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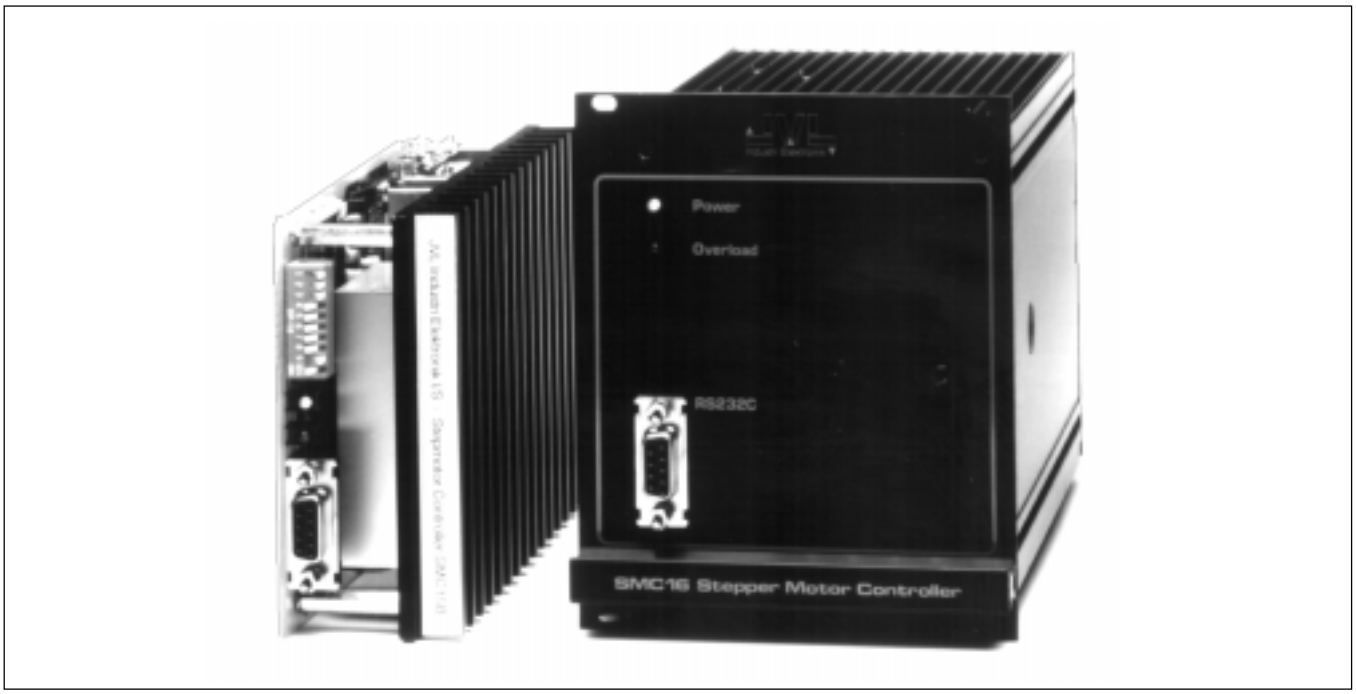
News from JVL

A newsletter from JVL Industri Elektronik Spring 1996

New Controller series with 1/4 and 1/8 th ministep

2nd generation Controllers give more value for money



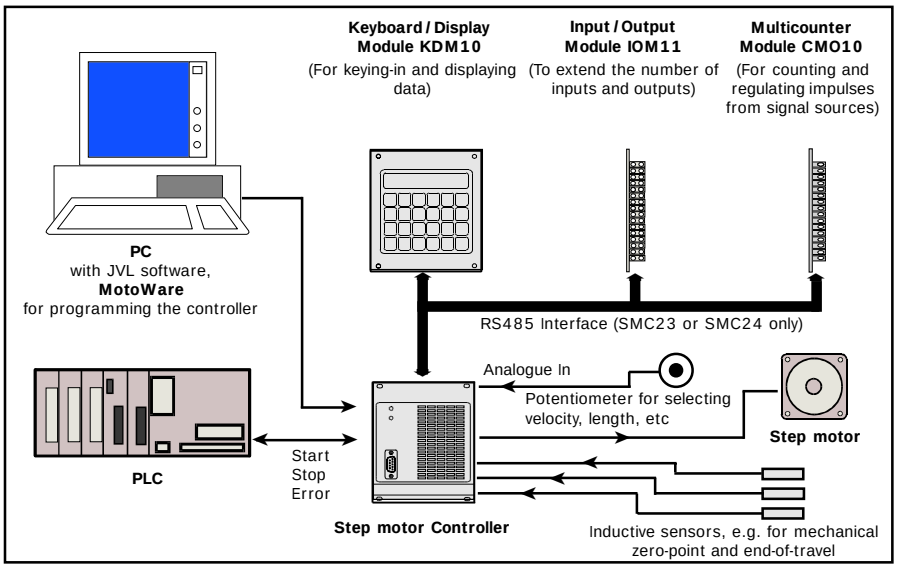
JVL is now introducing a second generation of step motor controllers. Five years of specialised expertise has been built into this new series of controllers to provide several new features, improved performance, better protection, and significantly improved EMC performance. The size of the controllers is unchanged however, so they can easily be used to replace earlier models and use the same expansion modules.

The new Controllers are designated SMC23, SMC24, SMC25 and SMC26, with a suffix "A" for 3A models and "B" for 6A models. All have 40V driver voltage.

Using the latest MOSFET technology, loss has been reduced by a factor of 4 to 5, thus reducing heat dissipation significantly. All controllers now also provide 1/4 and 1/8 step operation in addition to full and half-step operation. The latter mode now also includes *half-step compensation* which produces 40% more torque during half-step operation. In addition to standard protection against short-circuits and reverse polarity connection, the new controllers are now also protected against short-circuiting of the motor leads to ground.

The Controllers are constructed using 4-layer PCBs and equipped with EMI filters at all inputs and outputs to fulfil the requirements of the EMC directive.

All in all, a new state-of-the-art range of step motor controllers to satisfy all your requirements.



Assembly machines for insulin syringes

At Novo in Værløse and Hillerød in the north of Zealand, JVL Step Motor Controllers are used for automatic assembly of insulin syringes.

The "NovoLet" insulin syringe is used by millions of diabetics throughout the world every day. It enables diabetics to easily and painlessly inject the life-giving dose of insulin, often up to several times daily. Novo was the first to introduce this type of syringe on the market and they have become one of the company's major successes.

At Novo Nordisk A/S (Medical Devices) in Værløse and Hillerød in the north of Zealand, JVL Step Motor Controllers are used in connection with the assembly of the insulin syringes. Step motors are very advantageous in this process as they are quicker and more precise than compressed air machinery and at the same time offer a relatively simple and economic system construction.

Each of the assembly machines contains approximately 15 JVL SMC15A Controllers. Each Controller has its own program which determines the acceleration, deceleration, velocities, displacements, etc for the individual motors. All Controllers are controlled by diverse start/stop signals via a central PLC which is the “brain” of the machine.

In addition, an error signal path is routed from each Controller to the PLC so that if a blockage occurs, the operator is quickly notified of what is wrong and which motor control/workstation is jammed. Each Controller can itself reset the motor.

All of the Controllers in each machine are automatically powered from a central power supply Type PSU40-12 (40V/1.2kW). This provides an extremely compact and effective solution compared with using controllers with individual power supplies.

The individual tasks performed by the assembly machine with the help of step motors are:

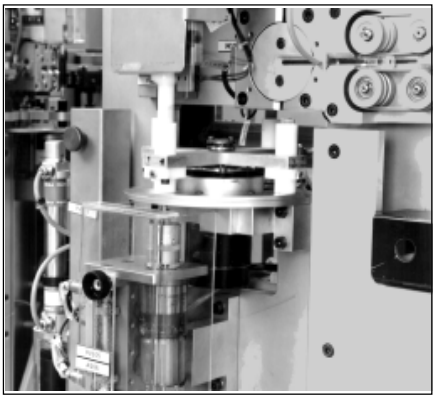
1) Rotation and location of units at 90 degree intervals.
2) Fixture of units.
3) Discrete movement of units in predefined increments.

One of the newer models of assembly machine includes JVL Controllers type SMC17A. This Controller offers the same features as SMC15A, but has a slightly different construction and, more important, is EMC tested, a factor on which Novo puts great emphasis for all new machines.

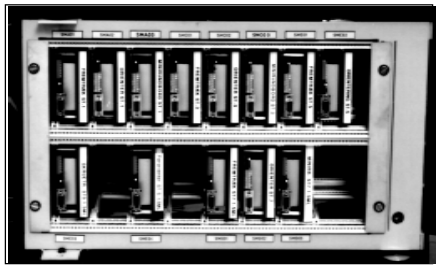
The new machines also use Zebotronics step motors, which are equipped with cable screw terminals so that the cable screens are terminated within the motor itself.

Several of these assembly machines are installed and in continuous operation they each produce over 40,000 syringes daily. After several years of production, the machines have demonstrated great operational reliability and yet another series is planned to meet the increasing demand for NOVO´s unique insulin syringes.

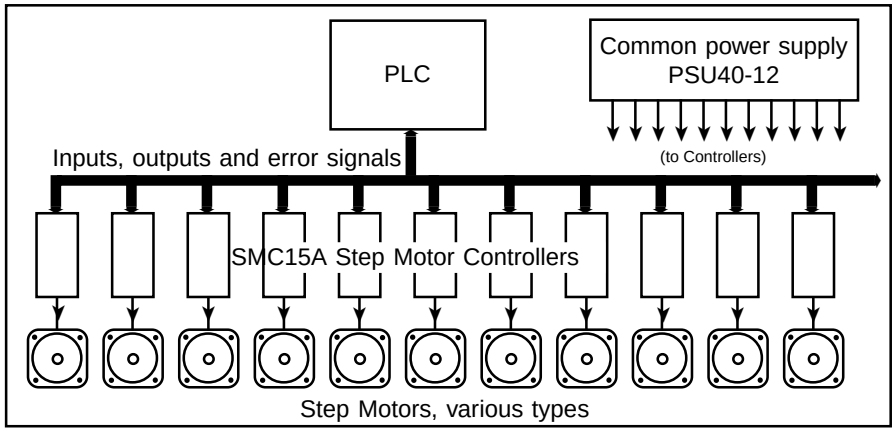
"NovoLet" assembly system at Novo Nordisk in Værløse.



Mechanical detail using step motor to position units.



The JVL Controllers mounted in a 19" rack.



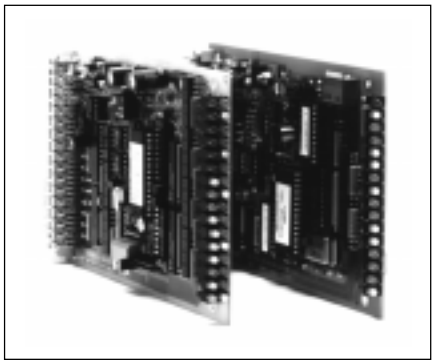
Modules provide Flexibility for Step Motor Control

JVL´s modules enable control systems to be constructed and expanded according to needs

One of the distinguishing features of JVL´s step motor systems is the range of expansion modules, which via a serial RS 485 interface provide the means to build up a system that approaches the size and complexity normally only achievable using a PLC system. A single system can consist of up to 31 modules, each of which is assigned its own unique address. The available modules are:

- **Keyboard/Display Module KDM10**
- **Display Modules DIS10, 11 and 12**
- **Input/Output Module IOM11**
- **Multicounter Module CMO10**

These modules can be used with three Controllers, SMC23, SMC24 and SMC30, which have a built-in module-interface and registers. The system configuration, using a standard interface and optical coupling at all critical inputs/outputs and in the module interface, results in a system with very high noise immunity, using standard 2-core cable for lengths of up to more than 500 metres between the Controller(s) and modules. This is very advantageous for large systems, where for example it is desirable to situate the Keyboard/Display Module at the operator's workplace while Input/Output and Counter Modules are located in proximity to various signal sources, relays, sensors and switches, and the Controller itself is installed in a control cabinet. Using JVL's modular system this can be achieved easily using standard 2-core cable.



• **Controller.** A system must include at least one Controller. This stores the control program which transmits and receives data to and from the other modules. The program is written in a very simple language using JVL's programming tool *MotoWare* and a standard PC. The program is then stored in the Controller via the RS232 interface. A system may also include several controllers, typically when several motors must be controlled independently of one another.

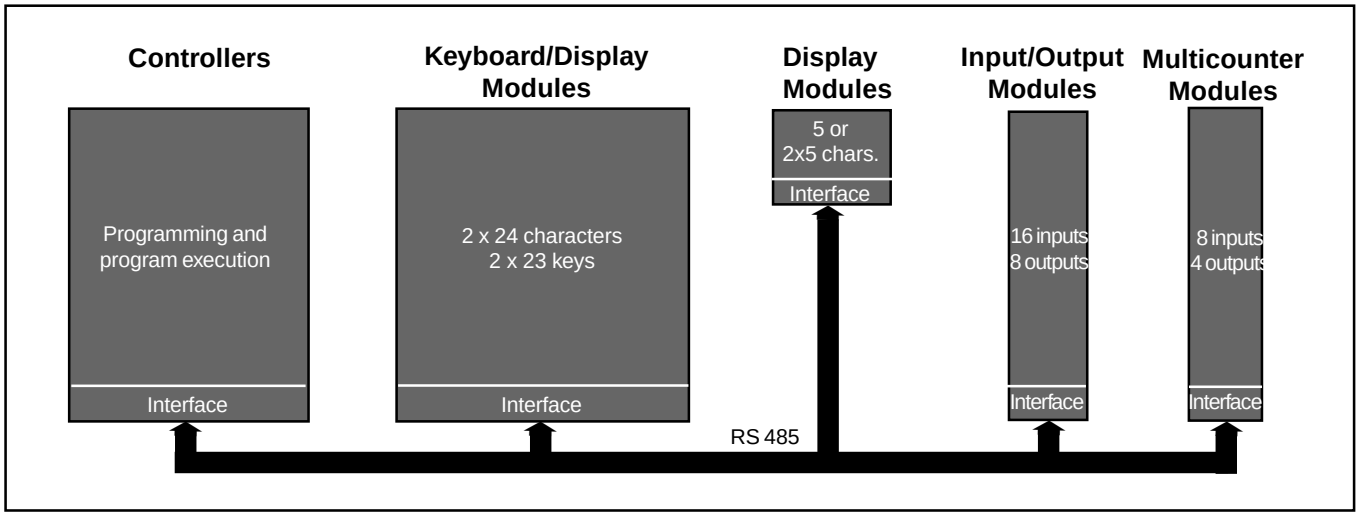
• **Keyboard/Display Module.** This module contains a 2-line, 24-character display and a 23-key keyboard with shift key for secondary functions. The Module can display data stored in the Controller registers and be used to input data to the control program, for example to display the motor position to an operator or to enable the operator to initiate a particular operation such as cutting a certain number of jobs in specified lengths, dosing a certain volume, opening a valve, etc.

• **Display Modules.** These are simple 5½-character LED displays which are available as single or double displays for showing the contents of Controller registers. These can be located where the information is needed.

• **Input/Output Module**. This module contains 16 inputs and 8 outputs as well as a "High-Speed" counter. An "A" version additionally includes a 12-bit analogue output with variable voltage or current which can be used for example to control frequency transformers, DC motors, etc. Together with a Controller, I/O modules can provide up to 496 inputs and 242 outputs. The counter can be used for simple registration of a number of events, e.g. number of steps, which can be transmitted to the Controller.

• **Multi Counter Module.** This module contains a counter which can count up and down. It has 4 outputs and 8 inputs, and is intended for use with encoders for determination of both position and velocity.

JVL's modular system, described very briefly here, has won widespread application in both large and small motion control systems in which many various parameters are controlled. It has proven to be a very simple and user-friendly system, both to configure and to adapt to changing needs.



New compact, programmable DC Controller

New DC Controller, first in a series of servo controllers

JVL's product range now includes a completely new, programmable DC Controller, DMC10. This Controller can control DC motors up to 1kW and is characterised by great flexibility for application and control. DMC10 can be controlled directly via the built-in RS232 interface, or indirectly via 4 digital inputs. These refer to 16 user-defined position and velocity references which are stored in the Controller's registers via the RS232 interface. Velocity control can also be achieved via an analogue input of +/- 10V. In addition, the DMC10 can operate as a step motor system via step-pulse and direction signals. 4 general-purpose outputs can be configured for example to signal that the motor has reached a desired position, or to give an error if the motor cannot operate.

The DMC10 is very easy to program. Various velocity profiles can be preset by defining acceleration, deceleration and velocity. The Controller also has built-in, programmable end-of-travel limits and a zero-point seek function.
For use as a signal from a feedback sensor to the digital control loop, the Controller accepts both balanced and unbalanced signals, e.g. from a standard 2-channel incremental encoder.
All inputs and outputs are galvanically isolated and overload protected to provide high immunity to unwanted spurious noise. Similarly, the Controller is protected against thermal overloads and short-circuits. The entire design has been planned so that EMC requirements are met as far as possible. The cabinet can be mounted in a 19"

rack or surface mounted.

Driver SMD 15 now with 1/4 and 1/8 mini steps

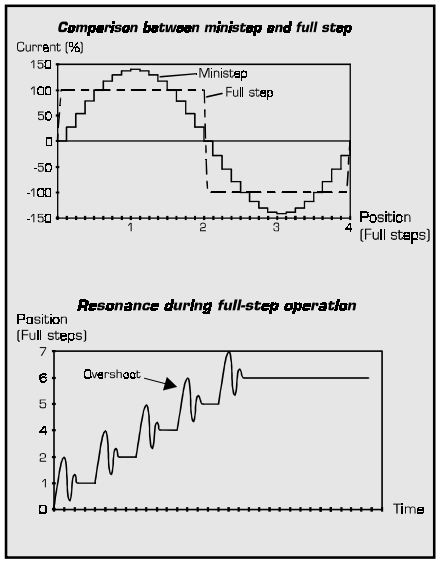
Subdivision of step-width gives greater positioning accuracy and smoother motor operation

In March 1995 we launched an improved model of our widely sold SMD15 Step Motor Driver. The new model is 100% compatible with the "old" SMD15, but additionally provides the facility for ministep operation with 1/4 and 1/8 step. The improved resolution enables a step motor to be positioned with an accuracy of 800 and 1600 steps/revolution, in addition to the earlier resolutions of 200 and 400 steps/revolution.

In general, ministep operation provides the advantage that audible noise from a motor is greatly reduced and mechanical resonances are significantly damped. Such resonances can often be critical, resulting in loss of torque.

As can be seen in the upper curve, during full-step operation the current is a maximum throughout the entire step duration, resulting in a very high angular velocity with each step. With ministep operation, the current is controlled in smaller increments, significantly reducing angular velocity. This minimises resonances/overshoot. Note that the peak current during ministep operation is 1.41 times greater than that during full-step operation. This ensures that the average motor current is 100% (the nominal value) and that the motor thus produces the same torque. The lower curve illustrates overshoot during full-step operation.

The improvements apply to the entire SMD15 driver series, and as mentioned above, the entire range



of JVL step motor controllers has also been updated to include the ministep function.

Industri Elektronik

...when motors must be controlled

Representative

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LJ 0007-01 GB

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