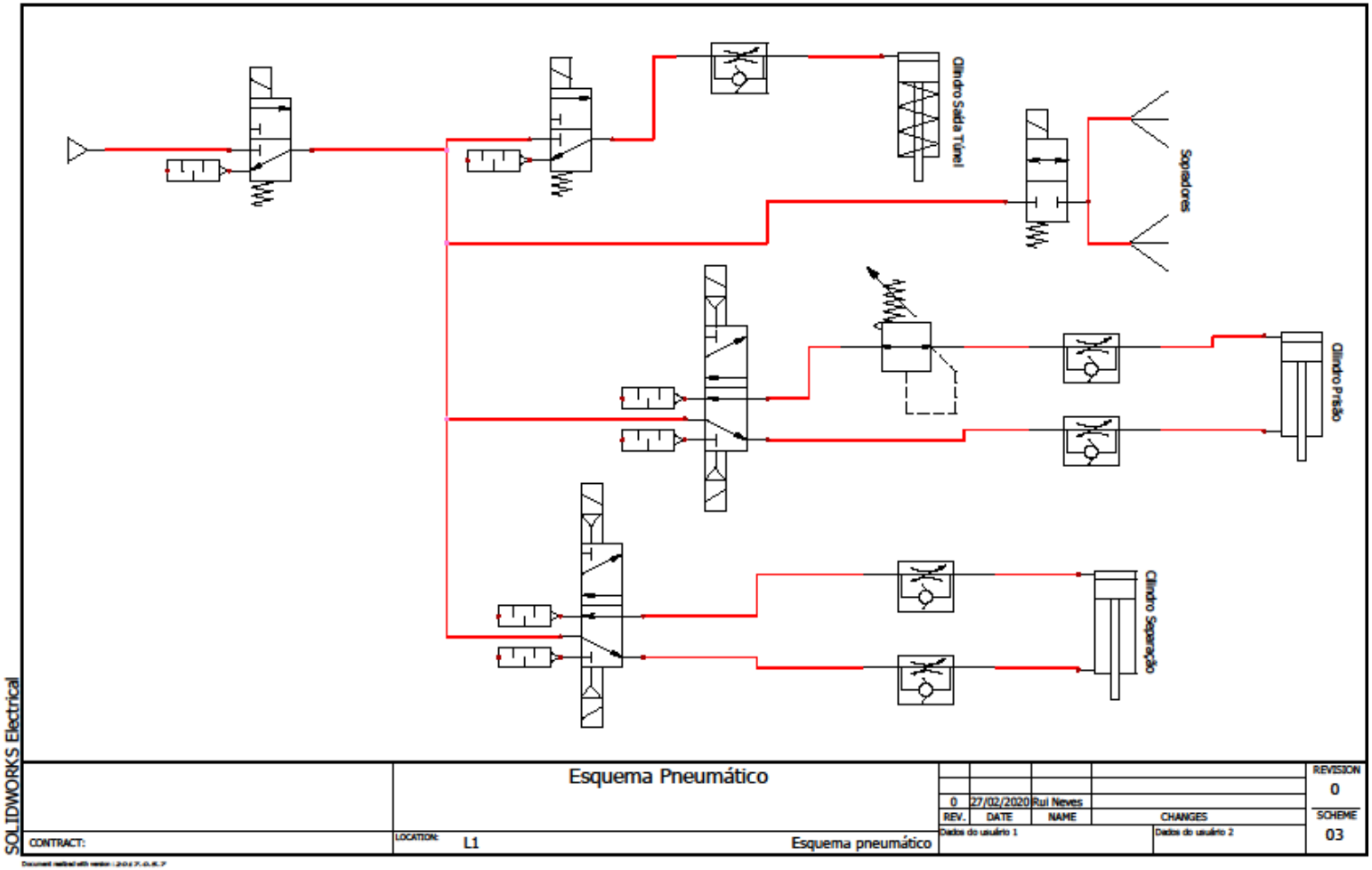
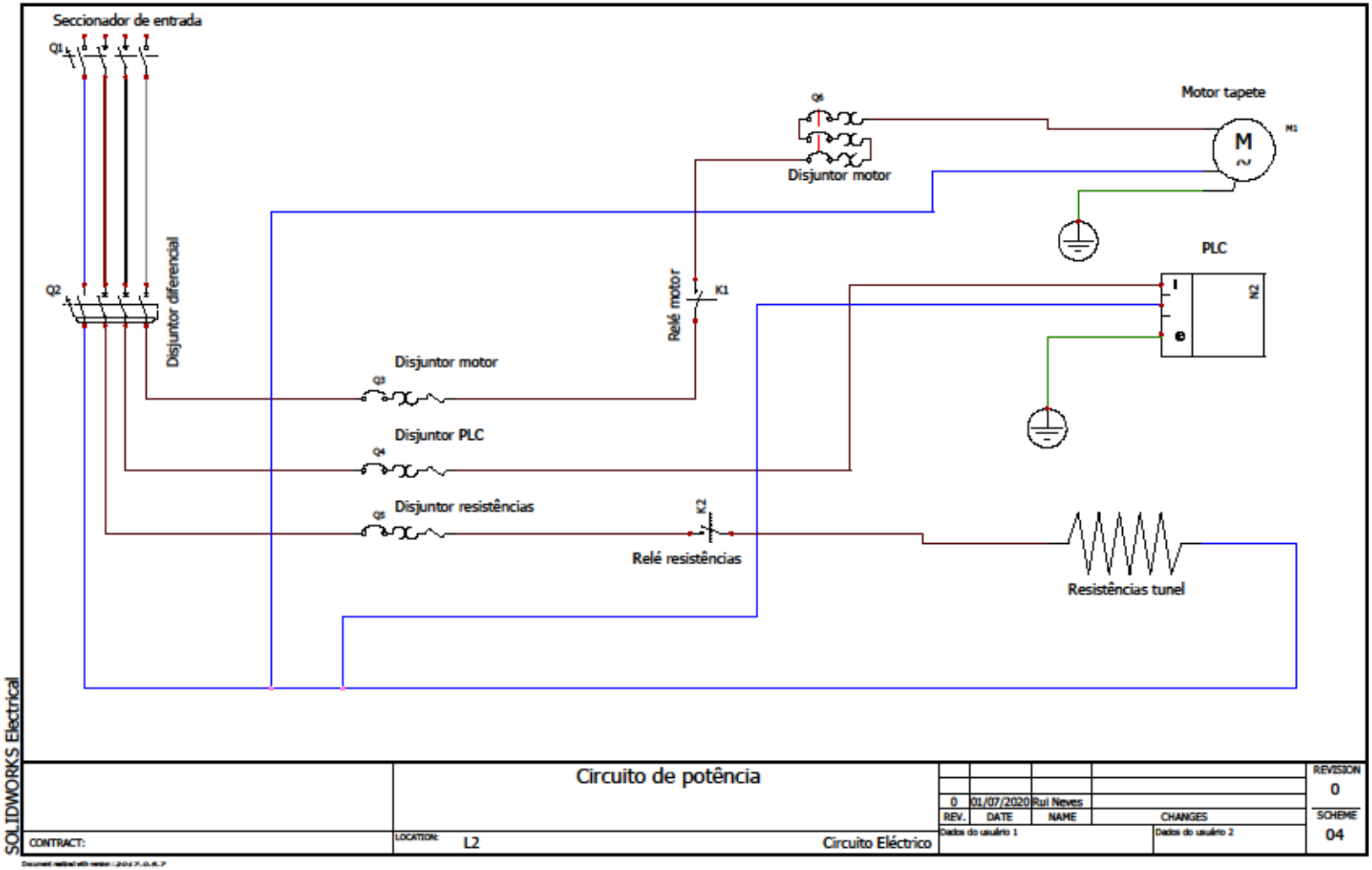
Anexo C – Esquemas elétricos e Pneumáticos

Esquema Pneumático



Circuito de Potência



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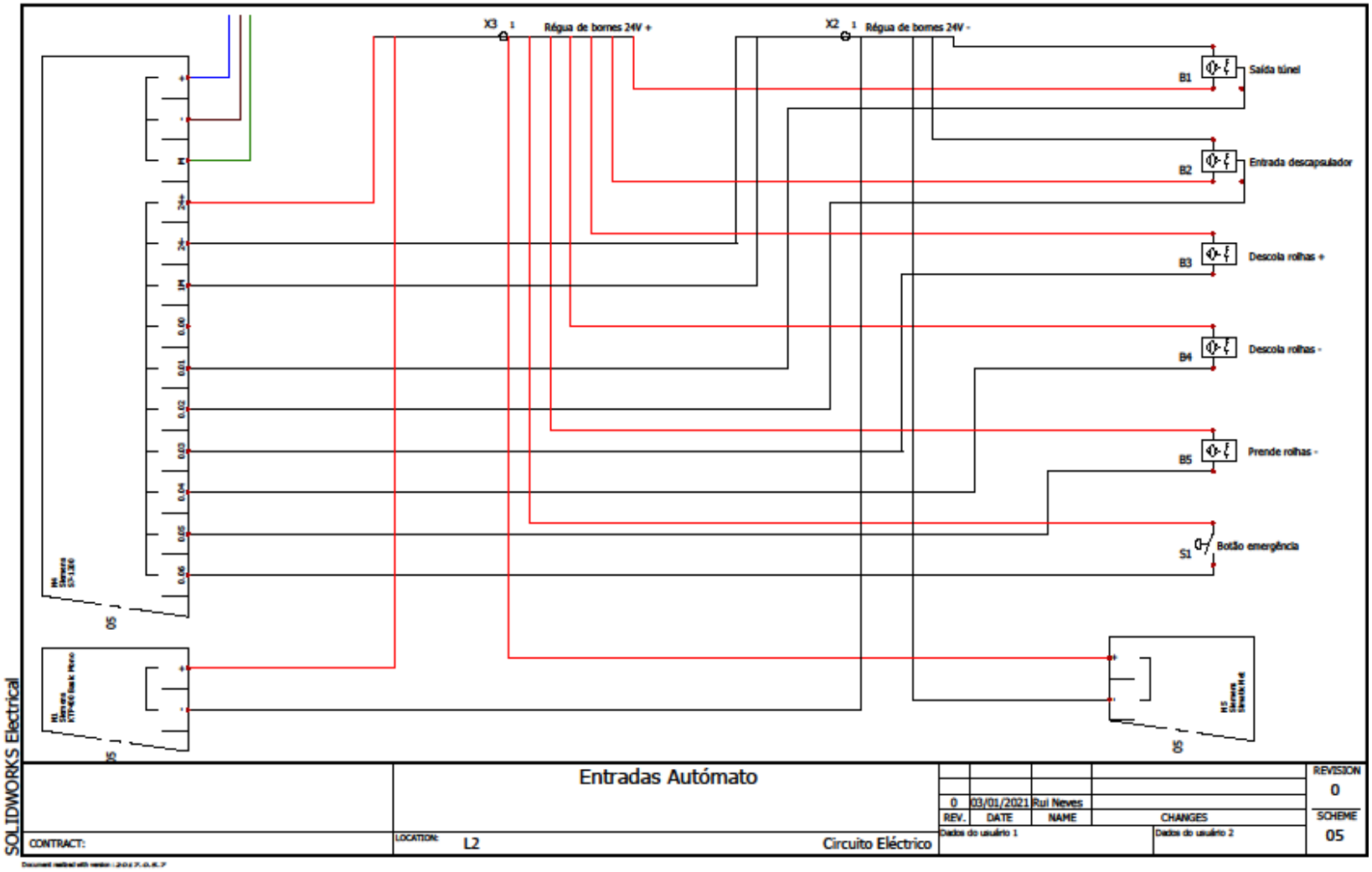
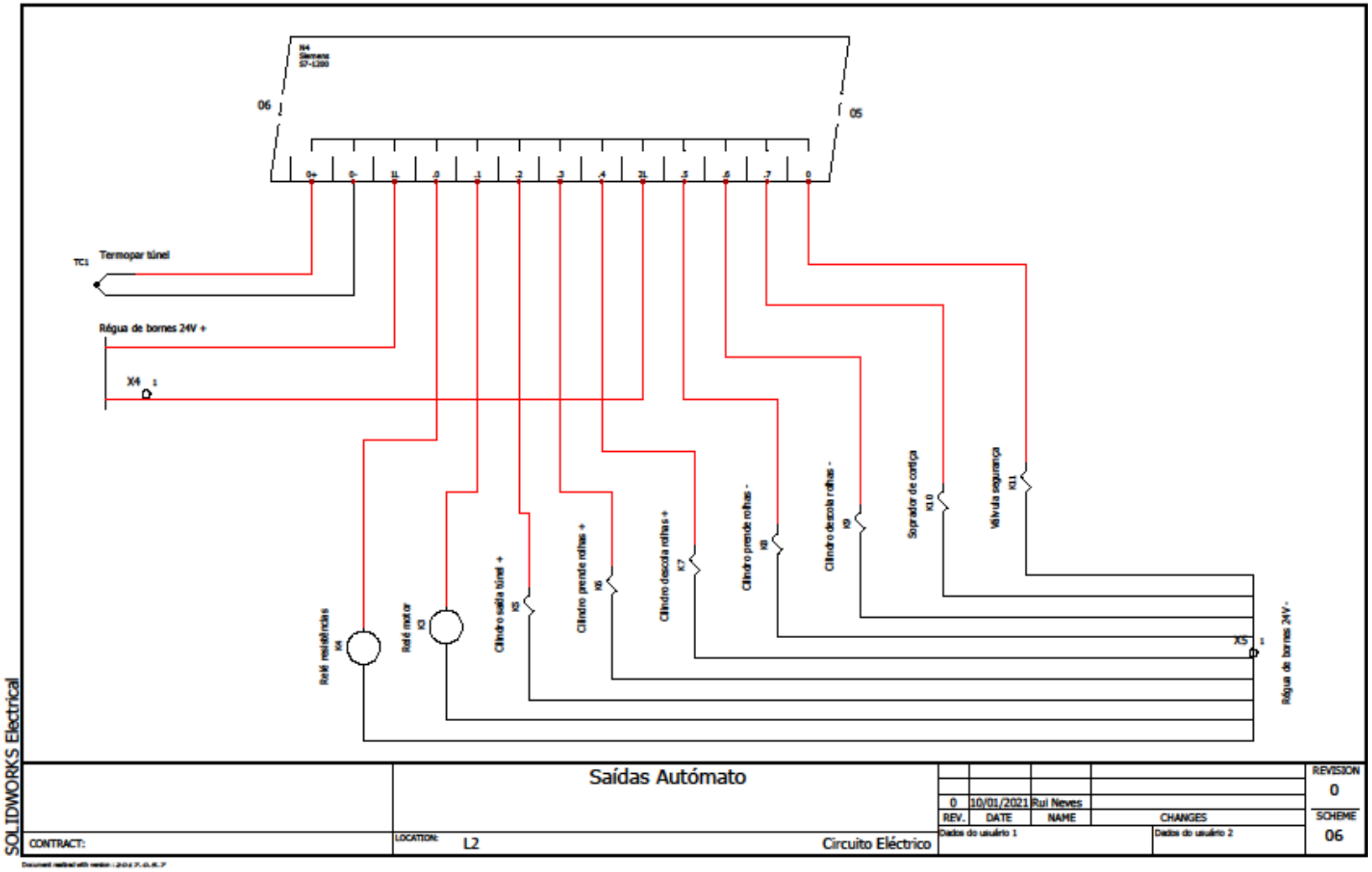
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