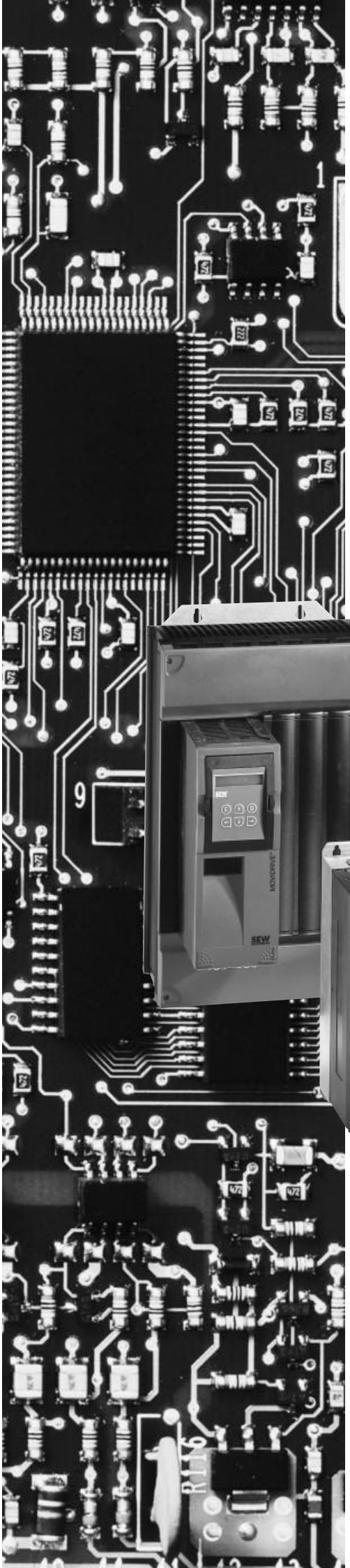
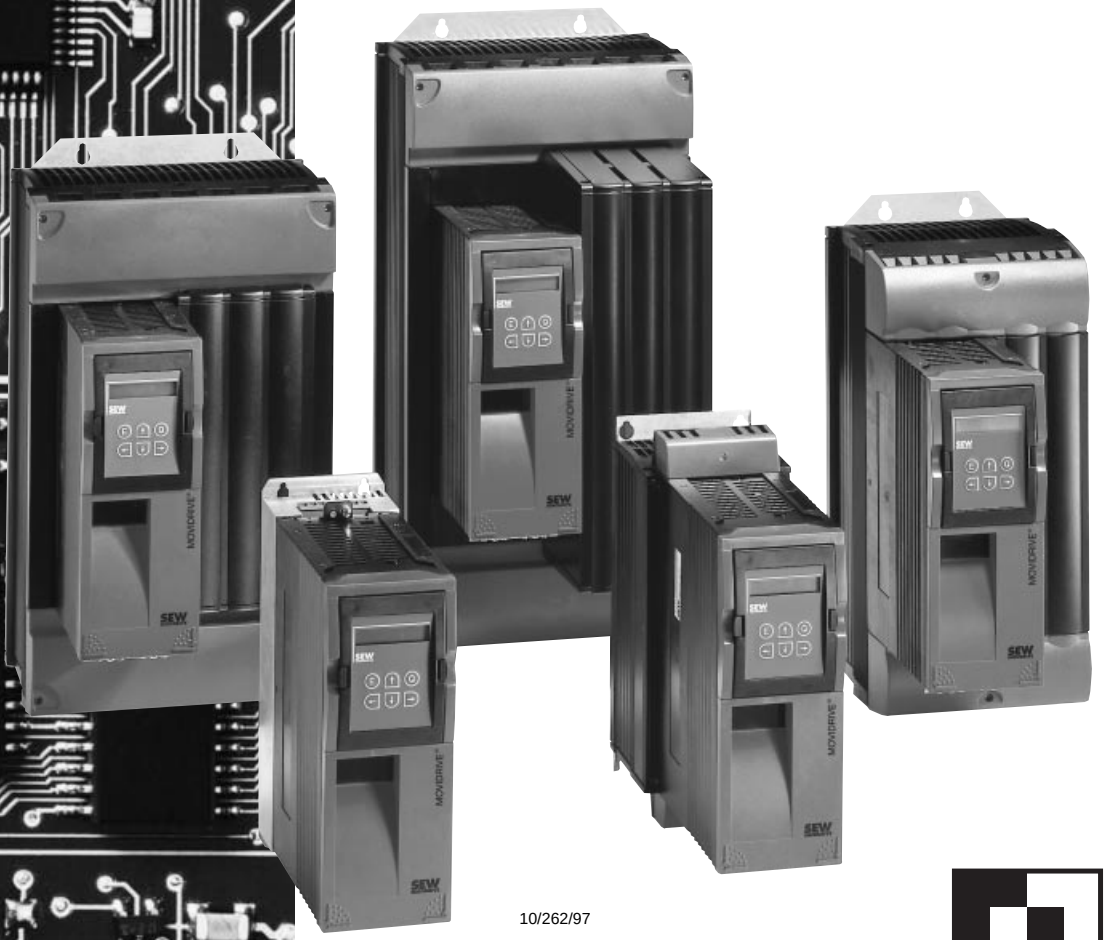


MOVIDRIVE® Drive Inverters

Manual

Positioning with Absolute Encoder and DIP11A Absolute Encoder Option

Edition 07/99



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DIN EN ISO 9001

SEW EURODRIVE

Important Notes

- **Read through this manual carefully before you start to install and commission MOVIDRIVE® drive inverters with DIP11A.**
  This manual assumes that the user has access to and is familiar with the documentation on the MOVIDRIVE® system, in particular the system manual and the "Positioning and Sequence Control IPOS$^{plus®}$" manual.

- **Safety notes:**
  Always follow the safety and warning instructions contained in this manual!
  Safety notes are marked as follows:

Electrical hazard, e.g. during live working.

Mechanical hazard, e.g. when working on hoists.

Important instructions for safe and fault-free operation of the driven machine/ system, e.g. pre-setting before commissioning.

- **General safety notes for IPOS$^{plus®}$:**
  The IPOS$^{plus®}$ positioning control allows you to match the MOVIDRIVE® drive inverter to the specifics of your application to a very high degree. As with all positioning systems there is, however, the risk of a programming error in the program, which may result in unexpected (not uncontrolled, though!) system behavior.

- Each unit is manufactured and tested to current SEW-EURODRIVE technical standards and specifications.
  The manufacturer reserves the right to make changes to the technical data and designs as well as the user interface herein described, which are in the interest of technical progress.
  A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that this information is observed.

- All revised information, as compared to edition 11/98, is indicated by a gray marker placed in the margin.

Contents

1 System Description

DIP11A absolute encoder option
Part number 822 777 2

The absolute encoder option extends the MOVIDRIVE® system to include an SSI connection for absolute encoders. This permits positioning functions to be implemented with IPOS$^{plus®}$ which offer the following possibilities:

- No reference travel is needed when the system is started or after a power failure.
- Positioning can either be direct with the absolute encoder or by means of the incremental encoder/resolver on the motor (in conjunction with MDV or MDS).
- Replacement of position switches on the travel distance, even without encoder feedback (in conjunction with MDF).
- Free processing of the absolute position in the IPOS$^{plus®}$ program.
- Both synchronous and asynchronous motors can be used in all MOVIDRIVE® operating modes (P700 / P701).
- The absolute encoder can be fitted both on the motor (in particular on DY motors) and on the track (e.g. high-bay warehouse).

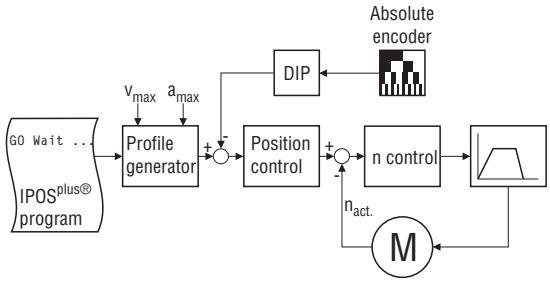
Absolute encoders used

The following encoders can currently be connected to the absolute encoder option (see also "Technical Data", Section 2):

HEIDENHAIN ROQ 424 (AV1Y)	(incremental encoder, non-programmable)
T&R CE65, CE100 MSSI	(incremental encoder, programmable)
T&R LE100 SSI	(laser distance measuring instrument)
T&R LA66K-SSI	(linear position sensor)
STEGMANN AG100 MSSI	(incremental encoder, non-programmable)
SICK DME-3000-111	(laser distance measuring instrument)
STAHL WCS2-LS311	(material measure with metal rule)
VISOLUX EDM	(laser distance measuring instrument)

DIP11A and processing in IPOS$^{plus®}$

Direct position control with absolute encoder (case 1)



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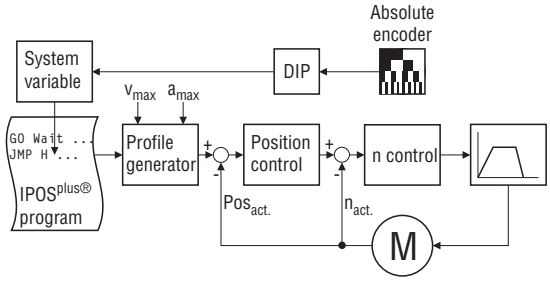
- Direct position control in IPOS$^{plus®}$ by means of the absolute encoder connected via DIP11A.
- An incremental encoder/resolver (X15) is always required on the motor for speed feedback.
- Automatic slip compensation between the incremental encoder/resolver of the motor and the absolute encoder.
- In IPOS$^{plus®}$, positioning commands such as “GOA ...” are performed with reference to the source actual position (in this case: absolute enc. (DIP)).
- The dynamic response which can be achieved depends on the properties and the mechanical attachment of the absolute encoder as well as the position resolution.

Position control with incremental encoder on motor, Processing of the absolute encoder position in the IPOS$^{plus®}$ program (case 2)



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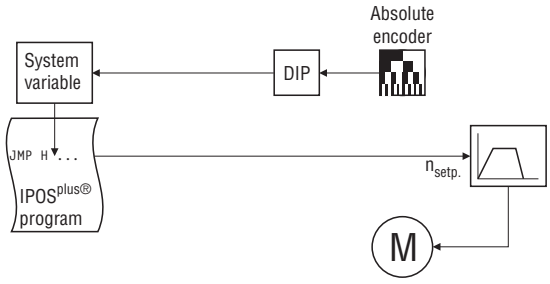
- Position control in IPOS$^{plus®}$ by means of the motor encoder connected to X15.
- An incremental encoder/resolver is always required on the motor for speed feedback.
- The high dynamic response of the inverter can be used directly for positioning.
- The position information of the absolute encoder is automatically reflected in an IPOS$^{plus®}$ variable and can be processed under program control.
- This application of the DIP11A is used for avoiding reference travel.

Processing of the absolute encoder position in the IPOS$^{plus®}$ program (case 3)



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- The position information of the absolute encoder is automatically reflected in an IPOS$^{plus®}$ variable and can be processed under program control.
- This application of the DIP11A can be used in particular for replacing applications in which positioning is undertaken using rapid traverse/creep speed by means of several proximity switches.
- No incremental encoder/resolver is required on the motor for speed feedback; a standard asynchronous motor can be used.

Encoder registration

- Monitoring of the change in position when the limits of the travel range are violated.
- The system's travel range can be calibrated to within the registration range of the encoder. Consequently, the encoder can be installed in any position and can subsequently be set so there is no change of position in the travel range.
- Couting directed adjustable via parameters.
- When an encoder is replaced, the startup procedure can be repeated with the help of MOVITOOLS. Individual parameters can also be adjusted via the DBG11A keypad or MX_SHELL.

Encoder monitoring

The DIP11A possesses the following monitoring and correction mechanisms which are needed because the SSI interface does not have its own protocol safeguard feature:

- Evaluation of a power failure or error bit
- Plausibility check of the actual position signalled by the encoder
- Compensation of dead times due to reading cycles of encoder (refresh time)

Control functions

- **Touch-probe function**
  Touch-probe makes it possible to register the current position of the absolute encoder via a binary input. The time-lag is exceedingly small. For example, this makes it possible to register positions very precisely using proximity switch signals and process these positions in the program.
- **Override**
  In the case of direct position control of the connected absolute encoder, the activated override also acts directly on the programmed travel parameters.

2 Technical Data

Option		DIP11A absolute encoder option		
Part number		822 777 2		
Binary inputs	X60:1 – 8 DI10 – DI17	Isolated via optocoupler (EN 61131-2)	$R_i \approx 3.0\ k\Omega$ $I_{in} \approx 10\ mA$	Sampling time: 5 ms PLC compatible
Signal level		+13 V – +30 V -3 V – +5 V	= "1" = "0"	To EN 61131-2
Control functions		→ Menu P60_		
Reference terminal	X60:9 DCOM	Reference for binary inputs X60: DI1Ø–DI17		
Reference terminal	X60:10 DGND	Reference potential for binary signals, only for non-isolation (DCOM-DGND) of the external command switches		
Binary outputs	X61:1 – 8 DO10 – D=17	PLC compatible Response time: 5 ms		
Signal level		"0" = 0 V	"1" = 24 V	**Important:** Do not apply external voltage!
Control functions		→ Menu P62_, I_{max} = 50 mA (short-circuit proof)		
Reference terminal	X61:9 DGND	Reference potential for binary signals		
Resolver connection	X62:1 X62:3 X62:5 X62:6 X62:8 X62:9	Data + Clock + DGND Data - Clock - 24 V output (max. 500 mA)[1]		
Weight		0.2 kg (0.44 lb)		

1) An external power supply to the inverter or the encoder is usually required (→ Sec. 3.4 and the MOVIDRIVE® system manual, Sec. 4.16).

2.1 Supported encoders

Manufacturer	Type[1]	Note
VISOLUX Elektronik GmbH D-10969 Berlin	VISOLUX EDM	Laser distance measuring system
TR-Electronic GmbH D-78647 Trossingen	T&R CE65, CE100-MSSI T&R LE 100 SSI T&R LA66K-SSI	Standard encoder Laser distance measuring system Linear position sensor
Max Stegmann GmbH D-78166 Donaueschingen	STEGMANN AG100 MSSI	Standard encoder for SEW DY motors
Sick AG D-79177 Waldkirch	SICK DME 3000-111	Laser distance measuring system
R. Stahl Fördertechnik GmbH D-74653 Künzelsau	STAHL WCS2-LS311	Metal rule as material measure

1) See Sec. 3.5 for precise specifications.

3 Project Planning

3.1 Encoder selection

When selecting the absolute encoder, the following points should be considered with priority in order to achieve optimum travel characteristics and good dynamic properties in the system:

- **Position measurement should be conducted without slip,** i.e. the incremental encoders must be driven non-slip via toothed belts. Avoid drive configurations with friction wheels.
- **Position measurement must be rigid,** i.e. flexibility and play must be avoided.
- **The resolution of the position measurement must be as high as possible.** The more encoder increments counted for each position unit, the greater the accuracy which can be achieved when moving to target positions. The control system can also be set for a more direct response.
- **The "refresh time"** (the time taken for the absolute encoder to determine a new actual position) **should be as short as possible.** Ideally, less than 1 ms. This value exerts a decisive influence on the dynamic characteristics of the drive.
- **The actual position output by the absolute encoder should not be averaged or filtered,** otherwise the dynamic properties of the drive are severely reduced.

Encoders which can be used with the DIP11A absolute encoder option are divided into three categories. These are:

1. Multiturn incremental encoders such as T&R CE100M SSI, CE65M SSI, Stegmann AG100
2. Laser distance measuring instruments such as VISOLUX EDM, Sick DME3000-111
3. Linear position measuring systems such as Stahltronik WCS2-LS311

Multiturn incremental encoders

- The ideal application involves having power transmitted from the motor shaft to the load without slip.
  In this case, the absolute encoder can be mounted on the motor shaft of the drive. This keeps the installation costs very low whilst the position resolution is generally very high due to the gear ratio.
- If the position measurement is performed using an externally mounted incremental encoder (synchronous encoder), it is essential to make sure the ratio between the encoder and the toothed belt is adequate. The ratio of the position resolution between the motor encoder and the synchronous encoder should not be less than a factor of 8.

Example: Travel drive with the following data

Motor:	R97 DV160L4 BM IG11, i = 25.03
Diameter of drive wheel:	150 mm
Diameter of encoder pinion:	65 mm
T&R CE65MSSI encoder with:	4096 x 4096 increments

Position resolution when mounted on the motor shaft:

$$\text{position resolution}_{motor} = i \cdot 4096 \cdot \frac{1}{\pi \cdot 150\ mm} = 217 \frac{Inc}{mm}$$

Position resolution when mounted on the track:

$$\text{position resolution}_{track} = 4096 \cdot \frac{1}{\pi \cdot 65\ mm} = 20 \frac{Inc}{mm}$$

The ratio between the position resolution of the motor/track is 10.9 (greater than 8). The diameter of the encoder pinion ought to be reduced.

Laser distance measuring instruments

Distance measurement with laser systems is based on a run-time measurement of pulsed infrared beams. Various measurement values have to be averaged in order to enable a position value to be determined accurately with this procedure. As a result, these systems are subject to a delay of approx. 50 ms in position measuring.

This delay affects the dynamics and positioning accuracy of the drive.

Therefore, the operator has to observe the following information when using or planning the procurement of laser distance measuring devices:

- Ensure non-slip arrangement when installing measuring system, e.g. in travel drives for storage and retrieval units for high-bay warehouses install system at low position. The shifting motion of the rack may otherwise affect the system accuracy.
- The maximum acceleration of the drive should not exceed 0.8 m/s².
- The properties of the encoder generally result in a lower limit for positioning accuracy of ±3 mm.
- The lengthy delay means that the speed pre-setting might have to be drastically reduced.
- The position controller gain can only be set to small values (0.1 – 0.4) as a result of the long delay. As a result, highly dynamic properties cannot be achieved.
- There is a lag fault which is dependent on the speed, making it harder to monitor the drive (delayed shut-off in the event of a fault).

Material measure by metal rule

The working method of this system corresponds to that of the multiturn incremental encoder. There is no averaging, so this system is not subject to a delay in position measurement.

Linear position measuring systems offer the following advantages:

- No reduction in dynamic properties.
- Speed feedforward of 100 % possible, so no lag fault which is dependent on speed.
- Monitoring functions are fully in effect, small lag fault window possible.

However, there are also disadvantages:

- Poor position resolution of 0.8 mm. The required positioning accuracy should not be less than ±2 mm.
- Rather complicated mechanical installation due to the need for routing the metal rule.

3.2 Setting parameters

Information about project planning with the absolute position measuring system

The measuring range of the selected measuring system must be larger than the distance to be covered. This means the registration range must be larger than the work area needed.

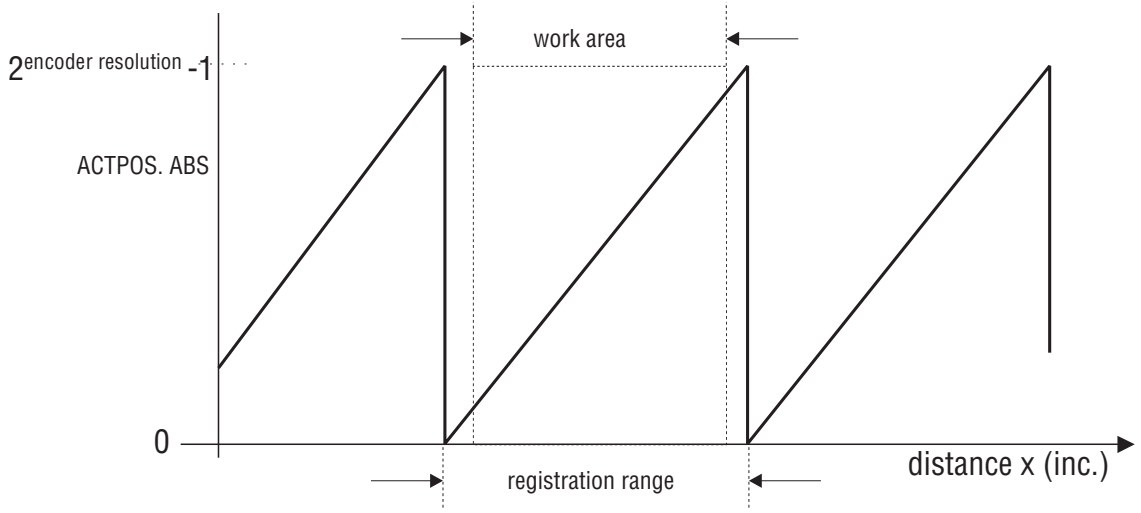


Fig. 1: Project planning for the registration range

3.3 Combination of options

See also Sec. 7.16 in the MOVIDRIVE® system manual.

MOVIDRIVE® MD_	**F/V/S**	**F/V/S**	**F/V/S**	**F/V/S**	**F/V/S**	**F/V/S**	**V/S**	**V/S**	**V/S**	**F/V/S**	**V/S**
→ ↓	DIP11A	DFP11A	DFI11A	DFC11A	DFD11A	DIO11A	DRS11A	DPA11A	DPI11A	No 2nd option	
Abs. encoder DIP11A	–	R I L	R I L	R I L	R I L	R I L	R I L	–	–	R	
PROFIBUS DFP11A	L I R	–	–	–	–	L I R	L I R	–	–	L	
INTERBUS DFI11A	L I R	–	–	–	–	L I R	L I R	–	–	L	
CAN DFC11A	L I R	–	–	–	–	L I R	L I R	–	–	L	
DeviceNet DFD11A	L I R	–	–	–	–	L I R	L I R	–	–	L	
I/O option card DIO11A	L I R	R I L	R I L	R I L	R I L	–	R I L	R I L	R I L	R	
Synch. operation DRS11A	L I R	R I L	R I L	R I L	R I L	L I R	–	–	–		R
Pos. ctrl. DPA11A	–	–	–	–	–	L I R	–	–	–		L
Pos. ctrl. DPI11A	–	–	–	–	–	L I R	–	–	–		L

– = Not possible together

L I R = card in the left-hand column in the OPTION1 slot,
card in the 2nd table heading line in the OPTION2 slot.

R I L = card in the left-hand column in the OPTION2 slot,
card in the 2nd table heading line in the OPTION1 slot.

3.4 Project planning for the external 24 V_{DC} voltage supply

See also Sec. 4.16 in the MOVIDRIVE® system manual.

The internal 24 V_{DC} power supply of MOVIDRIVE® has a maximum power of 29 W. An external 24 V_{DC} power supply unit must be connected to terminal X10:9 (VI24) if a higher power level is needed due to options installed on the 24 V_{DC} level. This power supply unit then takes over the complete 24 V_{DC} power supply for MOVIDRIVE®. The tables below specify when an external 24 V_{DC} power supply unit is needed and what output power this power supply unit must provide. MOVIDRIVE® units without options do not need an external 24 V_{DC} power supply as a rule.

The information for the power requirement of the options differentiate between typical and maximum values.

The typical power requirement assumes:

- The binary outputs are connected to a PLC and are loaded with I = 20 mA.
- The 24 V_{DC} outputs (VO24) are not loaded.
- The master and line resolvers of the DRS11A are powered from an external supply.

24 V_{DC} power requirement of MOVIDRIVE® type MDF:

Size	DIP11A typical[1]/maximum	DIP11A and DIO11A typical[1]/maximum	DIP11A and fieldbus typical[1]/maximum
1/2	29/43* W	37*/61* W	31*/45* W
3	30*/44* W	38*/62* W	32*/46* W
4	32*/46* W	40*/64* W	34*/48* W
5	37*/51* W	45*/69* W	39*/53* W

1) Depending on the encoder power supply

* External 24 V_{DC} power supply unit with at least this power is necessary.

24 V_{DC} power requirement of MOVIDRIVE® type MDV:

Size	DIP11A typical[1]/maximum	DIP11A and DIO11A typical[1]/maximum	DIP11A and fieldbus typical[1]/maximum	DIP11A and DRS11A typical[1]/maximum
1/2	35*/49* W	43*/67* W	37*/51* W	45*/69* W
3	36*/50* W	44*/68* W	38*/52* W	46*/70* W
4	38*/52* W	46*/70* W	40*/54* W	48*/72* W
5	42*/56* W	50*/74* W	44*/58* W	52*/76* W

1) Depending on the encoder power supply

* External 24 V_{DC} power supply unit with at least this power is necessary.

24 V_{DC} power requirement of MOVIDRIVE® type MDS:

Size	DIP11A typical[1]/maximum	DIP11A and DIO11A typical[1]/maximum	DIP11A and fieldbus typical[1]/maximum	DIP11A and DRS11A typical[1]/maximum
1/2	31*/45* W	39*/63* W	33*/47* W	41*/65* W
3	32*/46* W	40*/64* W	34*/48* W	42*/66* W
4	34*/48* W	42*/66* W	36*/50* W	44*/68* W
5	38*/52* W	46*/70* W	40*/54* W	48*/72* W

1) Depending on the encoder power supply

* External 24 V_{DC} power supply unit with at least this power is necessary.

3.5 Setting the encoder parameters

The following points must be observed in the design and construction of encoders and when setting their parameters:

HEIDENHAIN ROQ 424 (AV1Y)

The unit designation **specifies all required conditions.**

T&R CE 65, CE 100 MSSI, LE 100 SSI, LA 66K-SSI

- 24 data bits have to be set and programmed to logical 0. There may be either 0 or an error or power failure bit in the 25th bit. No other special bits after this position are evaluated. The 25-bit version is not supported.
- The output code must be programmed to Gray.
- The output mode must be set to "Direct."
- The interface must be set to SSI.

STEGMANN AG100 MSSI

Only the 24-bit version is supported.

SICK DME 3000-111

The output code must be programmed to Gray.

STAHL WCS2-LS311

The unit designation specifies all required conditions. The line length for the encoder is not to exceed 10 m (33 ft.).

VISOLUX EDM

Types: EDM 30/120/240 - 2347/2440

All modes are supported. Recommendation: Mode 0 (DIP switches 3 and 4 to ON) or mode 3 (DIP switches 3 and 4 to OFF) and measurement with triple reflector (DIP switch 2 to OFF).

4 Installation

4.1 Supported unit types

The DIP11A absolute encoder option can be operated with MD..60A drive inverters in the MOVIDRIVE® range. The position is evaluated using the integrated positioning control IPOS$^{plus®}$.

4.2 Installing the option card

Before you begin:

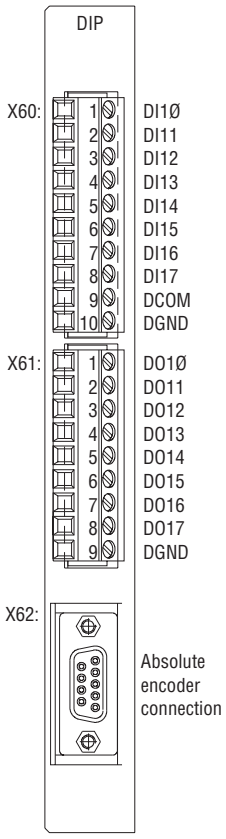
- Take suitable measures to dissipate any electrical charge in your body before you touch the option card (discharge strap, conductive shoes, etc.).
- Keep the option card in its original packaging and do not remove it until before it is to be installed.
- Do not touch the option card more than necessary, and only hold it by the edges of the circuit board. Do not touch any components.

Installing the option card:

- De-energize the inverter. Switch off the mains and the 24 V supply, if used.
- Remove the lower hood cover from the control module.
- Unscrew the electronics shield clamp.
- Remove the black cover plate.
- Insert the option card into the guide rails of the OPTION2 slot and push it in.
- Apply moderate pressure to the plug panel on the front to push on the option card. The option card has been clipped in correctly when it is flush with the control card.
- Screw the electronics shield clamp back on.
- Connect the option card.
- Put the hood cover of the control module back on.
- It may not be possible to fit the hood cover, depending on which sub D connector is used. However, this does not impair the enclosure of the unit.
- The DIP11A option card is now fully installed.

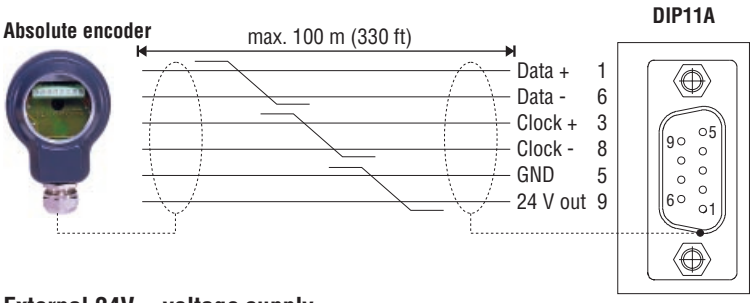
4.3 Terminal assignment and encoder cabling

- Max. line length (DIP11A – absolute encoder):
  100 m (330 ft) with a cable capacitance per unit length ≤ 120 nF/km (193 nF/mile).
- Use a shielded cable with twisted-pair conductors and the shield connected at both ends (on the housing of the sub D connector and on the encoder housing).



Terminal		Function	
Binary inputs	X60:1 – X60:8	DI10 – DI17	
	X60:9	DCOM	
	X60:10	DGND	
Binary outputs	X61:1 – X61:8	DO10 – DO17	≤ 50 mA (short-circuit proof)
	X61:9	DGND	
Encoder connection	X62:1	Data +	
	X62:3	Clock +	
	X62:5	Encoder ground	
	X62:6	Data -	
	X62:8	Clock -	
	X62:9	24 V out	≤ 500 mA

Internal $24V_{DC}$ voltage supply



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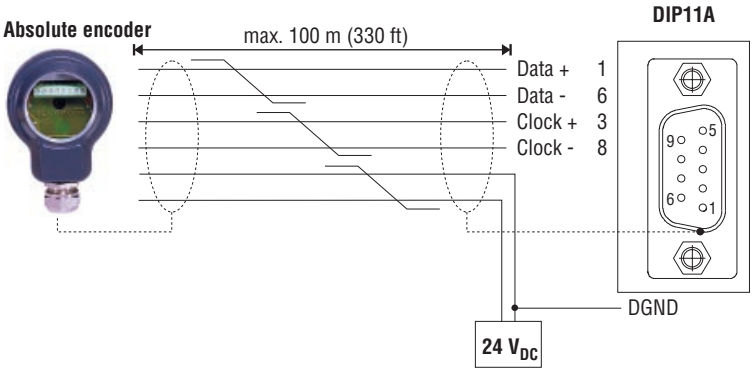
External $24V_{DC}$ voltage supply



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4.4 Shielding and routing of the encoder cables

Having the cables correctly shielded cuts out parasitic interference which can occur in an industrial environment. The following measures enable the best possible shielding to be achieved:

- Tighten the retaining screws of plugs, modules and equipotential bonding conductors until finger-tight.
- Only use connectors with a metal housing or a metallized housing.
- Connect the shield in the connector over a large surface area.
- Apply the encoder cable shielding on both ends.
- Do not route encoder cables parallel to power cables (motor cables); use separate cable ducts if possible.
- Only use metal, grounded cable racks in industrial environments.
- Route the signal cables and the associated equipotential bonding over a short distance and close together.
- Avoid using plug connections to extend encoder cables.
- Route the encoder cables closely adjacent to available grounding surfaces.

IMPORTANT!

In the event of fluctuations in the ground potential, a compensating current may flow along the shield which may be connected at both ends and to the ground potential (PE). In this case, make adequate provision for equipotential bonding in accordance with the relevant VDE regulations.

5 Startup

5.1 General startup instructions

The drive must be taken into operation in conjunction with the MOVIDRIVE® drive inverter as described in the MOVIDRIVE® system manual. It must be possible to move the drive using a suitable setpoint and control source.

Furthermore, it is necessary to ensure that:
- the installation of the DIP11A,
- the cabling,
- the terminal assignment
- and the safety cut-outs

have been configured correctly and suitably for the application.

There is no need to activate the factory settings. If you do call up a factory setting, this causes the MOVIDRIVE® parameters to be reset to default values. This also affects the terminal assignment, which must be altered to the required settings if necessary.

MOVITOOLS gives you the option for a guided startup. Dialog windows will prompt you to enter the required data and actions. You will need to start the MOVITOOLS manager and establish a connection with the inverter by selecting the corresponding interface and unit address. Execute the SHELL program and initiate the startup sequence via the menu [Startup] / [Startup for / DIP]. Any further information will be explained in the dialog windows.

After startup with MOVITOOLS, only the "Source Actual Position" (→ page 18) has to be indicated.

Perform the startup procedure for the DIP11A option step-by-step, observing the sequence of parameter settings described below. If error message F92 "DIP registration range" appears during startup, acknowledge it with a reset and continue with the startup. This message should not appear once the startup has been carried out successfully.

Encoder type P950

The encoder used is selected with (P950) encoder type. The following encoder systems are supported:

VISOLUX EDM	Laser distance measuring instrument
T&R CE65, CE100 MSSI	Incremental encoder
T&R LE 100 SSI	Laser distance measuring instrument
T&R LA66K-SSI	Linear distance sensor
HEIDENHAIN ROQ 424 (AV1Y)	Incremental encoder
STEGMANN AG100 MSSI	Incremental encoder
SICK DME-3000-111	Laser distance measuring instrument
STAHL WCS2-LS311	Metal linear scale

The connected type is selected from the list of possible encoders. Other encoders must be checked for their suitability and authorized by SEW-EURODRIVE.

Motor sense of rotation P35_

Moves the drive in the positive direction at low speed. If the actual position P003 counts upwards, it is possible to leave parameter P350 “Change direction of rotation” unchanged (use MX_SHELL or DBG11A to display the actual position). Change over P350 if the actual position counts downwards.

Counting direction P951

Moves the drive in the positive direction at low speed. If the absolute encoder position (H509) counts upwards, it is possible to leave parameter P951 “Counting direction” unchanged. P951 must be changed over if the absolute encoder position counts downwards.

Encoder scaling P955

If no motor encoder has been installed (no speed control), set the parameter to “1.“ The position information of the absolute encoder will be multiplied by the set value. The parameter is set so the travel information ratio between the motor encoder and the absolute encoder is as close to “1“ as possible.

For measurement purposes, set the parameter to 1 at first. Then note the values in variables H509 (ACTPOS. ABS) and H511 (ACTPOS. MOT). Move the drive by about 1 motor revolution (H511). Determine the difference between the noted values and the actual values and calculate the quotient.

$H509_{old}$ ..... – $H509_{new}$ ..... = $H509_{difference}$.....
$H511_{old}$ ..... – $H511_{new}$ ..... = $H511_{difference}$.....

$$\text{Quotient } Q..... = \frac{H511_{difference}.....}{H509_{difference}.....}$$

Set parameter ENCODER SCALING (P955) to the value closest to the calculated quotient Q, preferably the smaller value.

Position offset P953

The position offset (P953) only needs to be set on incremental encoders; it should be set to 0 for other encoders.
This parameter is used for shifting the change of position of the absolute encoder to a position outside the working range. Move the drive to approximately in the center of the working range. If error message F92 “DIP registration range” appears when this is being done, acknowledge it with a reset and continue with the startup. Read out the value of variable H509 (ACT. POS. ABS) and enter the following value in the “Position offset” parameter (P953):

P953 = (Variable H509) - 0.5 x Registration range

Zero offset P954

Zero offset is used for assigning the value you want to a specific position. The range of values can adopt positive or negative position values. The maximum valid parameter must not be exceeded. The limit is determined by the range of values of the numerator ($\pm 2^{31}$) and the range of values of the absolute encoder.

Move the drive to a known position. Read out the value of variable H509 (ACTPOS. ABS) and enter the following value in the zero offset parameter (P954):

P954 = (Variable H509) - Required value

The required value is the display value you wish to have for the current position.

Encoder factors P942 and P943

The parameters are used for internal adaption of the closed-loop speed control and for monitoring functions in the DIP11A.

1. Note the values of the variables H509 (ACTPOS. ABS) and H511 (ACTPOS. MOT).
2. Move the drive by about 30,000 increments (H511).
3. Determine the difference between the noted and the new values of the variable.
   $H509_{old}$ ..... – $H509_{new}$ ..... = $H509_{difference}$.....
   $H511_{old}$ ..... – $H511_{new}$ ..... = $H511_{difference}$.....
4. The differences may not be greater than 32,767 (2^{15} –1). If one of the values is greater, divide them so that you will receive smaller values or repeat the process with a shorter travel distance.
5. Enter the results $H511_{difference}$ in the parameter ENCODER FACTOR NUMERATOR (P942) and $H509_{difference}$ in the parameter ENCODER FACTOR DENOMINATOR (P943).

If there is no motor encoder (no MOVIDRIVE® speed control), it is recommended to estimate the ratio of encoder scaling to motor revolution. The value of the motor encoder is then 4096 increments per motor revolution.

To determine the value of ENCODER FACTOR DENOMINATOR (P943) proceed as described above. Set the value of P942 to "4096 x number of motor revolutions travelled".
The accuracy of the encoder scaling is not so important in this case (no speed control). The values are used only for a secondary check of the absolute values of the DIP11A.

Source actual position P941

This parameter determines which position encoder is used for position control when an operating mode "... & IPOS" is set in parameter 700 "Operating mode".

IPOS$^{plus®}$ has positioning commands for controlling the motor connected to the MOVIDRIVE®. Set the "Source actual position" to "Absolute encoder DIP" if the motor is to be positioned by the absolute encoder.

Important: The circuit gain for position control of IPOS$^{plus®}$, parameter 910 "Gain X controller" was preset during commissioning of the speed control loop. The preset requires position control to the motor encoder. The difference in encoder resolution or the time characteristics of the absolute encoder (e.g. laser distance measuring instrument) may require a smaller adjustment value.

Set half the value of the calculated preset. Start an IPOS$^{plus®}$ program with a positioning operation between two valid points at moderate speed. Reduce or increase parameter 910 "Gain X controller" step-by-step until the best movement and positioning characteristics have been set.

The position value provided by the absolute encoder is available in variable H509 (ACTPOS. ABS). The position value can be processed with the internal IPOS$^{plus®}$ control even without direct positioning.

6 Unit Functions

6.1 Encoder evaluation

All connected encoders are always evaluated irrespective of the operating mode (P700). Operating modes with positioning (VFC-n-CTRL & IPOS, CFC & IPOS, SERVO & IPOS) always require a motor encoder on X15. The actual positions can be evaluated with the touch-probe function.

Encoder type		Absolute encoder on DIP11A P941: Absolute encoder (DIP)	Incremental encoder simulation P941: External encoder (X14)	Incremental encoder / resolver P941: Motor encoder (X15)
Connection		X62 / DIP11A	X14 / basic unit	X15 / basic unit
Actual value on variable		H509 / ACTPOS. ABS	H510 / ACTPOS. EXT	H511 / ACTPOS. MOT
Resolution		Absolute position **after** conversion with: zero offset (P954), position offset (P953), counting direction (P951).	**Actual** number of encoder gradations (with 4-fold evaluation)	**Always** 4096 inc./motor revolution, irrespective of the actual encoder resolution
Touch-probe	**Edge at DI02**	H503 / TP. POS1ABS	H506 / TP. POS1EXT	H507 / TP. POS1MOT
	Edge at DI03	H502 / TP. POS2ABS	H504 / TP. POS2EXT	H505 / TP. POS2MOT
	Max. deceleration time	1 ms	< 100 µs	< 100 µs

6.2 Functions relevant for absolute encoders

The monitoring functions listed below do not depend on the use of the DIP11A. However, knowledge of the range of functions is important for optimum use.

Speed monitoring:

Speed monitoring checks the manipulated variable of the n-controller and, in M control mode, the actual speed range. The motor encoder is always used for the speed signal, so the "DIP11A encoder" is either not "checked" with speed monitoring P50_ or not "checked" directly.

Lag error monitoring:

When lag error monitoring is active, it checks the difference between the current setpoint position and the actual position. The maximum permitted amount is set using P923 (lag error window). This monitoring function is only effective if the drive is in positioning status. The resolution is always "encoder increments" (exception: parameter 941 = motor encoder (X15), in which case it is 4096 incr./motor rev. irrespective of the number of encoder gradations).

Axis in position message:

This function also operates with the encoder increments resolution of the encoder set using parameter 941 (exception: parameter 941 = motor encoder (X15), in which case it is 4096 incr./ motor rev. irrespective of the number of encoder gradations).

The function always returns "Axis in position = 0" if no positioning mode is set using parameter 700 or the drive is in reference travel status.

Reference travel:

Reference travel and all parameters associated with it (900 – 903) as well as the reference travel command all refer to the motor position (X15) and, consequently, to the motor encoder.

The "Axis referenced" signal (A-terminal fct.) refers to a completed reference travel of the motor position.

Targeted setting of the "ACTPOS. EXT" (X14) H510, e.g. set with IPOS$^{plus®}$.

The DIP11A position "ACTPOS. ABS" on variable H509 is the conditioned position value. It is created with the absolute value supplied from the encoder, taking account of the DIP11A parameters 952 Counting direction, 953 Position offset and 954 Zero offset.

Software limit switches:

The function of the software limit switches (if switched on) monitors whether the current target position (TARGET POSITION H492) is in the valid range. The function is active (if switched on) when the drive is referenced or parameter 941 = absolute encoder (DIP) is set and the drive is in positioning status. Reference travel must be performed if positioning is to "external encoder (X14)" and the limit switches are required.

System variables relevant for absolute encoders:

System variables:	Explanation:
H503: "TP.POS1ABS"	Touch-probe position DIP11A encoder
H502: "TP.POS2ABS"	Touch-probe position DIP11A encoder
H509: "ACTPOS. ABS"	Absolute position after conversion with zero offset, position offset, counting direction, encoder scaling

6.3 Display values

The MX_SHELL software and the DBG 11 A keypad OPTION display the position information of the motor encoder in parameter group P00_ "Display values / Process values". The same applies to the fieldbus information of the PE data "ACTUAL position LOW and HIGH".

System variable H509 (ACTPOS. ABS) contains the conditioned position value of the absolute encoder. The value can be viewed in MX_SHELL and the DBG 11 A. Transfer with the fieldbus is implemented by setting the PE data allocation to "IPOS PE-DATA" and writing the PE data with the SetSys command in the IPOS$^{plus®}$program.

Writing PE data with the SetSys command can also be used if an actual position (irrespective of the encoder) is to be transferred with scaling.

7 IPOS^plus® Parameters

The factory setting is underlined.

P941 Source actual position

The parameter defines the encoder to which IPOS^plus® performs positioning movement:

Motor encoder (X15)
Ext. encoder (X14)
Absolute enc. (DIP)

P942 Encoder factor numerator
P943 Encoder factor denominator

The ratio of these two parameters describes the correlation of the position values from the motor encoder to the absolute encoder (position information of absolute encoder is always multiplied with parameter955).

This setting is required:

- to realize the plausibility check of the two position values with each other (error message F95, plausibility error)
- to adjust the positioning ramp and the positioning speed to the absolute encoder (the derivation of the absolute encoder information is calculated as actual motor speed) to correctly evaluate the startup values (e.g. n-precontrol, M precontrol, filter, P share).

An inaccurate setting results in a deviation of positioning ramps and the positioning speed. It can also cause an error message F95, plausibility error.

P942 and P943 are calculated during startup of the DIP11A.

Adjustment range: 1 – 32767

P950 Encoder type

The absolute encoder connected to X62 of the DIP11A is selected. Only those encoders in the list can be selected.

	Cycle frequency [kHz]:			
	min.	**nom.**	**max.**	**adjustable with P952**
NO ENCODER				
VISOLUX EDM	125	300	1000	600
T&R CE65, CE100 MSSI	80	300	1000	600
T&R LE100 SSI	80	300	820	600
T&R LA66K-SSI	80	300	1000	600
HEIDENHAIN ROQ 424 (AV1Y)	90	300	1100	600
STEGMANN AG100 MSSI	70	250	500	500
SICK DME-3000-111	70	300	1000	600
STAHL WCS2-LS311	100	250	500	500

P951 Counting direction

This parameter defines the counting direction of the absolute encoder. The counting direction must be set so the absolute encoder position increases when the motor is running at a positive speed (alter the motor sense of rotation P350 / P351 if necessary).

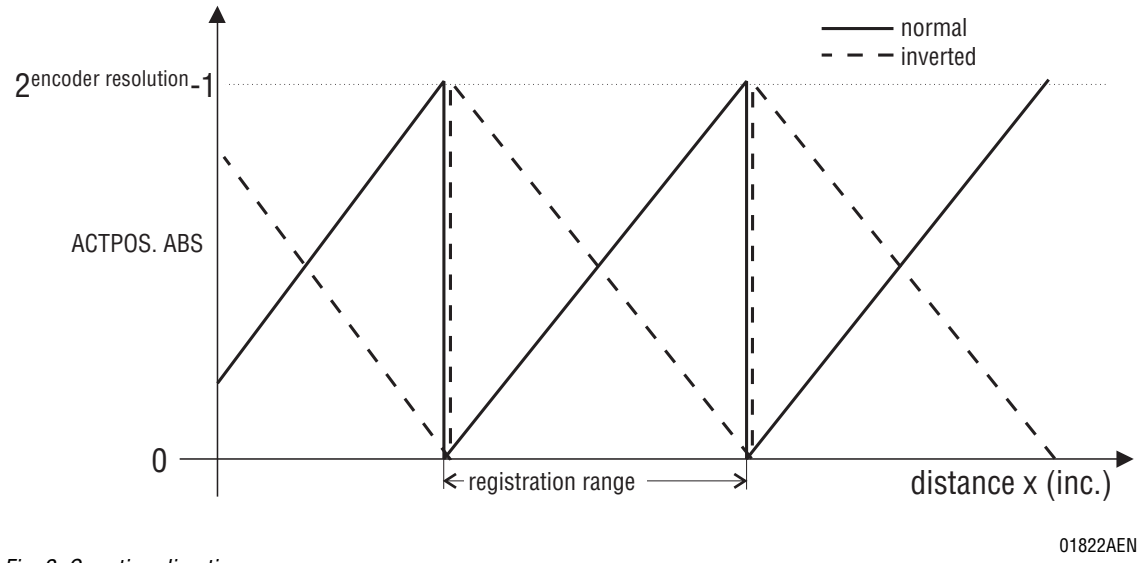


Fig. 2: Counting direction

Setting: NORMAL / INVERTED

P952 Cycle frequency

This parameter makes it possible to define the cycle frequency with which the DIP11A reads out absolute information from the absolute encoder.

100 % cycle frequency corresponds to the nominal frequency. The nominal frequency relates to the encoder manufacturer's information for a cable length of 100 m.

The cycle frequency can be increased by reducing the cable length. Reading out the position values more quickly improves the closed-loop control properties. It is not possible to increase it to more than the maximum encoder cycle frequency.

The cycle frequency may have to be reduced if the cable length is increased, so as to avoid getting incorrect data. It is not possible to reduce the cycle frequency to below the minimum encoder cycle frequency.

Adjustment range: 1 – 200%

P953 Position offset

After the encoder has been installed, the working range of the system does not usually correspond to the registration range of the encoder prior to initial startup. Parameter P953 must be set in order to adapt the encoder registration range to the working range.

Example:

The system is to be set so the middle of the registration range corresponds to the middle of the working range. To do this, the drive is positioned to the middle of the working range. Enter the following as the value for parameter P953:
Input value (P953) = Actual value of encoder - (0.5 × Encoder registration range).

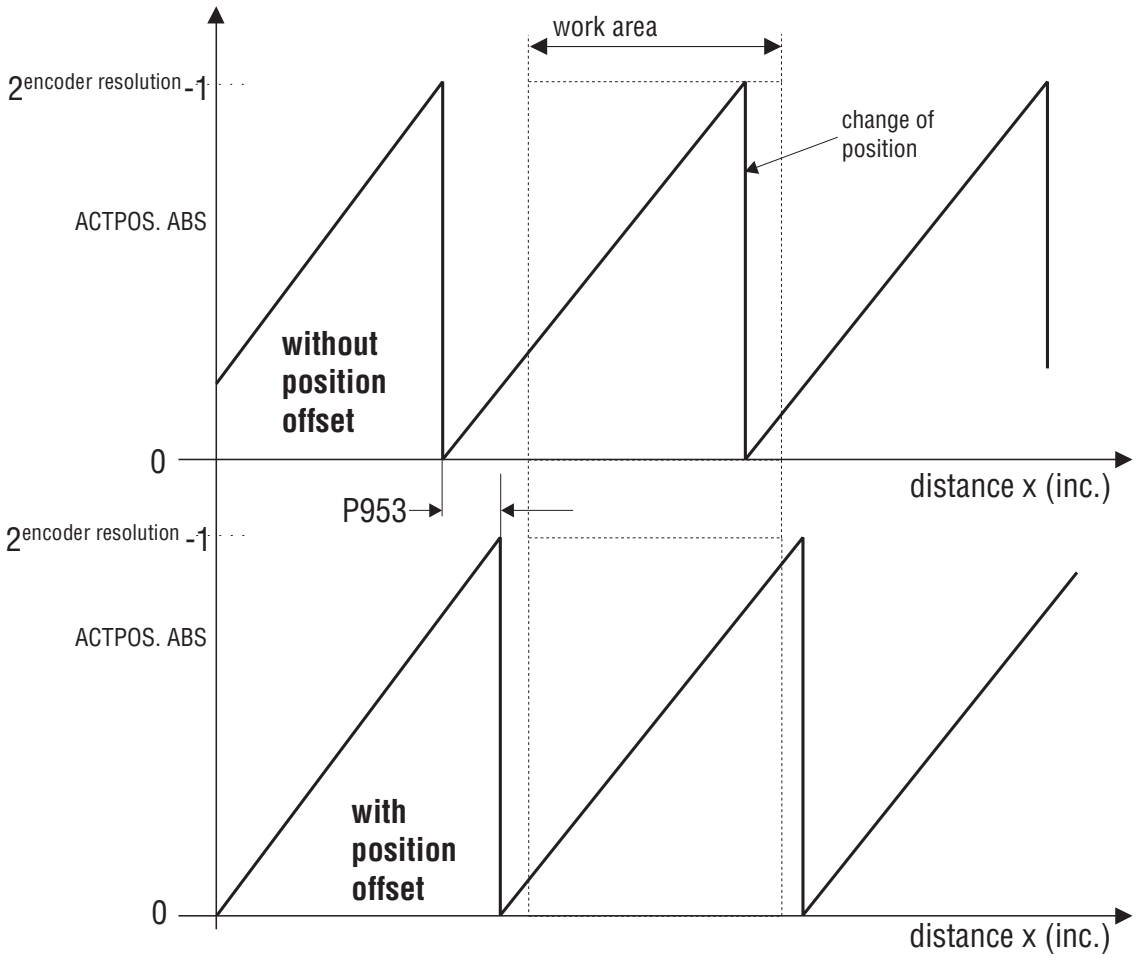


Fig. 3: Position offset

Adjustment range: $-(2^{31}-1)$ – 0 – $+2^{31}-1$

P954 Zero offset

The zero point of the encoder display is specified with the zero offset.

Example:

The encoder displays the value P in the current position. The position display P' is required.

Input value (P954) = P - P'

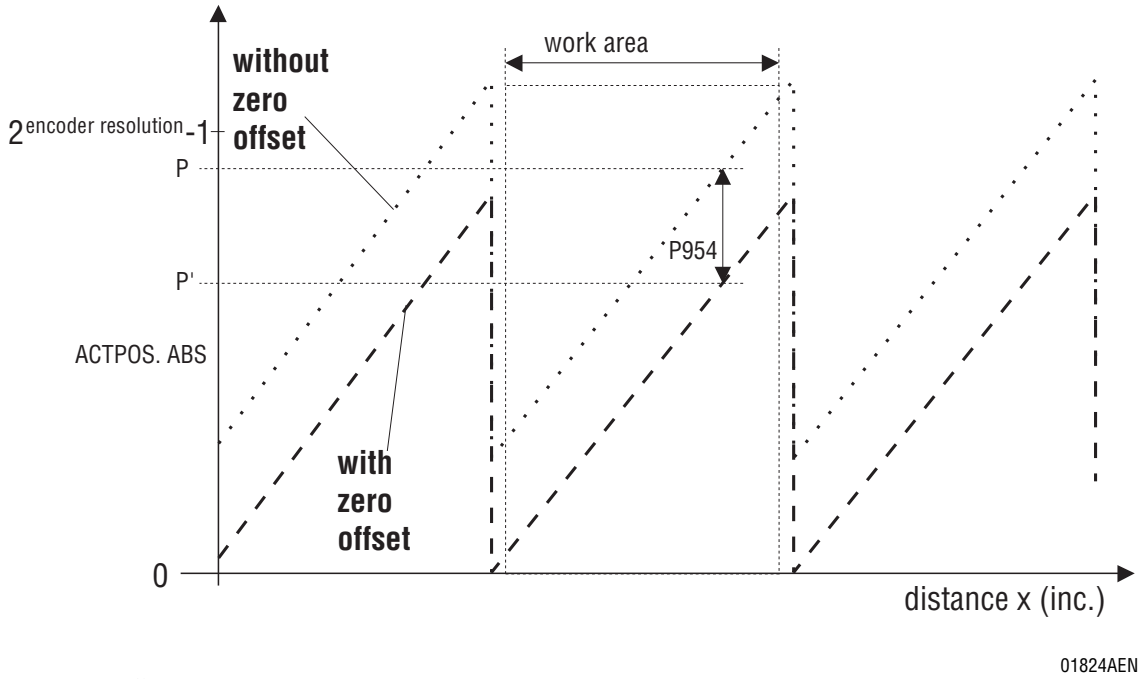


Fig. 4: Zero offset

Adjustment range: -(2^{31}-1) – <u>0</u> – + 2^{31}-1

P955 Encoder scaling

This parameter is irrelevant unless there is a motor encoder present. In this case, set parameter to “x1.“

The parameter is set so the travel information ratio between the motor encoder and the absolute encoder is as close to “1” as possible.

Important:

Encoder scaling has a direct effect on parameters 953 “Working range”, 954 “Zero offset”, 942 and 943 “Encoder factors “numerator” and “denominator” as well as on parameter group 92_ “IPOS Monitoring”. The setting of all listed parameters has to be adjusted every time the encoder scaling is changed!

Adjustment range: <u>x 1</u> / x 2 / x 4 / x 8 / x 16 / x 32 / x 64

8 Combination with Other Options

The DIP11A may be connected to option card slot 1 or option card slot 2.

All parameters relevant to the DIP can be set using the DBG.

Of the permitted possible combinations, attention must be paid to the function and organization of the terminal assignment when the "terminal expansion" DIO 11A or a fieldbus option is used.

- *Terminal assignment*
  The MOVIDRIVE® operating system permits the assignment of eight binary input terminals and eight binary output terminals on one option card. The following organization must be applied if the DIP11A is used together with a DIO11A "I/O card" or a fieldbus interface:

Functions			Input terminals		Output terminals	
			DIO11A	DIP11A	DIO11A	DIP11A
Terminals set/read with	Variable		H483		H482	
	Bit	DIP11A with DIO11A	6 – 13	14 – 21	3 – 10	11 – 18
		DIP11A with fieldbus	–	6 – 13	–	3 – 10
	Terminal		DI10 – DI17	DI10 – DI17	DO10 – DO17	DO10 – DO17
Parameters 61.. and 63.. and JMP HI/LO I...	DIP11A with DIO11A		Effective	–	Effective	–
	DIP11A with fieldbus		–	Effective	–	Effective

It is always possible to set and read terminals with variables, irrespective of which additional option is used together with the DIP11A. If the DIP11A is used in conjunction with a fieldbus interface, the virtual fieldbus terminals are only available in IPOS$^{plus®}$ by reading the process output data (GETSYS Hxxx PO-DATA).

The synchronous operation option with DRS11A can be used without changes in conjunction with the DIP11A. The possibility of using IPOS$^{plus®}$ to switch over between positioning and synchronous operation is retained.

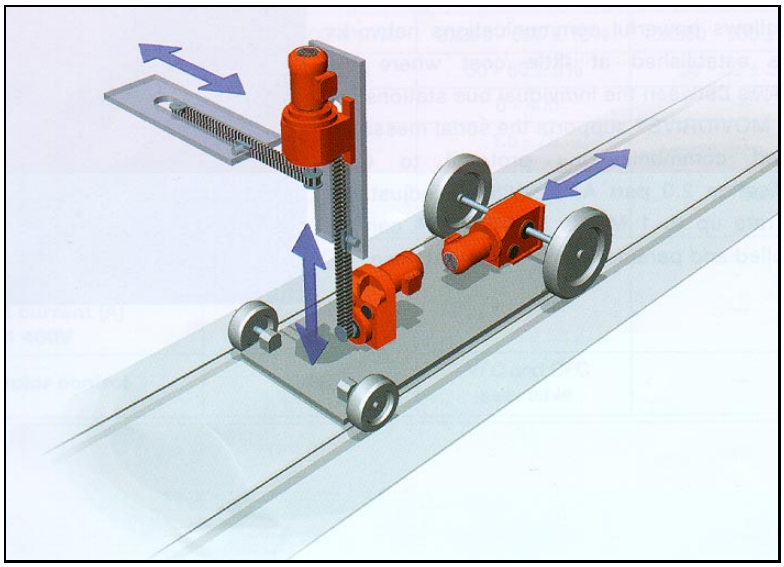
9 Application Example of a Storage and Retrieval Unit for High-Bay Warehouses

Introduction

A storage and retrieval unit for high-bay warehouses comprises a trolley, hoist and telescopic arm. The telescopic arm is driven by a four-pole AC geared motor. The drives for the lifting and travel axes are permanent-field geared servo motors which are controlled using **MOVIDRIVE® MDS** drive inverters. The AC motor is operated on the **MOVIDRIVE® MDF** drive inverter.

Absolute encoders are used for detecting positions on the lifting and travel axes. The drives are controlled by 24 V signals.

The absolute encoders used have an SSI interface and are read out by the DIP11A.



The following components result after project planning for the required values for the maximum speed and acceleration:

Unit	Motor	Inverter / type
Trolley	KA87 DY112 LB 35 Nm; 400 V; i = 36.52	MDS60A-0370-503-4-00 DIP11A absolute encoder card
Hoist	KA87 DY112 LB 35 Nm; 400 V; i = 86.34	MDS60A-0370-503-4-00 DIP11A absolute encoder card
Telescopic arm	FA47 DT80N4 BM i = 16.36	MDF60A-0008-503-4-00
Absolute encoder, hoist		T&R CE65M SSI absolute incremental encoder
Absolute encoder, trolley		VISOLUX EDM120 Laser distance measuring instrument

Specification of the target position

The warehouse management computer transfers the bay coordinates for the target bay to which the storage and retrieval unit for high-bay warehouses is to move. These coordinates are sent to the minicontroller on the storage and retrieval unit. Movement takes place to a total of 16 positions, the target positions of which are stored in the IPOS$^{plus®}$controllers of the trolley and the hoist. The set position is selected in binary code. The absolute value is in variable H509.

Properties:

- Binary coded selection of 16 table positions
- Binary coded output of the currently selected table position
- Definite signal when the selected table position is reached
- Automatically moving away from hardware limit switches

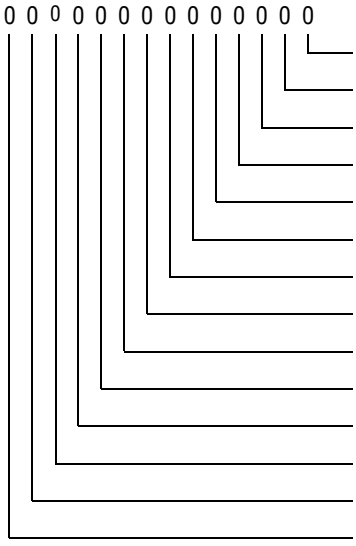
Procedure:

- The first 4 input terminals of the DIP11A option card can be used for selecting 16 table positions (travel variables H000 – H015) in binary coded format.
- When a travel variable number is selected (table pointer), it is always represented at the first 4 output terminals of the DIP11A in binary coded format.
- Input DI17 "Start positioning" enables the travel job to the table position or interrupts it (in the event of "Controller inhibit" and "Enable" = "1" signal). When a new table position is selected, it is advisable to set input DI17 to "low" until it is certain that all the bits of the table pointer have been set!
- A "1" signal at output DO15 "Table position valid" indicates that the selected table position has been reached. This output is immediately reset when a new table position is selected. By additionally evaluating output DO16 "IPOS in position", it is also possible reliably to detect when the selected table position is exited, even when the controller is deactivated ("Controller inhibit" = "0").
- The drive is moved away from a hardware limit switch with which it comes into contact by means of a "1" signal at the "RESET" input (DI02).

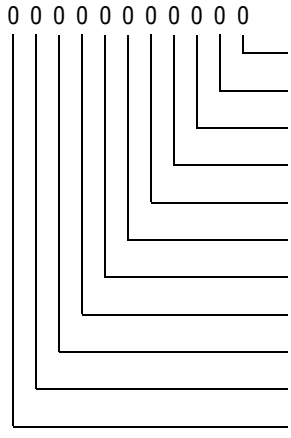
Settings:

The detailed configuration of the inputs/outputs (see page 26) and the variables used in the program is documented in the remark section of the program source code.

The table positions must be written into the variables (H000 – H015) with the MX_SHELL PC user interface, the hand-held terminal or via a bus system. This means the variables are stored in the non-volatile memory.



Input terminal mask	Terminal function	Meaning
DI00	/Controller inhibit	Switching power section on/off
DI01	Enable	Controlled standstill
DI02	Reset	Reset after fault (clear LS)
DI03	No function	
DI04	CW limit switch	Limiting switch for stopping (+)
DI05	CCW limit switch	Limiting switch for stopping (-)
DI10	IPOS input	Variable pointer bit 2'0
DI11	IPOS input	Variable pointer bit 2'1
DI12	IPOS input	Variable pointer bit 2'2
DI13	IPOS input	Variable pointer bit 2'3
DI14	IPOS input	Jog positive
DI15	IPOS input	Jog negative
DI16	IPOS input	
DI17	IPOS input	Start positioning



Output terminal mask	Terminal function	Meaning
DB00 MDx	/Brake	Activation of brake via auxiliary relay
DO01 MDx	Ready	Controller active, electronic power OK
DO02 MDx	/Fault	No fault present
DO10 DIO11A	IPOS output	Variable pointer bit 2'0
DO11 DIO11A	IPOS output	Variable pointer bit 2'1
DO12 DIO11A	IPOS output	Variable pointer bit 2'2
DO13 DIO11A	IPOS output	Variable pointer bit 2'3
DO14 DIO11A	IPOS output	–
DO15 DIO11A	IPOS output	Table position reached
DO16 DIO11A	IPOS output	Drive is in position window
DO17 DIO11A	IPOS output	–

IPOS plus® Program

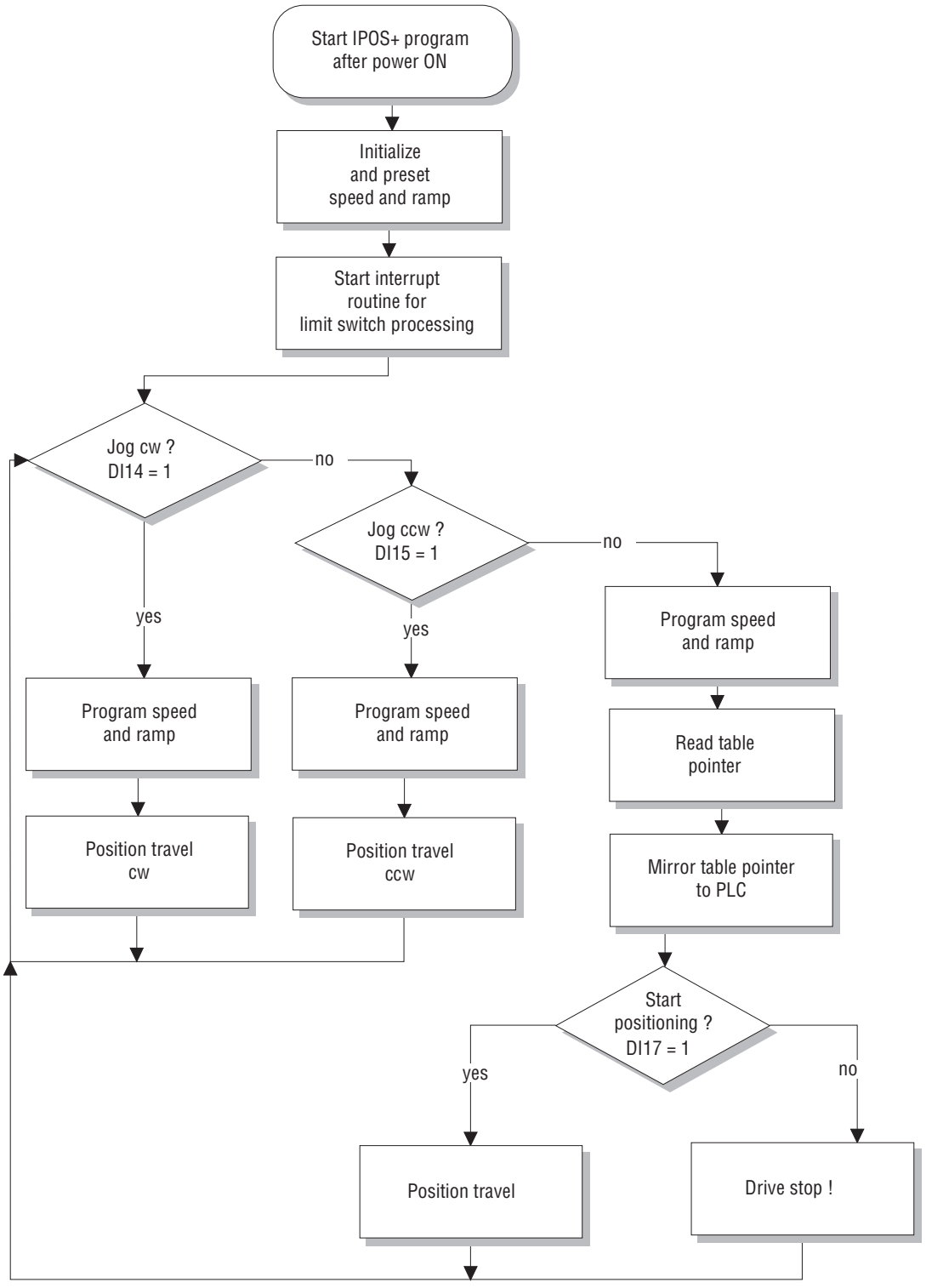
The following program is an example of how the IPOS$^{plus®}$ program for the trolley of the storage and retrieval unit for high-bay warehouses might be structured.

As a rule, every system has its own peculiarities, so this does not deal with details such as teach-in or fine positioning. Instead, the sample program shows the basic structure of the IPOS$^{plus®}$ program needed to operate it with an external encoder.

Required parameter settings

Parameters	Name	Set value
100	Setpoint source	Terminals
200-204	Controller parameters	After startup
700	Operating mode	SERVO & IPOS
917	Source actual position	Absolute enc. (DIP)
950	Encoder type	Visolux EDM 120

Flowchart



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Program for operating IPOS$^{plus®}$ with the VISOLUX EDM120 absolute encoder

Program source code (with remarks)

```
NUMER.: 1      DENOM. 1                          Program header
UNIT: inc

****************************************
Program: Table positioning                       Remarks for rough description of function
-The first 4 inputs of the optional
DIP11A select the position using binary
coding in the corresp. variables Ø-15
-Input DI17 (X22:17) is used for
enabling the selected travel command.

File:     Tab 1ØØ.mdx
Author: SEW/AWT
Date:     Ø1.Ø6.98
Modified:  Ø1.Ø6.98

Terminal wiring of inputs:-----------------
X13:1 “Controller inhibit”                       Hardware settings
X13:2 “Enable”
X13:4 “Fault reset” (move LS clear)

X13:5 “Limit switch CW”
X13:6 “Limit switch CCW”

X6Ø:1;DI1Ø Variable pointer bit 2'Ø
X6Ø:2;DI11                    2'1
X6Ø:3;DI12                    2'2
X6Ø:4;DI13                    2'3
X6Ø:5;DI14 (jog CW)
X6Ø:6;DI15 (jog CCW)

X6Ø:8;DI17 Start positioning

Terminal wiring of outputs:----------------
X1Ø:3;DBØØ Brake
X1Ø:4;DOØ1 Ready

X61:1;DO1Ø Variable pointer bit 2'Ø
X61:2;DO11        "           2'1
X61:3;DO12        "           2'2
X61:4;DO13        "           2'3
X61:5;DO14      - - -
X61:6;DO15 Table position reached
X61:7;DO16 “IPOS in position”

Variables used:--------------------
H3ØØ = Travel speed CW (1/1Ø rpm)                Memory allocation
H3Ø1 =        "       CCW          "
H3Ø2 = Acceleration ramp CW (ms)
H3Ø3 = Deceleration ramp CCW (linear) "
H32Ø - H324 Auxiliary variables
----------------------------------------
```

```
Program start
=======================================
Initialization
---------------------------------------
     SET      H300 = 15000
     SET      H301 = 15000
     SET      H302 = 1000
     SET      H303 = 1000
---------------------------------------

Program branch distributor
=======================================
     SETINT   ERROR   M10
M100:CALL     M51

M101:JMP      LO I0000010000000000, M102
     CALL     M30
M102:JMP      LO I0000100000000000, M103
     CALL     M40
M103:JMP      UNCONDITIONED  , M100
---------------------------------------

Subroutine: Reset/move clear of limit switch
=======================================
M10 :JMP      HI I0000000000110000, M1
M3  :JMP      HI I0000000000110000, M2
     ASTOP    IPOS ENABLE
     JMP      UNCONDITIONED  , M3
M2  :ASTOP    TARGET POSITION
M1  :RET
---------------------------------------

(Subroutine: Jog mode)
=======================================
M30 :RET
M40 :RET

Main program: Table positioning
=======================================
---------------------------------------
Set travel speed and ramp
---------------------------------------
M51 :SETSYS   POS.SPEED C(C)W = H300
     SETSYS   POS. RAMP       = H302
---------------------------------------
Read variable pointer into variable H320
---------------------------------------
     SET      H320 = H483
     ASHR     H320 >> 6
     AND      H320 & F        hex
---------------------------------------
Check output "Table position reached"
---------------------------------------
     JMP      H322 == H320, M54
     BCLR     H480.5  = 0
M54 :SET      H322 = H320
```

Set speed and acceleration values for table positioning (see variable description in the remarks for the program source code)

Program branch distributor
Activate interrupt routine for hardware limit switch processing ⇒ Reset/move clear of limit switch
(DI14 - DI15 = 0) ⇒ Main program

DI14 = 1
⇒ Jog CW
DI15 = 1
⇒ Jog CCW

Reset/move clear of limit switch
If drive has not moved onto limit switch (DI04/DI05 Limit switch CW/CCW), then return to branch distributor. If it has, then unlock travel and wait until drive has moved clear of limit switch (DI02 – input terminal function "Reset")
Then stop drive by setting target position = current position

Option: Subroutine (e.g. jog mode)

Jog CW
Jog CCW

Main program: Table positioning

Set travel speed, acceleration and deceleration ramp

Select table pointer (travel variable no.) in binary coded format with 4 inputs (DI10 – DI13)
(see explanation below)

Reset "Tab. position valid" output if table pointer was changed
Store current table pointer in comparison variable

```
----------------------------------------
Output variable pointer in binary coded format
----------------------------------------
     SET     H323 = H320                    Write selected table pointer to output terminals (DO10
     SET     H324 = H480                    – DO13) without altering other outputs of the output
     AND     H324 & FFFFFFF0 hex            variable (H480)
     OR      H323 | H324
     SET     H480 = H323
----------------------------------------
Table positioning enable
----------------------------------------
M53 :JMP     LO I0010000000000000, M52      If DI17 = 1, then travel to position value of selected
     ASTOP   IPOS ENABLE                    travel variable, else drive stop
     GOA     NOWAIT [H320]                  Reset "Table position selection valid" signal
     JMP     NOT IN POSITION, M53           Revoke travel lock
     BSET    H480.5  = 1                    Travel to table position,
     JMP     UNCONDITIONED  , M55           until position is reached or DI17 = 0
                                            Set "Table position selection valid" signal

----------------------------------------
M52 :ASTOP   HOLD CONTROL                   Drive stop
M55 :RET
----------------------------------------
End table positioning control
----------------------------------------
     END
```

10 Error Messages

Error code	Name	Possible cause	Action
36	Hardware missing for selected operating mode	An encoder type has been set which is not supported by the inserted DIP card.	Set the correct encoder type.
40	Boot synchronization	Initialization of DIP failed. Communication between MOVIDRIVE® and DIP is not functioning.	The DIP is not inserted correctly in its slot. Fit a new option card if this reoccurs.
41	Watchdog option	The DIP could not determine a new position within the required time. This error indicates a communication problem between MOVIDRIVE® and the DIP.	Contact SEW Service for advice.
92	DIP working range	The drive has moved beyond the permitted working range of the absolute encoder, possibly because the settings for the DIP encoder type parameter and/or the working range are incorrect.	Check the position offset parameter.
93	Encoder error	Cable break, max. travel speed exceeded with laser encoders. The encoder signals a fault/power failure. Resolver defective Possible causes: Connection cable between the encoder and DIP does not meet the requirements (twisted pair, shielded). Incorrect encoder type set. Cycle frequency too high for cable length. Maximum speed or acceleration permitted for the encoder has been exceeded. Numerator and denominator factors (IPOS travel parameters) set incorrectly.	Check the cable, check the travel speed with laser encoders. Replace encoder. Set the correct encoder type. Adjust the cycle frequency. Set the numerator/denominator factor; if necessary, program the fault reaction with IPOS$^{plus®}$ to “No reaction.”
95	DIP plausibility error	DIP was unable to determine a plausible position. Possible causes: Incorrect encoder type set. Cycle frequency too high for cable length. Numerator and denominator factor (IPOS travel parameters) set incorrectly. Depending on the application, it might be desirable for the determined position to change suddenly. The plausibility check will not be a good evaluation tool in this instance. The response to error 95 can be set in IPOS$^{plus®}$ with the command SETFR in this case.	Set correct encoder type. Adjust cycle frequency. Set the numerator/denominator factor; if necessary, program the fault reaction with IPOS$^{plus®}$ to “No reaction.”

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