Digital Cam Switch Unit

CamCon 1756-DICAM

for Allen Bradley Control**Logix**Ò

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For your attention

This instruction manual relates to the CamCon 1756-DICAM from 10.2003 Firmware 1.9 and the DC1756.ACD software V1.21. The company Digitronic Automationsanlagen GmbH reserves the right to make changes which present an improvement of the quality or functionality of the device without prior notice. The instruction manual was created with great care, although it may not be error-proof. We would be grateful for any communication relating to any errors you may have found.

Update
You can also obtain this instruction manual on the Internet at **http://www.digitronic.com** in the latest version as PDF file.

Qualified personnel
This device may only be started and operated by qualified staff. By qualified we mean personnel who are entitled to handle, to earth and to lable devices, systems and power circuits in accordance with the technology safety standards.

Liability
(1) The supplier is liable for damages caused by himself or by the owner of the rights up to the sum of the sales price. He is not liable for loss of profits, forfeited savings, intermediate and successive damages.
(2) The above mentioned limits to liability do not apply to insurance of named characteristics and damages which were caused deliberately or through negligence.

Protection

Note: CamCon is a registered trademark of the company Firma Digitronic Automationsanlagen GmbH.

Note: The devices of the CamCon series comply with norms: DIN EN 61000-6-2, DIN EN 61000-4-2, DIN EN 61000-4-4, DIN EN 61000-4-5, DIN EN 61000-4-8 and DIN EN 55011 and RoHS 2 (2011/65/EU)..

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1. Introduction

Electronic Cam Switch Units have been successfully used in industry for a long time. Experiences collected in close liaison with users over the years have been included in the development of the CamCon series. The result is a compact digital cam switch unit which is user friendly and reliable to a high degree. The following characteristics testify the excellence of the CamCon:

* Tested and reliable hardware
* Short-circuit-proof outputs
* Graphic liquid crystal display with 128x64 pixels in the CamCon DC50,51.
* Large and clearly visible 7-Segment display for program, position and speed on CamCon DC30,33 and 40.
* Any number of cams per output can be programmed.
* Up to 32000 Programs for product administration
* Master, for example: machine cams
* Optimising switch points when machine is in operation
* Compensation of mechanical delay time of switch components for switch-ON and switch-OFF points can be set in steps of 100µs separately (DTC = delay time or Speed Compensation).
* Position - Triggert - Time - Cams
* Power supply 24V DC +/- 20%
* Mounting of suspension rails to EN 50022 on CamCon DC16 and 90
* Switchboard panel standard casing 144 x 144 x 63mm to DIN 43700 on CamCon DC33,40 and 51
* S5 Components group for S5 115U, 135U and 155U on CamCon DC115
* S7 Components group for S7 300 on CamCon DC300
* AB Components group for Control**Logix**Ò 1756 on CamCon 1756-DICAM
* S5 Switch-ON via PG interface with L1 - Bus on CamCon DC16,40,50,51 and 90
* PLC Logic Module (optional)
* Shift register (optional)
* OP - Functions
* Analog outputs (optional)

Cam switch units are used wherever switching operations are periodically repeated. Digital cam switch units are an optimum replacement of mechanical units and offer in addition many other advantages, such as:

* Simplification of mounting and adjustment operations
* Repeatable adjustment facility
* Standardised for almost all areas of application
* Reliability
* High switch speed
* Speed Compensation
* Product administration for quick format change

2. Operating Pinciples

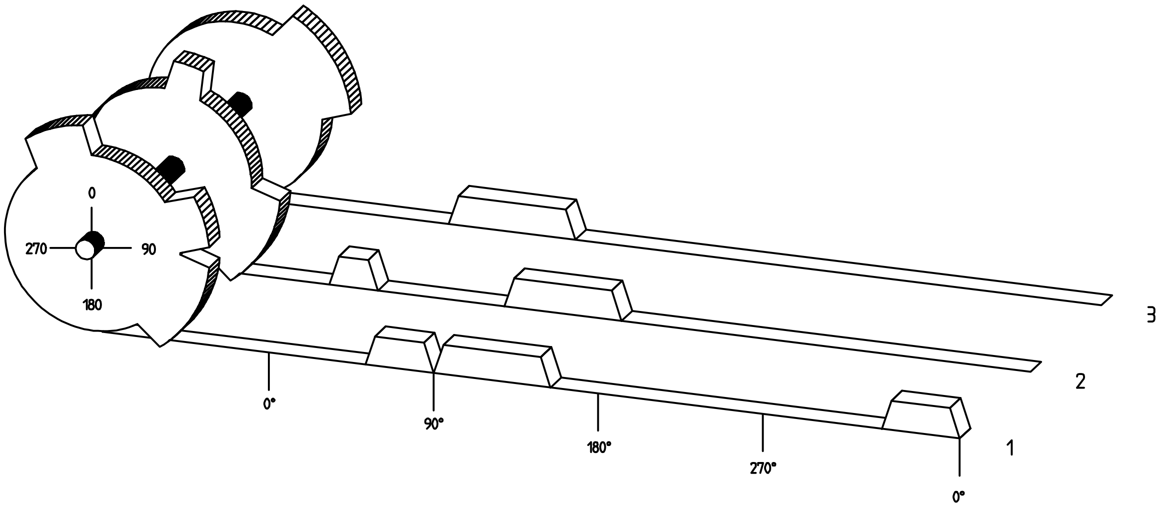


Diagram: Principles of a Cam Switch Unit

A principle for better comprehension of the function of a Cam Switch Unit is here presented. It has 3 outputs with the following cams:

Output 1:	Cam 1:	Switch-ON position	60°	Switch-OFF position	85°
	Cam 2:	Switch-ON position	95°	Switch-OFF position	145°
	Cam 3:	Switch-ON position	325°	Switch-OFF position	355°
Output 2:	Cam 1:	Switch-ON position	5°	Switch-OFF position	20°
	Cam 2:	Switch-ON position	95°	Switch-OFF position	145°
Output 3:	Cam 1:	Switch-ON position	30°	Switch-OFF position	85°

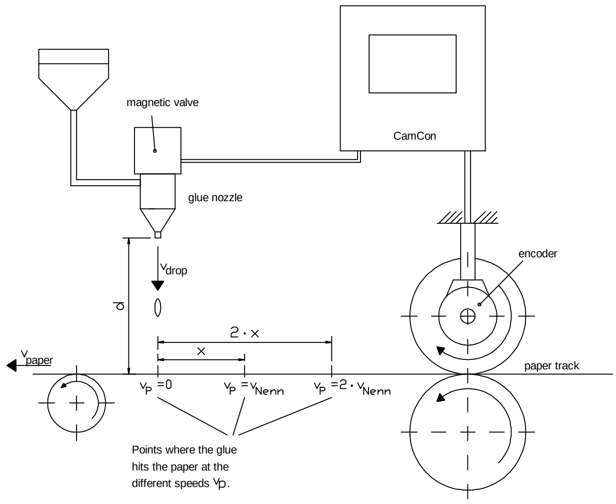
The positions of the output signals, here presented as three tracks, occur when the three cam disks turn anti-clockwise past a sensor, which scans the cams on the 0°-axis.

In a mechanical cam switch unit, the switch interval, i.e. the range between switch-ON and switch-OFF position are determined by the length of the cam. The length and the position of the cam can only be varied marginally and this is mechanically highly demanding and time consuming. With CamCon such adjustments can be realised in a fraction of time; in addition, there can be any number of tracks. A measuring system which is fitted to the device reports the position to the CamCon. The CamCon compares it with the programmed switch-ON and Switch-OFF positions of all outputs. If the position lies in the range of a programmed switch-ON / switch-OFF position (cam), then the respective outputs are active.

2.1. Speed Compensation

Each mechanical switch component (e.g. shield, magnetic valve) has a delay time, i.e. the time between the start signal and the actual switching of the contacts. In processes where positioning is executed on a moving system, this can cause problems. If such a process is driven with different speeds, different positions are caused. To avoid this happening, new timings for the switch signals of each speed would have to be calculated.

In order to ilustrate the complicated issues surrounding delay time or speed compensation, this will be shown on the example of a packaging machine. In the process shown in the diagram, a glue point has to be placed in an exactly defined spot on a moving paper track.



The system has the following parameters:

v_p - Speed of the paper track
v_T - Falling speed of the drop of glue
d - Distance between the glue nozzle and the paper track
T_{MV} - Delay time of the magnetic valve

Without speed compensation the following would happen:

As soon as the measuring system has reached a certain position, the CamCon sends a signal to the magnetic valve. The glue nozzle opens for a short time during which a drop of glue ejects. Between the start of the impulse and the exit of the drop time passes, which is mainly caused by the delay time of the magnetic valve T_{MV}. A further delay is caused by the time which the droplet needs to pass the distance between the glue nozzle and the surface of the paper.
This flight time is calculated as follows:

$$t_{Flight} = \frac{d}{v_T}$$

In total there the delay time is tFlight+T_{MV}. During this time the paper track moves on by a specific distance x.
It would now be possible to move the position, where the magnetic valve is switched on, forward by a specific amount, so that the glue droplet hits the same spot again as during standstill. In this way a speed compensation is created which works only at a specific speed of the paper. As soon as the speed of the device and consequently that of the paper track is, for example, doubled, the hit point of the glue droplet is shifted by the distance x, so that, without any speed compensation, it would move backward by double the distance (2 · x) in total.
The automatic speed compensation of the CamCon makes it now possible to drive processes with variable speed; CamCon registers the speed of the device continuously and adjusts the cams which determine the switch time points "On Line" depending on the speed. This has the effect that the outputs for the switch components are switched ON or OFF earlier. The direction of the movement is of no significance in this instance.

A small example in figures was designed to eludicate:

Supposing the drive cylinder with the measuring system has a circumference of 360mm, so that one millimeter of the circumference corresponds to exactly one angle degree of the measuring system.

The device has the following parameters:

$v_{droplet}$	=	20m/s
d	=	20cm
T_{MV}	=	20ms

This results in the following flight time of the droplet:

$$tFlight = \frac{d}{v_T} = \frac{0{,}2m}{20m/s} = 10ms$$

The total delay time is then $Tdead_{, altogether} = T_{MV}$ + tFlight = 20ms + 10ms = 30ms

During this time the paper track moves on by the distance x = $v_{paper} \cdot T_{total\ delay.}$ = 1m/s · 30ms = 30mm. In order to compensate the delay time, the switch point for the magnetic valve must be moved forward by 30°.

If the speed of the device and consequently that of the paper is doubled v_{paper}, then the distance x is also doubled by the speed of the paper track. In this case the switch point must be moved by 60°.

Note: Please take into account in these explanations that delay time is of a fixed size, which is determined by the mechanical constants of the set and switch components and by the dimensions of the construction and therefore does not change!

If the total delay time of 30ms was programmed into the respective output of CamCon, then the glue droplet would always hit the right spot, regardless of the speed.

2.1.1. Measuring delay time for Speed Compensation

Several ways of measuring delay time of a relay or valve are available.

2.1.1.1. Measuring delay time through actual differences

First the switch-ON point of a valve or relay is programmed. We assume that the programmed switch point lies at 200 degrees in this case. If the machine is driven with a speed of for example 40 rpm, a shift occurs due to delay time. This shift is then measured and, in this example, will amount to 40 degrees.

Warning: For the calculation of the shift the programmed delay time in the cam switch unit must be set to zero!

The delay time of the switch component is now calculated as follows:

$$\text{Delay time (in sec.)} = \frac{\Delta \text{ way (in °) * 60 (sec./min.)}}{\text{speed (in rpm) * 360 (°/turn)}}$$

$$\text{Delay time (in sec.)} = \frac{40 * 60}{40 * 360} = 0.1667 \text{ sec.}$$

The resultant delay time is then entered into the cam switch unit.

See Chapter "6.3.11. TAG "DC_2_PRG_DTC[X]"" an page 41.

2.1.1.2. Measuring delay time by means of different measuring points

First the switch point is calculated at a speed of, for example, 50 rpm. We assume that the programmed switch point lies at 200° in this case. The second measurement is taken at a speed of 80 rpm The necessary switch point must be set to 160°, if the exact switch point is to be also achieved at 80 rpm.

Warning: For the calculation of the two switch points the programmed delay time in the cam switch unit must be set to zero!

The delay time of the switch component is then calculated with the following formula:

$$\text{Delay time (in sec.)} = \frac{\Delta \text{ way (in °) * 60 (sec./min.)}}{\Delta \text{ speed (in rpm) * 360 (°/turn)}}$$

$$\text{Delay time (in sec.)} = \frac{40 * 60}{30 * 360} = 0.222 \text{ sec.}$$

The resultant delay time is then entered into the cam switch unit.

See Chapter "6.3.11. TAG "DC_2_PRG_DTC[X]"" an page 41.

Since the entered delay time shifts the switch point, the previously programmed cam must be changed. For the calculation of the exact switch-ON position, the difference to the speed O rpm (here using 50 rpm) must be added to the first measured switch-ON point (here 200°). The difference is calculated with the following formula:

$$\Delta \text{ way (in degrees)} = \frac{\text{dead time (in sec.) * } \Delta \text{ time (in min}^{-1}\text{) * 360 (degrees/rotations)}}{\text{60 (sec./min.)}}$$

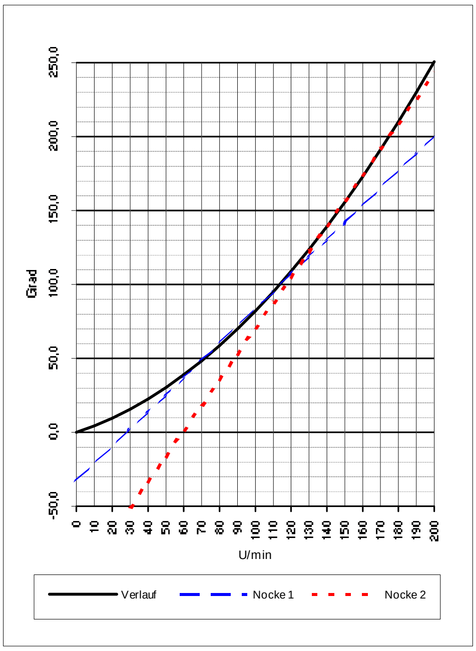
$$\Delta \text{ way (in degrees)} = \frac{0.222 * 50 * 360}{60} = 66.6 \text{ degrees}$$

The switch-ON point of the cam is now shifted from 200° by approx. 67° to 267°.

2.1.2. Speed Compensation using off-centre pressure, e.g. brake functions

The Speed Compensation of the CamCon Cam switch unit works using a linear function. If, for example, the speed doubles, then the shift of the compensated cam changes and also moves forward by twice the amount. If the ram on an eccentric press should be brought to a standstill at the exact upper stop point, the brake action of the press under different speeds results in a quadratic function. The Speed Compensation can therefore only find an approximation of the exact switch point for the stopping of the press by adjusting the line of the cam lines to the brake curves in the working range of the press.

In the graphic on the right the curved line represents the brake point of the ram in relation to the speed.



For the calculation of the parameters to be programmed please proceed as follows:

- Define the working range (e.g. 20-50 rpm) and determine two measuring points which have to be specified in the working process (e.g. 30 and 40 rpm).
- Now let the machine run at 30 rpm and program or optimise a cam **without** Speed Compensation so that, at switch-OFF, the ram comes to a halt in top stop. Note the switch-ON point of the cam (e.g. 340°).
- Now let the maching work with 40 rpm and program or optimise one cam **without** Speed Compensation so that, at switch-OFF, the ram comes to a halt in top stop. Once again, note the switch-On point of the cam. (e.g. 332°).
- Now calculate the delay time, taking into account the distance and speed difference, using this formula:

$$\text{Delay time (in sec.)} = \frac{\Delta \text{ way (in °)} * 60 \text{ (sec./min.)}}{\Delta \text{ Speed (in rpm.)} * 360 \text{ (°/turn)}} = \frac{340\text{-}332 * 60}{40\text{-}30 * 360} = 0.133 \text{ sec.}$$

- The calculated delay time is now entered into the cam switch unit.
- Since the switch-OFF point has shifted through the entered Speed Compensation, the previously programmed cam must be changed first. For the calculation of the exact switch-ON position, the difference to the speed 0 rpm (here 30 rpm) must be added to the first measured switch-ON point (first measuring point here 340°) The difference is calculated with the following formula:

$$\Delta \text{ way (in °)} = \frac{\text{delay time (in sec.)} * \Delta \text{ Speed (in rpm.)} * 360 \text{ (°/turn)}}{60 \text{ (sec./min.)}} = \frac{0.133 * 30 * 360}{60} = 23.94°$$

- The switch-ON point of the cam has now shifted from 340° by approx. 24° to 364°.

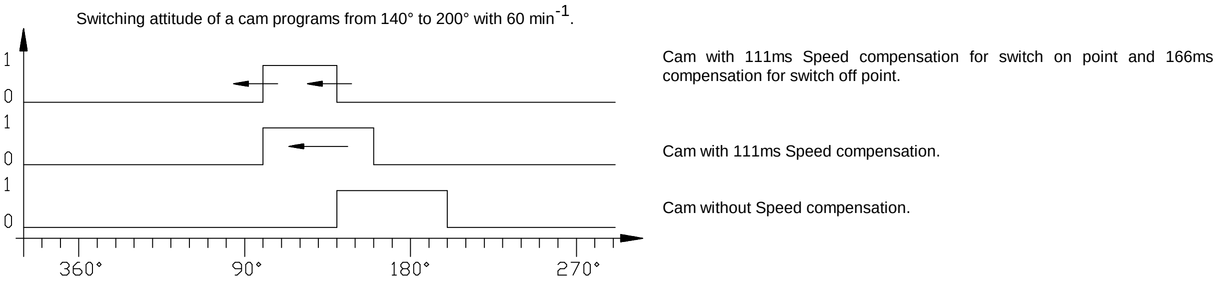
As a result a cam with a switch-ON point of 4° and a speed compensation of 0.133 sec has been calculated. This is entered in the cam switch unit as switch-OFF cam of the press.

Note: If the degree of accuracy is no longer sufficient when switch-OFF is done with one cam, two or several outputs can be switched in parallel and the cam of those is then adjusted to the required working range. For the calculation of two switch-OFF cams divide the working range in 5 parts with 4 measuring points and then calculate the delay time value and the cam value with the same formula as described above. For the calculation of the first cam, use the measuring points 1 + 2 and for the calculation of the second cam use the measuring point 3 + 4.

Through this association of the linear cam functions to the brake functions it is now possible to switch OFF the cam via the entire working range of the press in the top stop.

2.1.3. Separate delay time for Speed Compensation of switch-ON and switch-OFF points

For CamCon devices of Software from 3/2002 Speed Compensation is now available for separate switch-ON and switch-OFF points. This is necessary since some valves need longer to switch OFF than to switch ON.



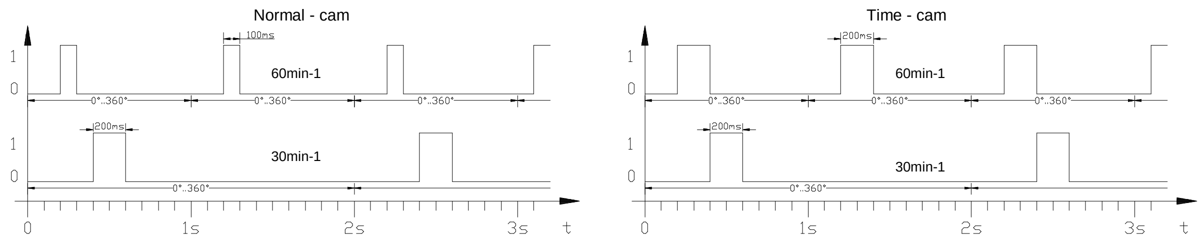
For the calculation of both delay times the same formuli are used as for a *normal* compensation. See Chapter "2.1.1. Measuring delay time for Speed Compensation" on page 9 for entering delay time see Chapter "6.3.11. TAG "DC_2_PRG_DTC[X]"" on page 41.

Attention: If the switch-off-point of a Cam overtakes the switch on point at rising speed, the result will be an non-defined signal.

2.2. Time - Cam

With nomale cam becomes with increasing plant speed switch-on time ever more briefly. If controlling a glueing-station, the result would be an insuffcent ammount of spreaded glue.

A Time - cam however has with each plant speed a firm temporal length, so that excactly the same ammount of glue could be spread at changing speeds. The switch-on point of the Cam on a *normal* as well as on a Time-Cam is appointed by a position-dependent Position value and a delay-time/speed compensation.

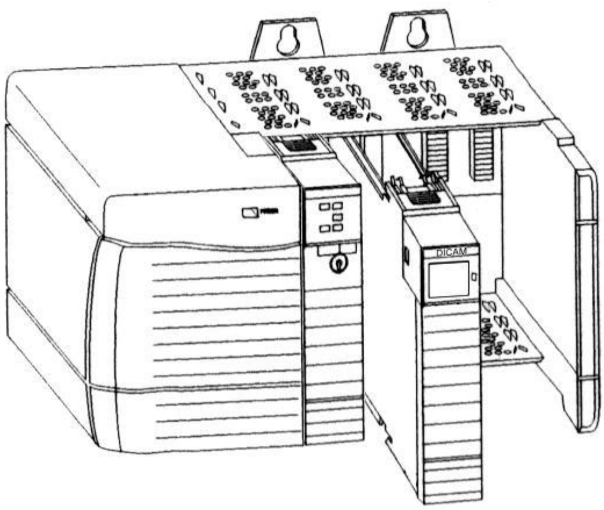


For CamCon devices of software releases after 3/2002 Time Cam is also available for devices without PLC - Logic - Module.

For entering a Time - Cam see Chapter "6.3.11. TAG "DC_2_PRG_DTC[X]"" on page 41.

3. Installation

Note: The component group CamCon 1756-DICAM can be plugged in and pulled out when the power is on, but this should be avoided whenever possible.



* All assembly work and cable connections must be carried out when power is OFF!

* Consult the ControlLogix instruction manual.

* Switch ControlLogix CPU to STOP and disconnect the power supply to the components base into which you wish to insert the CamCon 1756-DICAM.

* The power supply (5V) of all component groups on a base must not exceed the maximum current supply. Please consult the instruction manual for the ControlLogix. The Current load of the CamCon 1756-DICAM amounts to typically 450mA.

* Push the CamCon 1756-DICAM into the components base until the metal pin engages audibly.

* The grounding of the CamCon 1756-DICAM is made by the grounded rack of the ControlLogix.

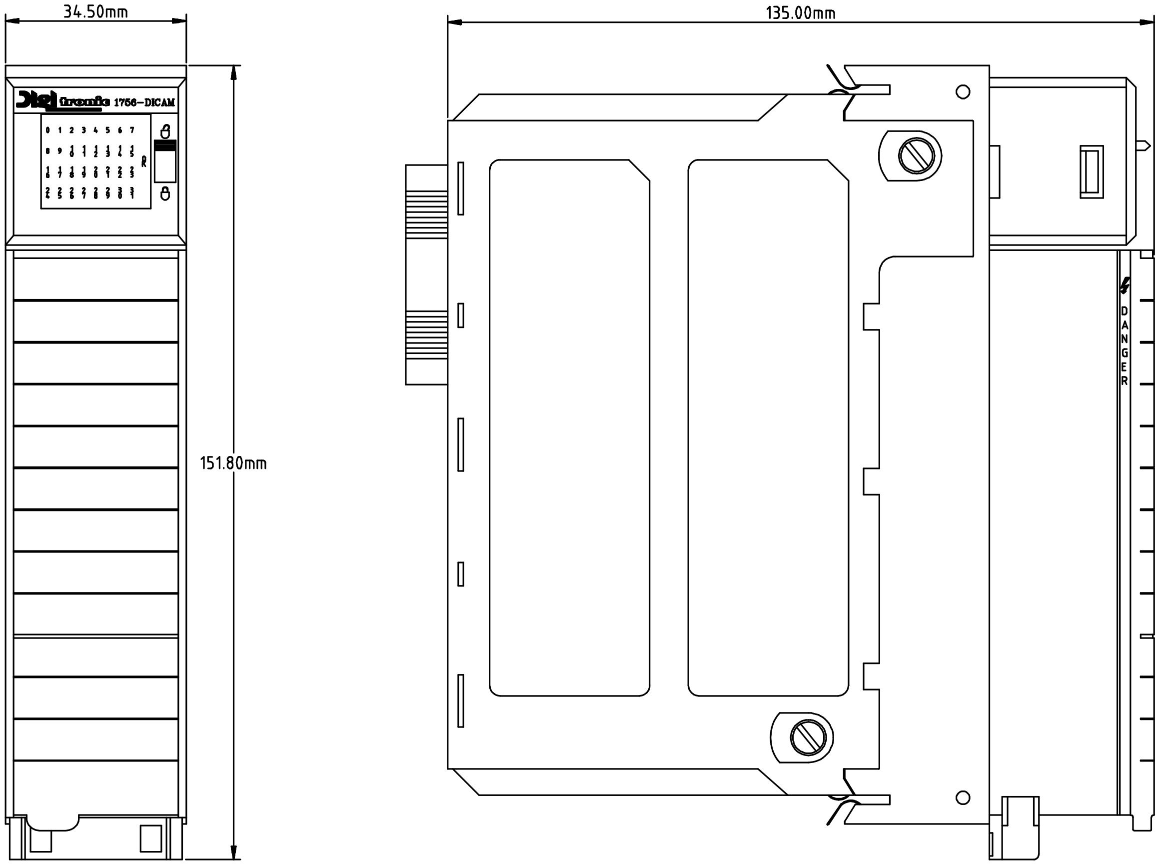
* The connecting cable for the measuring system must be screened and the screening must be laid down at both ends. For this purpose the screening of the cable should be attached to the components base by the shortest route.

* Wire up the CamCon 1756-DICAM in accordance with the cabling instruction in Chapter "4. Electrical connections" on page 14. The 36-pole CLX connecting plug is not part of the delivery package containing the CamCon 1756-DICAM (AB Order Nr.:1756-TBCH). Insert the connected plug into the component group and lock it by pulling down the small lever next to the status display.

* When all cables are connected, operations can start. See chapter "5. Starting" on page 23 and for Installation of the CamCon 1756-DICAM in the programming software see chapter "5.1. Planning the ControlLogix CPU for CamCon 1756-DICAM" on page 23.

Note: You can order the 36-pole CLX connecting plug and a label with the pin layout complete at Digitronic Order Nr.: DC1756/ZB!

3.1. Dimensions



The diagram shows a CamCon 1756 - DICAM.

4. Electrical connections

Before you begin with wiring, please consult the following chapters: "4.10. The outputs" on page 21, "4.11. The inputs" on page 21 and "4.9. The measuring system" on page 17.

4.1. Power supply to CamCon

Pins **2,4,6**: +24V power supply for measuring system and internal hardware.

The CamCon 1756-DICAM is supplied with 5V (approx. 450mA current input) via the PLC bus. The periphery of the 1756-DICAM must in addition be supplied with power since it is galvanized and thus separated from the BUS. The functioning of the periphery (measuring system, i.e. Encoder) depends on a power supply of +24V at pins **2**, **4** or **6**. These act simultaneously as the power supply for the three output blocks which should be connected to each output block since these are not connected to each other for reasons of better current distribution and can be switched off individually in emergency.

Warning: If the power supply to the measuring system is short-circuited (>2Amp.) or exceeds the total supply of an output block over 6 Ampere, for example wrong polarity, a Mini - Melt - Fuse on the circuit board blows. If is melted the CamCon must sent to repair.

4.2. Output pin layout

Pin **2**: +24V power supply outputs 1 - 8
Pin **1**: Output 1
Pin **3**: Output 2
Pin **5**: Output 3
Pin **7**: Output 4
Pin **9**: Output 5
Pin **11**: Output 6
Pin **13**: Output 7
Pin **15**: Output 8
Pin **17**: 0V

Pin **4**: +24V power supply outputs 9 - 16
Pin **19**: Output 9
Pin **21**: Output 10
Pin **23**: Output 11
Pin **25**: Output 12
Pin **27**: Output 13
Pin **29**: Output 14
Pin **31**: Output 15
Pin **33**: Output 16
Pin **35**: 0V

Pin **6**: +24V power supply outputs 17 - 24 respective inputs 1-8
Pin **20**: Output 17
Pin **22**: Output 18
Pin **24**: Output 19
Pin **26**: Output 20
Pin **28**: Output 21
Pin **30**: Output 22
Pin **32**: Output 23
Pin **34**: Output 24
Pin **36**: 0V

Note: The pins **17**, **35**, **36** and **18** are linked within the device.

4.3. Pin layout of inputs (Option)

The connecting pins of the inputs 1 - 8 and the outputs 17 - 24 serve a double use. If, for example, output 24 is set, input 1 is also active.

Attention: The power supply must be connected absolutely to terminal 6, even if the outputs 17-24 are used as inputs.

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Pin	**20**:	Input 8 / Output 17
Pin	**22**:	Input 7 / Output 18
Pin	**24**:	Input 6 / Output 19
Pin	**26**:	Input 5 / Output 20
Pin	**28**:	Input 4 / Output 21
Pin	**30**:	Input 3 / Output 22
Pin	**32**:	Input 2 / Output 23
Pin	**34**:	Input 1 / Output 24
Pin	**36**:	0V

4.4. Pin layout of RS422 SSI measuring system

Pin	**8**:	+24V DC power supply for the SSI measuring system (encoder)
Pin	**10**:	(RS422) Clock B or Clock -
Pin	**12**:	(RS422) Clock A or Clock +
Pin	**14**:	(RS422) Data B or Data -
Pin	**16**:	(RS422) Data A or Data +
Pin	**18**:	0V power supply for the SSI measuring systems (encoder)

4.5. Pin layout at 24Volt incremental measuring system

Pin	**8**:	+24V DC Power supply for the incremental - measuring systems (encoder)
Pin	**10**:	(24Volt) Clear 2
Pin	**12**:	(24Volt) Clear 1
Pin	**14**:	(24Volt) B Impulse
Pin	**16**:	(24Volt) A Impulse
Pin	**18**:	0V Power supply for the incremental - measuring systems (encoder)

The signals Clear 1 and Clear 2 are set to zero by default AND linked; their function can be changed with the software. See chapter "6.3.6.3. TAG "DC_1_SYSTEM_CONFIG_ENC_2_INK"" on page 35 for setting the necessary parameters and chapter "4.9.3. Incremental measuring system input" on page 18.

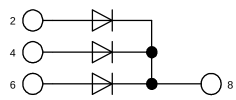
4.6. Pin layout for Hiperface incremental measuring system

Pin	**8**:	+24V DC Power supply
Pin	**10**:	REFCOS
Pin	**12**:	COS (B)
Pin	**14**:	REFSIN
Pin	**16**:	SIN (A)
Pin	**18**:	0V Power supply, i.e. reference potential of the measuring system

See chapter "6.3.6.3. TAG "DC_1_SYSTEM_CONFIG_ENC_2_INK"" on page 35 for setting the necessary parameters.

Note: The pins **17**, **18**, **35** and **36** are linked within the device.

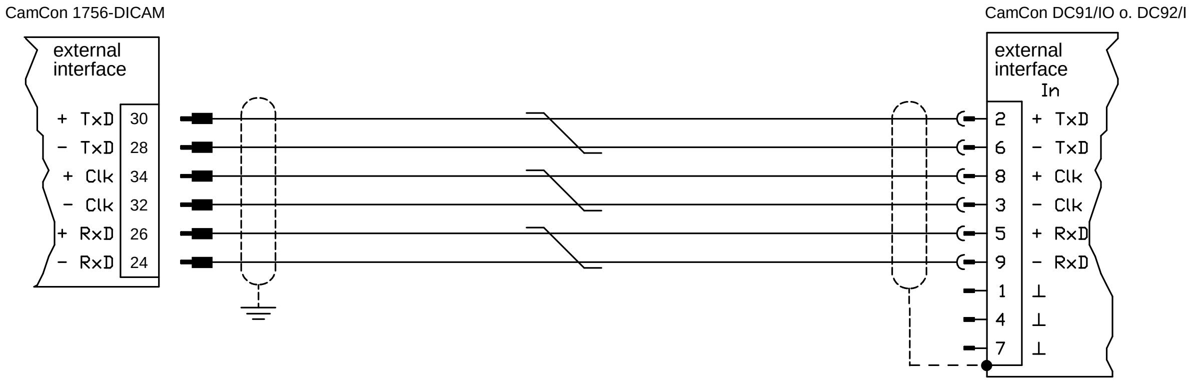
Note: Pin **8** is supplied with power via diodes through pins **2**, **4**, or **6**.



4.7. Clamping allocation of the external interface (option)

If you order an external interface additional to the CamCon (option X) the number of hardware-outputs at the device is reduced from 18 to 24 and the option hardwareinputs at the device is not more avaiable. Therefor, you are able to connect additional in- or outputs via a CamCon DC91/IO or DC92/I module. The extension modules are snapped upon a a carrier-rail in the switch-panel and are connected to the CamCon IO-module via a 6 pole cable, type KK1756/IO-XX, with the 9 poe. D-Sub male plug **"external Inter. in"** (max. 300m wiring distance). The data transfer takes place free of potentials via optical couplers.

Terminal **24**: RxD -
Terminal **26**: RxD -
Terminal **28**: TxD -
Terminal **30**: TxD +
Terminal **32**: Clk -
Terminal **34**: Clk +



DSUB 9 female plug:
Connection for external In- and output-modules.
e.g. DC91/IO or DC92/I

Pin 1,4,7	GND
Pin 2	TxD +
Pin 6	TxD -
Pin 8	CLK +
Pin 3	CLK -
Pin 5	RxD +
Pin 9	RxD -

4.8. RS485 interface (only for test mode)

Attention: The RS485 interface of the CamCon 1756 DICAM is only allowed to be used for test- or debug-modes of the PLC - Logic - functions of the programing-software DIGISOFT 2000. A permanent installation is not allowed i.e. can cause EMV - malfunctions at the PLC.

The flatwire-connection cable with a maximum length of 30cm and a 10 pole female-plug inserted into the device's case at the BUS-side of the device, where it is plugged into a 10 pole poleplug. If the PLC saubassembly-carrier is fully mounted, the cable has to be lead between two subbassemblies to the outer side.

Cable type:	KK 1756 RS485"	Pin	2	B (-)
		Pin	3	A (+)
		Pin	5	GND

Note: Additional to the cable "KK1756 RS485" the levelconverter "COMUCA/USB is required.

4.9. The measuring system

The measuring system is designed to record the necessary actual values (positions) for the Cam Switch Unit. Many different measuring system can be linked with the CamCon.

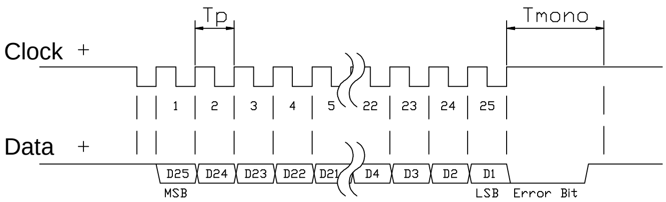
See chapter "4. Electrical connections" on page 14 and for adjustment of the measuring system to the software of the CamCons please also consult Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[0]" on page 31.

Note: Please also consult the instruction manual for your measuring system.

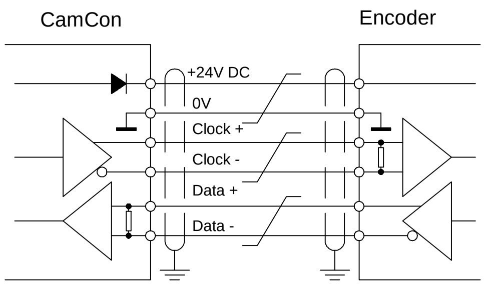
4.9.1. SSI Measuring system input

Systems with a synchronous series interface = SSI. The SSI interface is widely used in industry for absolute single and multi-turn angle encoder. At this interface the CamCon supplies the measuring system with 24Volt. For the purpose of data reading the CamCon sends a stroke signal (clock) with RS422 level to the measuring system. This answers synchronously with the data output of the position in the grey code. The frequency of the pulse signal depends on the length of the cable to the measuring system and can be set in the CamCon.

Note: The data record corresponds to the Stegmann SSI Standard!



Tp	=	clock impulse max. 1MHz to min. 66kHz. (adjustable through the cable length)
Tmono	=	Mono flop time 25µs



Please note:
Use a screened dual strand connection cable. Do not place the cable parallel to a high voltage cable. If possible, lay the screening down on both sides.

4.9.2. Parallel measuring system input

Systems with parallel 24V data leads, e.g. single turn - angle encoder or via a transformer with parallel data output.

In this instance a gray or binary encoded value is attached to the free inputs of the CamCon and this will be read as actual value. Since the connection cable are quite expensive and the EMV - compatibility is limited, this interface type is rarely used in industry nowadays.

Note: Since the outputs are partly switched parallel to the inputs in CamCon DC16, DC115, DC300 and CamCon 1756-DICAM, these must not be programmed under any circumstances and this reduces the number of available outputs.

Warning: Reading a binary encoded value into the CamCon is only permitted after consultation with the Service department of the company Digitronic.

4.9.3. Incremental measuring system input

Systems with 90° phase shift signals such as turning angle encoders, glass measuring rods or flow measuring devices.

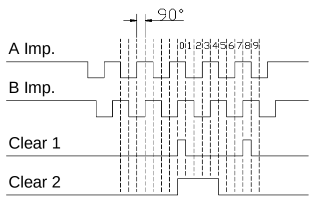
At the present time incremental measuring inputs for the CamCon DC16/50/51/115/300 and DC1756 are available as an option. We differentiate between three signal levels:

- 24V PNP Signal inputs (Order number Option: J)
- 5V RS422 Signal inputs (Order number Option: I)
- Hiperface Signal inputs (Order number Option: H)

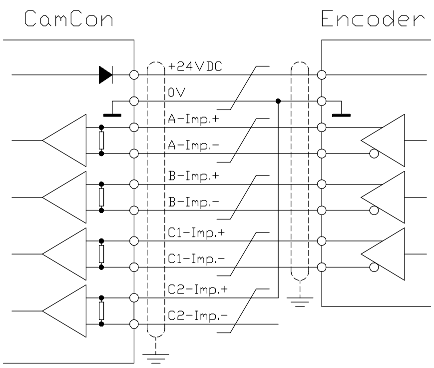
Note: For the CamCon DC16 and DC300 only the version with 24V PNP signal is available. For the CamCon 1756-DICAM the version with 24V PNP signal and Hiperface Signal is available. If a different signal level is necessary, this can be converted externally with the INCDRV converter.

In all cases the CamCon supplies the measuring system with 24Volt/DC or in CamCon DC115 optionally with 5 or 24Volt/DC. As a counting signal the measuring system gives out two impulses at a time shifted by 90° (A + B). These are counted in the CamCon and are evaluated as position values. In addition, for each rotation another zero impulse (Clear 1) is given out for synchronisation purposes. In order to stop synchronisation (zero setting) of the counter, a further clear signal (Clear 2) is available on the CamCon.

The signals Clear 1 and Clear 2 are to standard AND linked and can be changed in their function with the software. See Chapter "6.3.6.3. TAG "DC_1_SYSTEM_CONFIG_ENC_2_INK"" on page 35

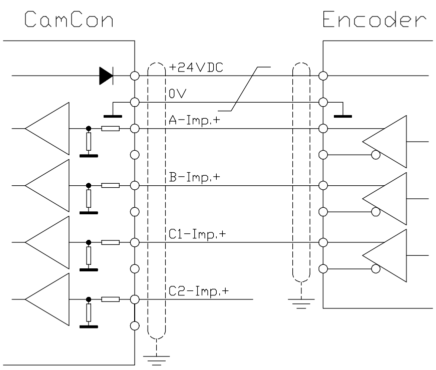


4.9.3.1. Incremental measuring system input with 5V RS422 level



If the 5V RS422 system is used, all signals of the measuring system input must be active, otherwise the input conditions are undefined. If no signal is available for one of the two Clear inputs, then this input must be switched to mass on the (+) signal in order to switch the input to low. The inputs of the measuring system can be activated with a maximum voltage of 5V. Please pay attention to the power supply of the angle encoder which can be 5Volt as well as 24Volt. Only the CamCon DC115 can at present provide a voltage of 5Volt for the supply of the angle encoder.

4.9.3.2. Incremental measuring system input with 24V PNP level



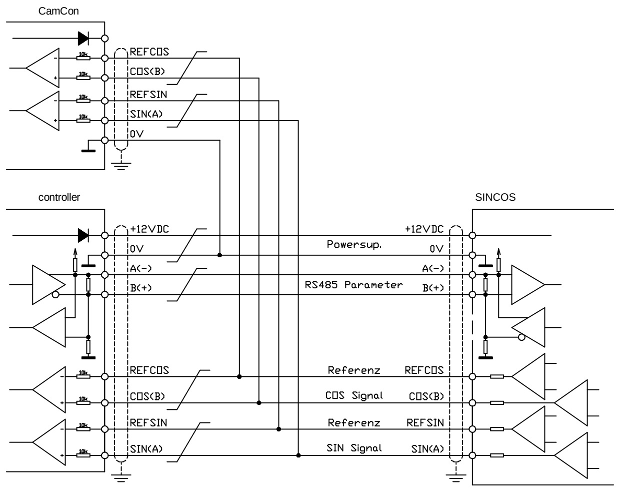
If a 24V PNP signal is used for data input, then only the (+) signals of the inputs may be connected. The (-) signals must stay inactive in this case. The connection of such a measuring system requires a change of the interal switch system and must therefore be stated on the order form.

Note: At the incremental input of the CamCon DC16, DC300 and DC1756 no (-) signals are available.

4.9.3.3. Incremental Hiperface measuring system input with SINCOS level

The Hiperface measuring system is a feedback system for servo-motors of the company Stegmann.

It is a mixed system and consists of an absolute measuring system and an incremental measuring system. The absolute measuring system sends its values via RS485 interface to the counter. The incremental measuring system works with analog sine - and cosine interface with a resolution of 512 or 1024 impulses per revolution.



The CamCon with the Hiperface signal input (option: H) reads only the incremental sine - and cosine signal. The signals are converted and counted in the CamCon into normal incremental measuring system signals.

Since the absolute measuring system of the Hiperface interface is not used and no clear - signals are available, the CamCon must be initialized after each restart.

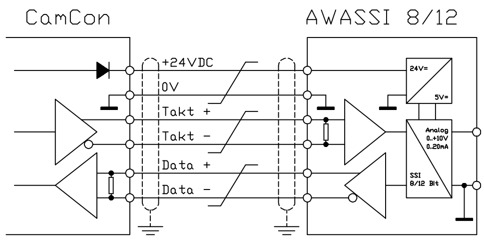
This must be done by the preset input or the instruction "actual value set" of the CamCon. See for this to chapter 6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[16] on page 32 and chapter 6.3.8. TAG "DC_1_SYSTEM_SET_ACTUAL_VALUE" on page 40.

Note: The maximum number of revolutions per minute is 3000 min^{-1} with 512 Impulse per revolution.
The maximum number of revolutions per minute is 1500 min^{-1} with 1024 Impulse per revolution.

4.9.4. Analog measuring system input

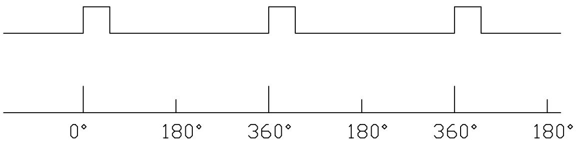
These are systems which receive their actual value through conversion of current or voltage signal, such as temperature or pressure sensors.

For the recording of analog signals the analog to SSI conversion module AWA/SSI in 8 and 12 bit resolution is available for the CamCon. This module is connected to the SSI of the CamCon and is switched ON through the selection of the analog measuring system in the menu ”Measuring system”.



4.9.5. PLL measuring system input

Systems with Phase - Lock - Loop data recording. In these systems the actual value is found through interpolation of initiator impulses. This measuring system is applied to machines with constant speed and with a cyclic pulse.



= Initiator impulse

= Found actual value

The Initiator can be connected to any free input of the CamCon.

Note: For CamCon DC115 a special input is available on the 25pol. SUB-D plug.

See also chapter "6.3.6.5. TAG "DC_1_SYSTEM_CONFIG_ENC_4_PLL"" on page 36.

4.9.6. Timer as a measuring system

Systems which are controlled by elapsed time. In this case the CamCon makes a time available with a time basis of minimum 1 ms as actual value. Through laying on of input signals it is possible to influence the elapsed time. This measuring system is applied to machines with a fixed time scanner as a control feature, e.g. washing machines.

See also chapter "6.3.6.6. TAG "DC_1_SYSTEM_CONFIG_ENC_5_TIMER"" on page 36.

4.9.7. RS232 as a measuring system

Systems, receiving their actual position through the RS232 interface, e.g. for a junction of a Stegmann POMUX linear scale to a RS232 data output.

Warning The activation of this measuring system blocks the RS232 interface for programming. This measuring system is only reasonable with a CamCon DC50/51.

4.10. The outputs

The CamCon 1756-DICAM has 24 short-circuit outputs. They give out 24Volt high - active signals and are isolated from the system BUS. The +24V power supply of the output blocks 1-8, 9-16 and 17-24 are separated from each other for the purpose of current distribution; therefore each output block must be supplied with +24Volt externally. The outputs deliver continuous power supply of 0.2 Amp. or 0.4 Amp. at 50% duty cycle per channel. See also chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[31]" on page 32 and chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[47]" on page 33. In addition, a mini-melt-fuse has been inserted for each output block which will blow of short-circuit or currents over 6 amps.
If they are melted, send in the device for repairing.

Note: The outputs 17 - 24 share the pins with the optional inputs 1 - 8.

Note: The outputs must be set to free through PLC. See chapter "5.1.2. The O - Range" on page 24.

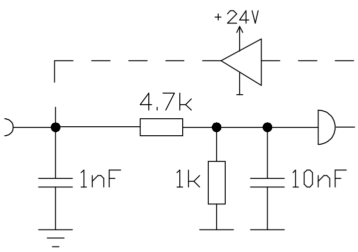
Warning: *For inductive loads a flywheeling diode is required.*

4.11. The inputs

The CamCon 1756-DICAM can be mounted with 8 inputs as an option. These inputs work with high active 24Volt signals and are isolated from the system BUS.

Note: The inputs 1 - 8 share the pins with the outputs 17 -24.

The input wiring:



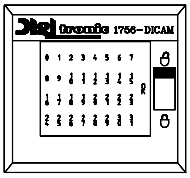
The input resistance is about 5.7 KOhm.

The inputs of the CamCon have not been covered with functions by the factory. The user would have to do this himself in the process of setting system data of the CamCon depending on his requirements. See chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[30]" on page 32, chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[0]" on page 31, chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[34]" on page 33 and chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[16]" on page 32.

Precautionary measures for welding work

Attention: *For the duration of welding operations carried out at the machine, the connecting wires concerning the data exchange from the measuring system to the CamCon and the power supply as well as the grounding connections and inputs and outputs have to be separated from the CamCon.*

4.13. Status Displays



The CamCon 1756-DICAM has several Status Displays. These include: 32 Output displays (LED 0 up to 31 for Output 1 to 32) and a Status LED (OK-LED). In addition, in the I-Range of the CamCon status information is indicated, which can be evaluated through the ControlLogix CPU (see Chapter "4.13.2. Status Bits in the I - Range").

4.13.1. Status LED

The Status LED (OK-LED) of the CamCon 1756-DICAM indicates as follows:

GREEN light	=	Communication between CamCon and ControlLogix OK.
RED blinking	=	Firmware UP-Date via ControlFLASH.
GREEN blinking	=	ControlLogix CPU in Stop mode, i.e. the CamCon is not accessed by the software.
ORANGE light	=	ASIC in Reset.

4.13.2. Status Bits in the I - Range

In the I-Range of the CamCon 1756-DICAM component group the following information is transferred:

INT 0,1: reserved for ControlLogix intern (0 = OK, not 0 = error)

INT 2: Hardware status of the CamCon.

Bit 0 =	Output error, short circuit or overload (low active).			
Bit 1 =	Hardware release of CamCon outputs (low active).			
Bit 2 =	Hardware reset, the IO periphery of the CamCon is in reset mode (low aktiv).			
Bit 3 =	Always 0; if this Bit = 1, there is no current supply on the IO periphery of the CamCon and die other Bits in this Byte are always 1, i.e. undefined.			
Bit 4 =	Power supply Output 1 - 8 ON.			
Bit 5 =	Power supply Output 9 - 16 ON.			
Bit 6 =	Power supply Output 17 - 24 ON.			
Bit 7 =	Power supply IO periphery and measuring system ON.			
Status range for MSG commands.				
Bit 8 =	CMD_OK	=	Last written message successful.	
Bit 9 =	CMD_IN_USE	=	Command is being carried out.	
Bit 10 =	CMD_ERROR	=	Error at execution of last written message.	
Bit 11-14:	not in use.			
Bit 15 =	EXOR_BIT	=	This Bit toggles after each execution of a written message.	

INT 3,.. and all of the following contain the Output Bits of the CamCon.

Example: 32 Outputs with active real time transfer for speed (Speed analogue = yes) and position display (Actual value output = Bin.).

INT 3	=	Status outputs 1 - 16.
INT 4	=	Status outputs 17 - 32.
INT 5	=	Actual speed as 15 Bit values with signs and an offset of 8000Hex, scaled to 100% value in the CamCon. (See the calculation example in the DICAM1756 program, i.e.Chapter "6.4. Transferring actual value and speed into realtime" on page 44.)
INT 6,7	=	Actual position as 32 Bit value

Note: In addition to the described Status Bits an output parameter of the CamCon can be set as a safety output, i.e. as RUN - Control. (Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[25]" on page 32) which is switched off when an error occurs. If this is not active, the exact error can be found by checking the status question (Chapter "6.3.12. TAG "DC_3_STATUS"" on page 41).

5. Starting

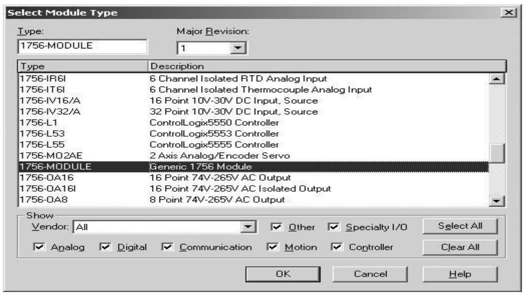
After assembly and before the first switch-on please check the wiring of the device. See Chapter "4. Electrical connections" on page 14.

Warning: *For inductive loads a flywheeling diode is required.*

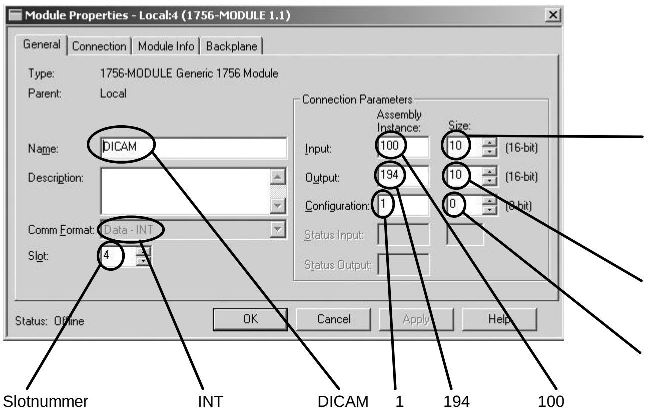
After switching on the power supply on the ControlLogix component base, the device signals with a short flicker of the Status LED (OK-LED). This is followed by an check of the loading of the systems (i.e. the checked total of the EPROM and the EPROM are evaluated). This takes a few seconds. When this process is finished, the BUS is initialized.

5.1. Planning the ControlLogix CPU for CamCon 1756-DICAM

In order to plan your ControlLogix CPU open your RSLogix 5000 Project and insert into the "**I/O Configuration**" a "**Generic 1756 Module**" into the relevant slot.



Input the parameters shown in the next diagram:

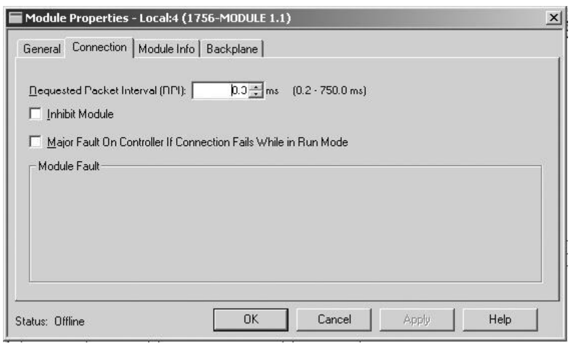


This value corresponds to the number of hardware outputs of the CamCon; it must be adapted to the requirements of the device. The CamCon can administer up to maximum 200 outputs. In addition, a further 6 Bytes are necessary for the status display and for communication. These are described in Chapter "4.13.2. Status Bits in the I - Range" on page 22.
If the actual value and the speed are to be translated into realtime, then 2 INT must be added for the actual value and 1 INT for the speed value. See Chapter "6.4. Transferring actual value and speed into realtime" on page 44.

Above this value you set the number of Bits which are then sent to the CamCon in cycles. These are used as enable Bits for the cams of the CamCon and must be set to 1, so that the respective output can be switched on when the cam is active.

0

Note:
The data exchange between the CamCon 1756-DICAM component group ControlLogix CPU may be set to 0.2 for Firmware Version 1.9 or later only.



5.1.1. The I - Range

The status display lies within the input range of the CamCon 1756 - DICAM. See Chapter "4.13.2. Status Bits in the I - Range" on page 22.

5.1.2. The O - Range

The enable Bits of the CamCon 1756 - DICAM lie in the output range. The ControlLogix PLC must set a respective bit to free each output at a time so that this can be switched on by the Cam Switch Unit. Bit 0 in the first INT "Local:X:O.Data[0]" is the release Bit for output 1 of the CamCon. Bit 0 in the second INT "Local:X:O.Data[1]" is the release for output 17 of the CamCon etc..

Note: Outputs i.e. release bits are linked to the CamCon Outputs AND (Output switch-off). When the PLC - Logic - Module is switched on, the release bits are made available as V - inputs to the PLC - Logic - Module. See the Instruction Manual of the PLC - Logic - Module (Order Nr.: H-SPS/E).

5.1.3. The C - Range

The configuration range of the CamCon 1756 - DICAM is not used currently.

6. Communication between ControlLogix 1756 CPU and CamCon 1756-DICAM

Communication between the ControlLogix CPU and the CamCon 1756-DICAM takes place via the back panel Bus. Some function components are needed and "User-Defined" Data types which are available under Order Nr.:DC1756/HB.

NOTE: If parameters, cams or delay times are cyclically written, then the EEPROMS data memory is destroyed after short time. If this is however necessary for certain reasons, then the EEPROM must lock. See Chapter "6.3.3. TAG "DC_0_EEPROM_LOCK"" on page 30

6.1. Installation of the Software

The software RSLogix 5000 Project V8.02 is available on disk or on the internet. The project name is "DC1756". You can read about the software version in the "DICAM1756" program characteristics (right mouse button).

For installation the following **consecutive** steps must be carried out:

- Open the desired project in a RSLogix 5000 sitting.
- Add to the I/O configuration the CamCon 1756-DICAM with the name "DICAM" as described in Chapter "5.1. Planning the ControlLogix CPU for CamCon 1756-DICAM".
- Open the DC1756 project on the disk in a second RSLogix session.
- Copy into your own project via clipboard (Copy+Paste) from the "Data Types" all "User-Defined" projects of the DC1756.
- Copy into your own project via clipboard (Copy+Paste) all "Controller Tags" of the DC1756 project which begin with "DC_".
- Change in all the Alias "Controller TAGs" "DC_5_" the Base TAGs to the slot number of your CamCon 1756 - DICAM.
- Change the index for the number of outputs and the type for the number of cams for each output in the "Controller TAG" DC_2_PRG_CAM[x].

  If you apply the PLC - Logic - Module of the CamCon DC1756-DICAM you also change the index of the DC_1_SYSTEM_CONFIG_PLC[x] TAGs to the number of necessary link networks.

TIP: The programingsoftware DIGISOFT 2000 enables programing the PLC-Logic-module also "Offline" with the PLC-Logic-module's editor. This programing can be transfered by an L5K - export i.e. import to the ControlLogix. For this purpose see also the DIGISOFT 2000's manual chapter "Export"

- Copy the "DICAM1756" progam from the DC1756 project into the "Main-Task" of your project.
- Enter the necessary data in the "Controller TAG" DC_1_SYSTEM_CONFIG.
- Installation is now complete.

In the "MainProgramm" of the DC1756 project you will find a few examples of how the program can be used.

Note: During copying via the clipboard parts of the information related to the DC_9_MSG TAGs are lost. Should you have to re-enter these, please see Chapter "6.2.1. The write program DC_9_DATA_WRITE" on page 27 and Chapter "6.2.2. The read program DC_9_DATA_READ" on page 28. There you will find the necessary parameters described.

6.2. General Information on the Software

The data transfer between CamCon 1756-DICAM and ControlLogix is carried out through "CIP Generic Messages".

All parameters, cams, delay times and status displays of the CamCon can be written and read. These are divided into 256 DINTs each (0..255) in 255 data-ranges (1..255) and are predefined through "User-Defined" TAGs in the RSLogix 5000 software.

Each TAG represents a dataset and consists initially of an address (ADR) and a stipulated number of DINTs into which those data are placed which are to be read or written.

The address (ADR) TAG is based on the "DC_9_HEADER" and the "DC_9_CMD_BITS "User-Defined" TAG. Initially the range numbers (RANGE), the offset in the range (OFFSET) and the number of DINTs (DATA_LEN) which are to be transferred must be entered. At the present time a maximum of 120 DINTs can be transferred with one MSG. Via the TAG "DC_9_CMD_BITS" a flag READ or WRITE is placed on the dataset. For the status display the bits data transfer running (RUN), Data Transfer successfully executed (OK) and Data Transfer was not successfully executed (ERROR) are stored in the CMD_BITS.

Note: The description of the individual TAGs and the meaning of the data can be found in Chapter "6.3. The Controller TAGs of the CamCon 1756-DICAM" on page 30.

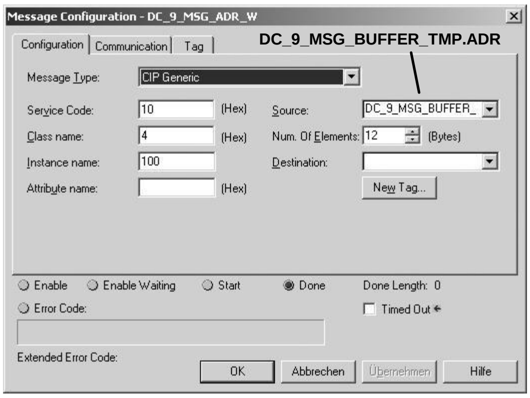
The dataset filled with the address and the used data can now be transferred into the subprogram DC_9_DATA_WRITE and DC_9_DATA_READ of the DICAM1756 program. The subprogram is called up by the programs DC_2_ALL. Here the read and write bits of the individual datasets are evaluated and the transfer programs are called up. Each write or read access always requires initially a write - and then a second write or read message respectively. The two progams WRITE and READ see to the correct procedure and set or reset the respective bits in the dataset after successful transfer. If the data transfer takes longer than 5 seconds, control bit DC_5_STATUS_COMM_TIMEOUT is set and the dataset is confirmed with an error meassage and the command is repeated. An error message through the CamCon to a dataset is signified by the Control Bit DC_5_STATUS_COMM_ERROR.

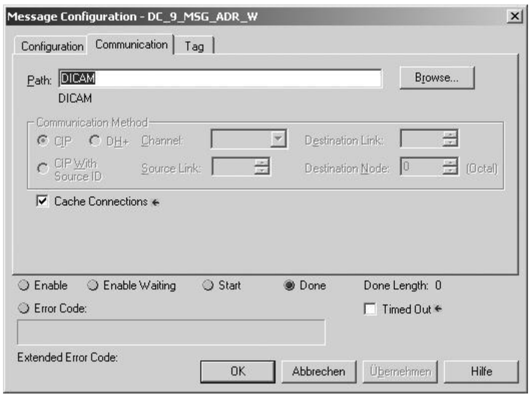
Further subprograms in the DICAM1756 program are:

DC_1_MAIN:	DICAM1756 main program, calls up DC_0_INIT once, calls up the subprogram DC_2_ALL, calculates the actual realtime speed, , checks the status, and carries out an error reset every 5 seconds when an error message has been reported.
DC_0_INIT:	Initializing of all general data and of the datasets, calling up the subprogram "DC_0_INIT_LOOP" with a FOR loop. In case of a change of cam and delay time tables the number of loops is also changed.
DC_0_INIT_LOOP:	Subprogram of DC_0_INIT.
DC_2_ALL:	Here the read and write Bits of the individual datasets are evaluated and the transfer programs are called up. In case of a change of cam and delay time tables the number of loops is also changed.
DC_2_ALL_CAM_LOOP:	Subprogram of DC_2_ALL.
DC_2_ALL_PLC_LOOP:	Subprogram of DC_2_ALL.
DC_2_ALL_TZK_LOOP:	Subprogram of DC_2_ALL.

6.2.1. The write program DC_9_DATA_WRITE for parameter, cams or delay times

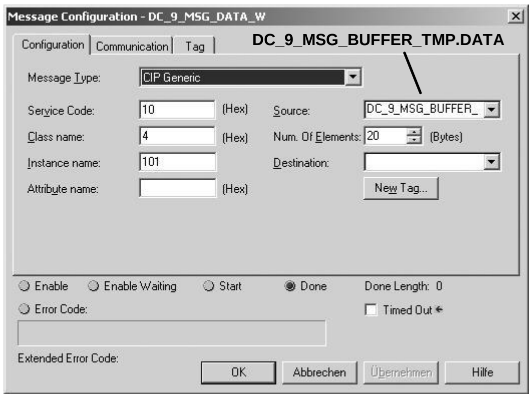
In order to write a parameter, a cam or a delay time, the CamCon must first be informed of the target range by means of a write-message. This always consists of 3 DINTs (12 bytes) and is transferred through the "Service Code:" = 10, the "Class name:" = 4 and the "Instance name:" = 100 with a length of 12 bytes to the CamCon 1756-DICAM (Communication / Path = DICAM).





The construction of the source range, in the example "DC_9_MSG_BUFFER_TMP", consists of 3 DINTs, whereby the first DINT covers the target range (1..255), the second DINT the Offset in the target range (0..255) and the third DINT the number of DINTs which are to be written.

The message must only be set when the bit "CMD_IN_USE" (See Chapter "4.13.2. Status Bits in the I - Range") is not acitve. The "DN" Bit of the message itself as well as the bits "CMD_OK" or, in the case of an error the Bit "CMD_ERROR" confirms the MSG. At the end of writing the first message the "EXOR_BIT" toggles its place and the "CMD_IN_USE" Bit goes back to 0. If the MSG was successful, then the actual data range with the parameters i.e. cams or delay times can be sent.



The second message must contain **exactly** as many DINTs as previously stipulated. It is transferred through the "Service Code:" = 10, the "Class name:" = 4 and the "Instance name:" = 101 with the respective length = number of DINTs * 4 (this is adapted during the program runtime i.e. calculated) to the CamCon 1756-DICAM (Communication / Path = DICAM).

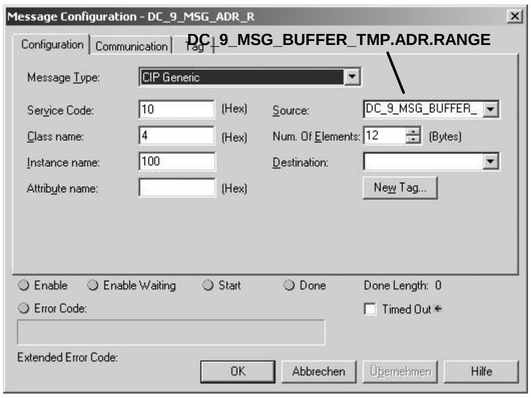
The second message must not be stopped when the bit "CMD_IN_USE" is active. The "DN" bit of the message itself as well as the bits "CMD_OK" or "CMD_ERROR" also confirm the MSG. In this case it is possible that the "DN" of the message is already active, but the bits "CMD_OK" or "CMD_ERROR" are not yet set. At the end of writing the second message the "EXOR_BIT" once again changes its place, the "CMD_IN_USE" bit goes back to 0 and the command has now either been carried out successfully or has been processed with an error.

Note: Since the bits in the I - Range can be asynchronous to the program run, it is possible that the PLC Program cannot recognise the bit "CMD_IN_USE". Only through evaluating the "EXOR_BIT" will it be discernible whether a write - MSG has arrived and is finished.

Note: If the data transfer takes longer than 5 seconds, a Control Bit DC_5_STATUS_COMM_TIMEOUT is set, the dataset is confirmed with an error message and the command is repeated. An error message through the CamCon to a dataset is signified by the Control Bit DC_5_STATUS_COMM_ERROR.

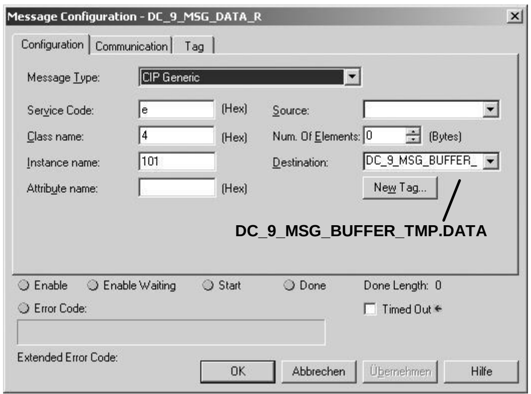
6.2.2. The read program DC_9_DATA_READ for Status, Parameter, Cams or Delay Times

In order to read the status, a parameter, a cam or a delay time, the CamCon 1756-DICAM must first be informed of the source range through a write message. This always consists of 3 DINTs (12 bytes) and is transferred through the "Service Code:" = 10, the "Class name:" = 4 and the "Instance name:" = 100 with a length of 12 bytes to the CamCon 1756-DICAM (Communication / Path = DICAM).



The construction of the source range, in the example "DC_9_MSG_BUFFER_TMP", consists of 3 DINTs, whereby the first DINT covers the source range (1..255), the second DINT the Offset in the source range (0..255) and the 3. DINT the number of DINTs which are to be read.

The message can only be set when the bit "CMD_IN_USE" (see Chapter "4.13.2. Status Bits in the I - Range") is not active. The "DN" bit of the message itself as well as the bits "CMD_OK" or, in the case of an error the bit "CMD_ERROR", confirm this MSG. At the end of writing the first message the EXOR_BIT toggles its place and the "CMD_IN_USE" Bit goes back to 0. If the MSG was successful, then the actual data range with the status, the parameters i.e. cams or delay times can be read.



The second message in the "Destination" range must be allocated **exactly** as many DINTs as previously stipulated. It reads through the "Service Code:" = e, the "Class name:" = 4 and the "Instance name:" = 101 the CamCon 1756-DICAM data.

Note: In this case the length must always be specified as 0, since the lengths was already fixed by the first message.

The second message must only be set when the bit "CMD_IN_USE" is not active. The "DN" bit of the message itself as well as the bits "CMD_OK" or "CMD_ERROR" also confirm the MSG. The read command has now been carried out successfully or has been processed with an error.

Note: Since the Bits in the I-Range run asynchronous to the program, it is possible that the PLC program cannot recognise the Bit "CMD_IN_USE". Only through evaluating the "EXOR_BITs" will it be discernible whether a write - MSG has arrived and is finished.

Note: If the data transfer takes longer than 5 seconds, a Control Bit DC_5_STATUS_COMM_TIMEOUT is set, the dataset is confirmed with an error message and the command is repeated. An error message through the CamCon to a dataset is signified by the Control Bit DC_5_STATUS_COMM_ERROR.

6.2.3. The TAGs of the "DICAM1756" Program

Type	Name	Data	Description
DINT	NMB_CAM_OUTPUTS	1..62	Number of components (cams per output) from the cam table (for the creation of automatic parameters for the FOR - loops)
DINT	NMB_OUTPUTS	1..200	Number of components (outputs) from the cam table (for the creation of automatic parameters for the FOR - loops)
DINT	NMB_PLC_LOGIC	1..896	Number of components from the PLC - Logic - Module table (for the creation of automatic parameters for the FOR - loops)
DINT	NMB_DTC_OUTPUTS	1..200	Number of components (cams with DTC) from the delay time table (for the creation of automatic parameters for the FOR - loops)
BOOL	OUTERROR	DICAM_I_KOM.0	Hardware Bit of the CamCon for recognition of output errors.
BOOL	CMD_ERROR	DICAM_I_KOM.10	Error during execution of write message.
BOOL	CMD_IN_USE	DICAM_I_KOM.9	Command in progress
BOOL	CMD_OK	DICAM_I_KOM.8	Last write message successfully done
DC_5_STATUS_COMM_RANGE	DICAM_I_KOM	local:X:I.Data[2]	Alias for controller TAG "DC_5_STATUS_COMM_RANGE".
BOOL	EXOR_BIT	DICAM_I_KOM.15	This Bit toggles after execution of a write message
BOOL	EXOR_BIT_SAVE	0..1	Save variable for EXOR Bit.
BOOL	HARDWARE_RESET	DICAM_I_KOM.2	Hardware reset bit of the CamCon.
DINT	HELP	0..1000	Run variable
DC_9_MSG_BUFFER	MSG_BUFFER_TMP_2	-	2. MSG Bufffer for changing position of data in the subprogram
DINT	MSG_STATUS	0..2	Status of MSG transfer / 0 = No MSG / 1 = 1.MSG run / 2 = 2.MSG run.
BOOL	OUTPUT_ENABLE	DICAM_I_KOM.1	Hardware bit of the CamCon for output release
BOOL	POWER_SUP_ENCODER	DICAM_I_KOM.7	Power supply IO periphery and measuring system available
BOOL	POWER_SUP_IO	DICAM_I_KOM.3	must always be 0, if 1 then all other Bits in this are Byte 1 i.e. undefined
BOOL	POWER_SUP_OUT_17_24	DICAM_I_KOM.6	Power supply Output 17 - 24 available
BOOL	POWER_SUP_OUT_1_8	DICAM_I_KOM.4	Power supply Output 1 - 8 available
BOOL	POWER_SUP_OUT_9_16	DICAM_I_KOM.5	Power supply Output 9 - 16 available
INT	SPEED_HELP	-32767..+32767	Help variable for calculating realtime speed
TIMER	STATUS_R_TIMER	every 5 seconds	Timer for cyclic reading of the status question
TIMER	TIMEOUT_R	maximum 5 seconds	Data transfer, read Timeout Timer
TIMER	TIMEOUT_W	maximum 5 seconds	Data transfer, write Timeout Timer
DINT	LOOP_PLC	0..NMB_PLC_LOGIC	Loop counter for the controller TAG: DC_1_SYSTEM_KONFIG_SPS[] for DICAM SPS - Logic - module programing.
DINT	LOOP_PLC_CHK	-1..NMB_PLC_LOGIC	Counter for the elements of the TAG: DC_1_SYSTEM_KONFIG_SPS[] with se OK Bit. If this value equals the NMB_PLC_LOGICthe controller TAG: DC_1_SYSTEM_KONFIG_SPS_OK is set to1.
DINT	LOOP_CAM	0..NMB_OUTPUTS	Loop-counter for controller TAG: DC_2_PRG_CAM[] for Cam programingerung.
DINT	LOOP_CAM_CHK	-1..NMB_OUTPUTS	Counter for the TAG's elements: DC_2_PRG_CAM[] with set OK Bit. If this value equals ANZ_OUTPUTS the controller's TAG: DC_2_PRG_CAM_OK is set to 1.
DINT	LOOP_DTC	0.. NMB_DTC_OUTPUTS	Loop-counter for controlleTAG: DC_2_PRG_DTC[] for delay-time programingg.
DINT	LOOP_DTC_CHK	-1.. NMB_DTC_OUTPUTS	Counter for the TAG's elements: DC_2_PRG_DTC[] with se OK Bit. If this value equals ANZ_DTC_OUTPUTS the controller'sr TAG: DC_2_PRG_DTC_OK is set to 1.

6.3. The Controller TAGs of the CamCon 1756-DICAM

The Controller TAGs described here are derived from the predefined "User-Defined" TAGs.

6.3.1. TAG "ADR"

The ADR TAG of the individual datasets always consists of the data range, the offset, the data length and the control bits. Via the range and the offset the function, i.e. the parameters, cams or delay time values are selected. If more validators are necessary, it is then stipulated via the data length how much is to be read or written. Data transfer is released and monitored by the control bits.

Type	Name	Description
DC_9_HEADER	ADR	Address consists of:
DINT[0]	RANGE	Data range number
DINT[1]	OFFSET	Offset in the data range
DINT[2]	DATA_LEN	Length of transferred data
DC_9_CMD_BITS	CMD	Command bits consist of:
DC_9_CMD_BIT	WRITE	Dataset to be written Note: Not ev99ery dataset can be written
DC_9_CMD_BIT	RUN	Dataset transfer in progress
DC_9_CMD_BIT	OK	Dataset transfer completed and OK
DC_9_CMD_BIT	ERROR	Dataset transfer completed with Error or Timeout In a Timeout; the DC1756DICAM Program attempts to send the dataset again
DC_9_CMD_BIT	READ	Dataset to be read Note: Not every dataset can be read

For simpler presentation purposes, the following tag description will always show one line with the range, Offset and the length. The bits WRITE, RUN and READ must always be 0 in this definition. In case a data transfer is interrupted by a power cut of the CPU, these must be set to 0 during initialisation (See Program DC_0_INIT).

6.3.2. TAG "DC_0_CLEAR_ALL"

Type	Name	Data	Description
DC_9_HEADER	ADR	205,1,1	Address
DINT[0]	DATA	-1	If this dataset is transferred, the CamCon is completely erased Note: write only is possible

6.3.3. TAG "DC_0_EEPROM_LOCK"

Type	Name	Data	Description
DC_9_HEADER	ADR	205,4,1	Adresse
DINT[0]	EEProm_Lock	0..1	0 = EEProm not blocked 1 = EEProm blocked, no write to the EEProm **Warning:** The EEProm must be blocked, if data is written frequently (cycllic) to the component group; otherwise the EEProm memory is destroyed. Changes on cams, parameters etc. which are written after the memory has been blocked are lost after switching OFF and ON.

6.3.4. TAG "DC_0_HW_RESET"

Type	Name	Data	Description
DC_9_HEADER	ADR	205,2,1	Adresse
DINT[0]	DATA	-1	When this dataset is transferred, a Hardware Reset is released on the CamCon. This corresponds to switching operating power OFF and ON. Note: write only is possible

6.3.5. TAG "DC_1_SYSTEM_CONFIG"

With the transfer of this TAG the parameters of the CamCon 1756-DICAM are complete.

Type	Name	Data	Description
DC_9_HEADER	ADR	203,0,66	Adresse
DINT[0] alue	Measuring_system_type	-1, 0..20	Here you select your measuring system. 0 = 256 SSI Single turn Grey 1 = 360 SSI Single turn Grey 2 = 512 SSI Single turn Grey 3 = 1000 SSI Single turn Grey 4 = 1024 SSI Single turn Grey 5 = 2048 SSI Single turn Grey 6 = 4096 SSI Single turn Grey 7 = 8192 SSI Single turn Grey 8 = AWA/SSI 8 Bit 9 = AWA/SSI 12Bit 10 = 4096x4096 SSI Multiturn 4096Imp.= 1 Turn 11 = 4096x4096 SSI Multiturn 4096Imp.= 2 Turn 12 = 4096x4096 SSI Multiturn 4096Imp.= 4 Turn 13 = 4096x4096 SSI Multiturn 4096Imp.= 8 Turn 14 = 4096x4096 SSI Multiturn 4096Imp.= 16 Turn 15 = 4096x4096 SSI Multiturn 8192Imp.= 2 Turn 16 = 4096x4096 SSI Multiturn 8192Imp.= 4 Turn 17 = 4096x4096 SSI Multiturn 8192Imp.= 8 Turn 18 = 4096x4096 SSI Multiturn 8192Imp.= 16 Turn 19 = 4096x4096 SSI Multiturn 8192Imp.= 32 Turn 20 = 4096x4096 SSI Multiturn 8192Imp.= 64 Turn or select a specific one -1 = Special measuring system
DINT[1]	Special_measuring_system_type	0..7	Special measuring system type 0 = SSI - Measuring system 1 = Parallel - Measuring system 2 = Incremental - i.e. Hiperface - Measuring system. 3 = Multiturn - Measuring system 4 = PLL - Measuring system 5 = Timer - Measuring system 6 = RS232 - Measuring system 7 = AG615 at 360° - Measuring system
DINT[2]	SMS_Parameter_1		Special measuring system depends on Parameter 1. See Chapter "6.3.6. Special measuring system TAGs"
DINT[3]	SMS_Parameter_2		Special measuring system depends on Parameter 2. See Chapter "6.3.6. Special measuring system TAGs"
DINT[4]	SMS_Parameter_3		Special measuring system depends on Parameter 3. See Chapter "6.3.6. Special measuring system TAGs"
DINT[5]	SMS_Parameter_4		Special measuring system depends on Parameter 4. See Chapter "6.3.6. Special measuring system TAGs"
DINT[6]	SMS_Parameter_5		Special measuring system depends on Parameter 5. See Chapter "6.3.6. Special measuring system TAGs"
DINT[7]	SMS_Parameter_6		Special measuring system depends on Parameter 6. See Chapter "6.3.6. Special measuring system TAGs"
DINT[8]	Value_hysteresis	0..125	The value hysteresis This value is necessary to suppress fluttering of the outputs during unsteady value gathering. The exact value can only be obtained by trial and error, but it has to be as small as possible or always 0. Hysteresis can be set between 0 and maximum 1/4 of the total resolution but it must not exceed maximum of 125 Impulses.
DINT[9]	Speed_maximum	0..9999	Maximum speed for measuring system control (Impulses per cycle) The value to be entered is calculated from the actual cycle time of the CamCon, from the physical resolution of the measuring systems and the speed of the machine. Example: Cycle time = 0.5ms / resolution = 360 / speed of the machine = 180 min $^{-1}$. $\text{Value} = \frac{\text{Resolution * machine speed}}{60 * 1000} * \text{cycle time + safety reserve}$ $\frac{360 * 180}{60 * 1000} * 0.5 + 5 = 5.54 \approx \mathbf{6}$ The result is rounded up and entered. If the CamCon now registers an actual value jump of more than 6 impulses, an error message **"Pos-Err:5"** is created. If a zero is entered, the control is switched off. The Resolution must be entered as a physical value (no transmission factor).
DINT[10]	Transmission_multiplier	-99999... 99999	The multiplier for electronic transmission serves for measuring range transformation. The physical measuring range, for example of a rotational angle encoder, is transformed into a new and for the user effectively visible measuring range (actual value). **Note:** The counting direction of the measuring systems is marked by the prefix.
DINT[11]	Transmission_divider	1..99999	Divider for electronic transmission **Example:** In the event of a full turn of the rotational angle encoder with 360 steps per rotation, a machine drives around 1000mm. If the display of the position is no longer supposed to be in angle degrees but in mm, the motor must be set to the factor **1000 / 360** with the effect that the display will no longer change in one-step increments, since the resolution is not influenced. If you select, for example **100 / 360**, the actual value is calculated down to a process range of up to 100. The position display is then given in cm, whereby moving the decimal point is not possible.

DINT[12]	Measuring_system_movement	0..1	Measuring system type 0 = Rotational (for example: eccentric presses, packaging machine) 1 = Linear (for example: toggle press, positioning) **Warning:** If during linear path measuring the value is outside the stipulated range, the CamCon switches off with the error message **"Pos-Err 3".**
DINT[13]	Starting_point_line_measuring_system	-9999999... 9999999	Start value for linear measuring system Here you state the required start value of the process range. You can also set a negative value.
DINT[14]	Offset_measuring_system	minimum... maximum possible actual value	Offset for measuring system The Offset is deducted from the physical actual value and thus gives you the option of moving the zero point. **Note:** If you have selected a linear movement and the turning direction is set to minus, then the offset must be of a value smaller than zero (for example -359).
DINT[15]	Preset_value_measuring system	minimum.. maximum possible actual value	Setting a preset value for an actual value in the measuring system when a positive limit on the CamCon preset input is found. By setting the preset value to zero you can create an external zero signal, in order to, for example, synchronise the position of the machine with the acual value of the CamCon.
DINT[16]	Preset_input_measuring_system	0.. Number_cam_ Inputs	Preset Input for measuring system 0 = Preset OFF The actual value can be changed with a positive limit on the CamCon Preset Input.
DINT[17]	Zero_power_fixed_preset	0..1	Preset fixed zero power 0 = zero power not fixed 1 = zero power fixed **Warning**: At a value of 1the EEProm can be destroyed by cyclical writing! **Note:** This parameter also affects the setting of the actual value. See Chapter "6.3.8. TAG "DC_1_SYSTEM_SET_ACTUAL_VALUE"" on page 40.
DINT[18]	Speed_factor	1..999999999	Speed factor The speed is measured by increments i.e. impulses per second which the measuring system gives out after calculation through the electronic gear (USER resolution). But, if you want to display the speed, for example in U/min. or in items per minute or status, you willhave to set a conversion factor. With a Speed factor of 100000 the speed value shows User resolution / second. Factor for U/min = 60 / User resolution * 100000. Example: 16666 = at 360° User resolution or 732 = at 8129 Imp User resolution
DINT[19]	Max_speed_value	2..999999999	100% - Speed value This value served the adaptation of the speed display and must always be set to 10% greater than the maximum expected speed of the device.
DINT[20]	Speed_display_accuracy	1..999	Accuracy or damping of the speed indicator 100 = 1.00% Oscillation of the speed indicator can be limited to a maximum value. This is achieved by damping through a low pass, which results in a smoothing of the display, i.e. a kind of middle value is created. The smaller the entered value, the smoother the speed display will be.
DINT[21]	Switchover_mode_display	0	This value has no function in the CamCon 1756-DICAM.
DINT[22]	Input_switchover_display	0	This value has no function in the CamCon 1756-DICAM.
DINT[23]	Cable_length	0..1000	Cable length between the SSI - measuring system and the CamCon and between the external input/output extension and the CamCon in meters. This value is necessary, since the cable lengths determines the maximum possible speed of serial data transfer. The greater the entered cable length, the slower the data communication and the greater the cycle time (Default = 30 meters).
DINT[24]	Cycle_time	0..10000	The expected cycle time in µs, i.e. actual cycle time when this value is read. The expected cycle time is for example necessary when a measuring system is connected to it, which allows only one reading of the data within a specific time.
DINT[25]	Safety_output	0.. Number_cam_ Outputs	Safety Output i.e. Run-Control In order to have the option of controlling the CamCon in situations such as short circuits on output channels or errors in path measuring, a rotary cam can be programmed for a single output. This output is only switched off when an error occurs and serves as a safety output. In the case of a program change the safety output is temporarily set back. See also DINT[36] on page DINT[36] on page 33. "**0**" means that no safety output has been programmed.
DINT[26]	Send_actual_realtime_value	0..2	Output of actual realtime value on the I-range 0 = No actual realtime output 1 = Output actual value in grey code 2 = Output actual value in binary code Always set CamCon 1756-DICAM to 2.
DINT[27]	Turning_direction_output	0.. Number_cam_ Outputs	Rotational direction output This switches over when the speed hysteresis is exceeded. When the direction of the movement is positive, output is switched on and if it is negative, it is switched off. "**0**" means that no rotational direction output has been programmed.
DINT[28]	Hold_output	0.. Number_cam_ Outputs	No movement output This output switches on when the actual speed exceeds the set hysteresis value. "**0**" means that no standstill output was programmed.
DINT[29]	Speed_hysteresis	0.. Max_speed_value	Speed hysteresis For the rotational direction output and the standstill output the speed hysteresis must be set. This value is necessary for defining a switch threshold at which the switch-over takes place.
DINT[30]	Number_cam_inputs	0..200 (only multiples of 8)	Number of cam-switch inputs When the "PLC - Logic - Option" is switched off, the number of hardware inputs must be entered at the CamCon. If the option inputs is built into the device, 8 or otherwise 0 must be entered. Note: The option X = "external Interface" and the connected extension device require that the number of inputs correspond exactly to the number of electrical inputs, since the short-circuit recognition of the CamCon reacts to the number of inputs.
DINT[31]	Number_cam_outputs	24..200 (only multiples of 8)	Number of cam-switch outputs When the "PLC - Logic- Option" is switched off, the number of hardware outputs must be entered at the CamCon (24). In addition it is possible to make up to 200 cam outputs available via the back plane bus of the ControlLogix. Note: The option X = "external Interface" with the connected extension devices require that the number of outputs correspond exactly to the number of electrical outputs.

DINT[32]	Number_outputs_with_DTC	0.. Number_cam_ outputs (only multiples of 8)	Number of outputs with Speed Compensation Here you enter the number of Speed Compensating cam outputs which are available to the CamCon. The number of outputs should not exceed the absolutely necessary maximum, otherwise you waste storage space and cycle time unnecessarily.
DINT[33]	Input_keyboard_lock	0	This value has no function in the CamCon 1756-DICAM and must always be 0.
DINT[34]	Number_Input_for_external_ progam_selection	0	This value has no function in the CamCon 1756-DICAM and must always be 0.
DINT[35]	Strob_Input_of_external_pro gram_selection	0	This value has no function in the CamCon 1756-DICAM and must always be 0.
DINT[36]	Program_selection_mode	0..2	Program selection mode 0 =slow, 1 = direct, 2 = by actual value **slow:** The selected program is constructed cam by cam. This kind of program change does not require any additional RAM storage, but during program switching at full speed complications on the machine can occur. In this case, the safety output of the CamCon is temporarily switched off. **direct:** In a buffer store the selected program is constructed cam by cam and then quickly changed. This kind of program change needs double storage space for the cam construction and the outputs are never undefined. The safety output of the CamCon is not switched off in this case. **by actual value:** In a buffer the selected program is constructed cam by cam. You must wait until the machine passes a specific actual value and then execute a sudden program change. This kind of program change also needs double storage space for the cam construction and the outputs are never undefined. The safety output of the CamCon is not switched off in this case.
DINT[37]	Actual_value_progam_select ion_mode_2	minimum.. maximum possible actual value	Change-over point when the program select mode is set to 2.
DINT[38]	Number_of_analog_outputs	0	This value has at present no function in the CamCon 1756-DICAM and must always be 0.
DINT[39]	Realtime_speed_output	0..1	Realtime speed output 0 = no realtime speed output 1 = realtime speed output switched on
DINT[40]	Number_internal_analog_out put	0	This value has no function in the CamCon 1756-DICAM.
DINT[41]	Offset_int_analog_output_1	0	This value has no function in the CamCon 1756-DICAM.
DINT[42]	Offset_int_analog_output_2	0	This value has no function in the CamCon 1756-DICAM.
DINT[43]	Factor_int_analog_output_1	0	This value has no function in the CamCon 1756-DICAM.
DINT[44]	Factor_int_analog_output _2	0	This value has no function in the CamCon 1756-DICAM.
DINT[45]	Plc_logic_module_status	0..2	Plc - Logic - Module / 0 = OFF / 1 = ON/ 2 = ON / remanend **Warning:** Before you switch on the Plc - Logic - Module, it is essential that you read the instruction manual of the Plc - Logic - Module. You can access this instruction manual at the address "http://www.digitronic.com" as a PDF file.
DINT[46]	Number_hardware_inputs	0..200 (only multiples of 8)	Number of Hardware Inputs **Note:** This value is only applied if the Plc - Logic - Module is switched on.
DINT[47]	Number_hardware_outputs	0..200 (only multiples of 8)	Number of Hardware Outputs = I - Range of ControlLogix **Note:** This value is only applied if the Plc - Logic - Module is switched on.
DINT[48]	Number_plc_register	0..248 (only multiples of 8)	Number of "PLC - Logic - Module" register **Note:** This value is only applied if the Plc - Logic - Module is switched on.
DINT[49]	Number_plc_x_register	0..248 (only multiples of 8)	Number of "PLC - Logic - Module" X - register **Note:** This value is only applied if the Plc - Logic - Module is switched on.
DINT[50]	Number_plc_timer_ counter	0..200 (only multiples of 8)	Number of "PLC - Logic - Module" Timer/Counter **Note:** This value is only applied if the Plc - Logic - Module is switched on.
DINT[51]	Number_plc_v_inputs	0..248 (only multiples of 8)	Number of "PLC - Logic - Module" V - Inputs = 0 - Range of ControlLogix **Note:** This value is only applied if the Plc - Logic - Module is switched on.
DINT[52]	Number_plc_s_inputs	0..248 (only multiples of 8)	Number of "PLC - Logic - Module" S - Inputs **Note:** This value is only applied if the Plc - Logic - Module is switched on.
DINT[53]	Master_program	0..1	Master - Program / 0 = OFF / 1 = ON This gives you the option of defining program or related product cams. These are necessary if, for example, you process several products with your machine which have only few product related differences in the cam program. It is a way of saving considerable cam storage space (EEProm), since the cams which are not product dependent need not be repeatedly programmed.
DINT[54]	Master_program_number	0..32767	Master Program Number Enter the Master Program Number under which the Master cams are to be stored.
DINT[55]	Master_output_1_32	Bits 0-31	Master Program Output 1 - 32, Radix := Binary Here it is defined as bit example which cam output is a Master Output.
DINT[56]	Master_output_33_64	etc.	Output 33 - 64
DINT[57]	Master_output_65_96	"	etc.
DINT[58]	Master_output_97_128	"	"
DINT[59]	Master_output_129_160	"	"
DINT[60]	Master_output_161_192	"	"
DINT[61]	Master_output_193_224	"	"
DINT[62]	Master_output_225_248	"	"
DINT[63]	DC300_interrupt	0	This value has no function in CamCon 1756-DICAM.

DINT[64]	Number_plc_shift_register	0..200 (only multiples of 8)	Number of shift registers in the Plc - Logic - Module **Attention:** **If a shift register is defined, the variable "speed max" is set to 16, for the reason that in a cycle of the DICAM a maximum of 16 Bits of the shift register can be shifted. See also chapter** 6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[9]. **Note:** This value is rounded up and only then applied when the Plc - Logic - Module is switched on
DINT[65]	Max_shift_size	0..999999	Maximum length of a shift register in the Plc - Logic -Module. **Note:** This value is rounded up and only then applied when the Plc - Logic - Module is switched on.

Note: You will find the minimum/maximum possible actual value in Chapter "6.3.13. TAG "DC_3_STATUS_FULL" Value: DINT[27]" and Chapter "6.3.13. TAG "DC_3_STATUS_FULL" Value: DINT[28]" on page 42.

6.3.6. Special measuring system TAGs

A special measuring system is necessary if you cannot connect or use any of the predefined SSI - measuring systems to the CamCon.

6.3.6.1. TAG "DC_1_SYSTEM_CONFIG_ENC_0_SSI"

Type	Name	Data	Description
DINT[0]	REC	-1	Always -1 = recognition of special measuring system
DINT[1]	TYP	0	Type 0 = SSI Measuring system
DINT[2]	BIT	2..25	Measuring system resolution in bits Enter the number of the used data bits of the SSI - measuring system. Resolution of, for example 1000 Impulses, this corresponds to 10 bits.
DINT[3]	LSB	2..25	Position of the LSB (Offset) in the delivered encoder value from which the evaluation is to be started. For a 1000 Impulse SSI - measuring system the position of the LSB is on position 10. For more accurate information please consult the instruction manual for your measuring system.
DINT[4]	CAPP	0..65536	Capping for encoders which have no binary resolution. At 1000 Impulses this would be (1024 - 1000) / 2 = 12.
DINT[5]	ERROR	14 25 / 26	Bit position of the SSI - Error bit Standard rotating angle encoders of the Stegmann company use the bit position 14. At this SSI - Position it is necessary to transfer a 0.
DINT[6]	RES1	0	Reserve 1
DINT[7]	RES2	0	Reserve 2

Copy this data range to the beginning of the data range tag "DC_1_SYSTEM_CONFIG" with the ”COP” command or enter the value directly in the DC_1_SYSTEM_CONFIG TAG. After the transfer of this dataset the SSI - special measuring system is set.

Note: Consider also chapter "4.9.1. SSI Measuring system input" on page 17.

6.3.6.2. TAG "DC_1_SYSTEM_CONFIG_ENC_1_PAR"

Type	Name	Data	Description
DINT[0]	REC	-1	always -1 = Recognition of the special measuring system
DINT[1]	TYP	1	Type 1 = parallel measuring system
DINT[2]	RESOLUTION	2..65536	Measuring system resolution Please state the resolution of the parallel measuring systems (for example 500 Impulses)
DINT[3]	INPUT	0... Number_cam_outputs - resolution in bits	Input number from which evaluation is to be started This is the input of the lowest value bits (LSB). At a resolution of 500 impulses 9 bits of resolution are needed. The CamCon calculates from the position of the LSBs automatically the position of the remaining inputs, that is in ascending order. Please make sure that you are not going outside the input range of the CamCon.
DINT[4]	MODE	0..1	Coding of parallel measuring systems 0 = Gray code 1 = Binary code **Warning:** The parallel binary code should only be used in exceptional circumstances. Please contact your customer service.
DINT[5]	RES1	0	Reserve 1
DINT[6]	RES2	0	Reserve 2
DINT[7]	RES3	0	Reserve 3

Copy this data range to the beginning of the data range tag "DC_1_SYSTEM_CONFIG" with the ”COP” command or enter the value directly in the DC_1_SYSTEM_CONFIG TAG. After the transfer of this dataset the parallel special measuring system is set.

Note: Consider also chapter "4.9.2. Parallel measuring system input" on page 17.

6.3.6.3. TAG "DC_1_SYSTEM_CONFIG_ENC_2_INK" or Hiperface

Type	Name	Data	Description
DINT[0]	REC	-1	always -1 = Recognition for special measuring system
DINT[1]	TYP	2	Type 2 = INK or Hiperface Measuring system
DINT[2]	RESOLUTION	2..131072	Measuring system resolution Enter the maximum necessary impulse number. This value is then the maximum resoluton which the CamCon will evaluate. If more impulses are counted than set for the resolution, then the CamCon begins to count from zero again. But, if the movement system was set to **"linear"** (TAG = Measuring system_movement), then the CamCon switches to **"Clear...."** or **"Pos-Err: 3"**. In this case the resolution must be made greater or the actual value must be reset by means of a Clear or Preset signal.
DINT[3]	DIV	0..11	Divisor of impulses, 0 = *4, 1 = *2, 2 = *1, 3 = /2, 4 = /3..... The divider divides or multiplies the incoming impulses of the measuring systems with this value. The following dividers can be entered: "***4**", "***2**", "***1**", "**/2**", "**/4**", "**/8**", "**/16**", "**/32**", "**/64**", "**/128**", "**/256**", "**/512**". If the divisor is set to "***4**" = 0, this means that a measuring system with 500 impulses resolution makes available 2000 impulses to the device (quadrupling).
DINT[4]	MODE	0..7	Clear Modes, 0=C1&C2, 1=/C1&C2...... 7=C2 neg. edge or C1 Here you set the function of the additional inputs C1 and C2. You can select from 8 possible function types: "**C1 & C2**" If Input C1 is high and C2 is high, the counter is set to zero. "**/C1 & C2**" If Input C1 is low and C2 is high, the counter is set to zero. "**C1 & /C2**" If Input C1 is high and C2 is low, the counter is set to zero. "**/C1 & /C2**" If Input C1 is low and C2 is low, the counter is set to zero. "**C1 : W**" If Input C1 is high, the counter is set to zero. If Input C2 is high, impulses are no longer counted (Wait). "**/C1 : W**" If Input C1 is low, the counter is set to zero. If Input C2 is high, impulses are no longer counted (Wait). "**C1 or áC2**" The counter is set to zero, if Input C1 is high if or if the signal changes an Input C2 from low to high. "**C1 or âC2**". The counter is set to zero, if Input C1 is high or if the signal changes an Input C2 from high to low.
DINT[5]	RES1	0	Reserve 1
DINT[6]	RES2	0	Reserve 2
DINT[7]	RES3	0	Reserve 3

Copy this data range to the beginning of the data range tag "DC_1_SYSTEM_CONFIG" with the "COP" command or enter the value directly in the "DC_1_SYSTEM_CONFIG" tag. After the transfer of this dataset the incremental special measuring system is set.

Note: Consider also chapter "4.9.3. Incremental measuring system input" on page 18.

6.3.6.4. TAG "DC_1_SYSTEM_CONFIG_ENC_3_MULTI"

Type	Name	Data	Description
DINT[0]	REC	-1	always -1 = Recognition for special measuring system
DINT[1]	TYP	3	Type 3 = Multi-turn measuring system for AAG626 or AAG66107 This measuring system is needed, if you have to drive a multi-turn angle encoder with non-binary number revolutions.
DINT[2]	RESOLUTION	2..65536	Measuring system resolution **Example 1:** You have a turntable with a gear ration of 3 to 1, whereby the angle encoder makes three turns and the turntable one turn. These three revolutions correspond now to 360 impulses (360 Degrees). The following entries are necessary to achieve this: Resolution = 360 / Turn = 3 / Div = 1. **Example 2:** You have a turntable with a gear ratio of 12.5 to 1, whereby the angle encoder makes 12.5 turns and the turntable one turn. These 12.5 revolutions now correspond to 3600 impulses (360.0 Degrees). The following entries are necessary to achieve this: Resolution = 3600 7 Turn = 25 / Div = 2. **Warning:** This measuring system works only in connection with a multi-turn angle encoder with 4096 x 4096 impulses resolution (Type: AAG66107 or AAG626) and must not be through more than 512 revolutions of the angle encoder without power supply.
DINT[3]	TURN	1..999	Number of turns of the encoder
DINT[4]	DIV	1..999	Divider for uneven turns or 1
DINT[5]	RES1	0	Reserve 1
DINT[6]	RES2	0	Reserve 2
DINT[7]	RES3	0	Reserve 3

Copy this data range to the beginning of the data range tag "DC_1_SYSTEM_CONFIG" with the "COP" command or enter the value directly in the "DC_1_SYSTEM_CONFIG" tag. After the transfer of this dataset the multi-turn special measuring system is set.

6.3.6.5. TAG "DC_1_SYSTEM_CONFIG_ENC_4_PLL"

Type	Name	Data	Description
DINT[0]	REC	-1	always -1 = Recognition for special measuring system
DINT[1]	TYP	4	Type 4 = PLL - Measuring system The PLL measuring system (Phase - Lock - Loop) calculates the path from time Interpolation of a single measuring impulse. For example: If you have fixed an initiator to your turntable and you would like to calculate the actual position at constant speed without attaching a further measuring system, then the PLL measuring system is the right choice.
DINT[2]	IMPULSES	2..8192	Impulses per input signal
DINT[3]	NUMBER_ IMPULSE	1..8192	Number of input impulses for one revolution
DINT[4]	ERROR	0..8192	Error window
DINT[5]	IMPULS_ INPUT	1.. Number_cam_inputs	Impulse - Input
DINT[6]	CLEAR_INPUT	0.. Number_cam_inputs	Clear - Input
DINT[7]	ERROR_ OUTPUT	0.. Number_cam_outputs	Error - Output

Copy this data range to the beginning of the data range tag "DC_1_SYSTEM_CONFIG" with the ”COP” command or enter the value directly in the ”DC_1_SYSTEM_CONFIG” tag. After the transfer of this dataset the PLL special measuring system is set.

Note: Consider also chapter "4.9.5. PLL measuring system input" on page 20.

6.3.6.6. TAG "DC_1_SYSTEM_CONFIG_ENC_5_TIMER"

Type	Name	Data	Description
DINT[0]	REC	-1	always -1 = Recognition for special measuring system
DINT[1]	TYP	5	Type 5 = Timer Measuring system
DINT[2]	RESOLUTION	2..65536	Measuring system resolution The timer path simulation makes it possible to create paths or actual time values without measuring system, that is on a time basis. In that case, the Cam Switch Unit behaves in a similar way as a washing machine control system.
DINT[3]	TIME	1..10000	Time per step in ms
DINT[4]	STOP_INPUT	0 - Number_cam_inputs	Stop - Input (release) A high signal at this input lets the timer run, a low signal at this input stops the timer. If you do not want to have a stop input, simply insert "**0**".
DINT[5]	CLEAR_INPUT	0 - Number_cam_inputs	Clear - Input A high signal at this input leaves the timer at **"0"**. If you do not want a Clear - Input, simply insert "**0**".
DINT[6]	RES1		Reserve 1
DINT[7]	RES2		Reserve 2

Copy this data range to the beginning of the data range tag "DC_1_SYSTEM_CONFIG" with the ”COP” command or enter the value directly in the DC_1_SYSTEM_CONFIG TAG. After the transfer of this dataset the timer special measuring system is set.

Note: Consider also chapter "4.9.6. Timer as a measuring system" on page 20.

6.3.6.7. TAG: "DC_1_SYSTEM_CONFIG_ENC_7_AG615"

Type	Name	Data	Description
DINT[0]	REC	-1	alwaysr -1 = Recognition for special measuring system
DINT[1]	TYP	7	Type 7 = Measuringsystem AG615 This SSI Speciale measuring system makes a Multi-Turn i.e. Use measuring sytem of an AAG615-8192 Single - Turn measuring system. As a result, one gets severally revolutions at the DICAM per a single Turn of the AG615.
DINT[2]	RESOLUTION	2..8192	Resolution of the measuring system per Turn
DINT[3]	TURNS	1..999	Number of Turns per revolution of the measuring system
DINT[6]	RES1		Reserve 1
DINT[6]	RES2		Reserve 2
DINT[6]	RES3		Reserve 3
DINT[7]	RES4		Reserve 4

Copy this data range using the "Copy" command at the beginning of the data-range of the TAG "DC_1_SYSTEM_CONFIG" or directly enter the values into the TAG: DC_1_SYSTEM_CONFIG. After the transmission of this data-record, the AG615 is set.

6.3.6.8. TAG: "DC_1_SYSTEM_CONFIG_ENC_8_SPEED_SIM"

Type	Name	Data	Description
DINT[0]	REC	-1	recognition for special measuring systems
DINT[1]	TYP	8	Type 8 = measuring system simulator This measuring system simulator enables creating way- or actual time-values without needing a measuring system (on the base of time). On the contrary to the Timer-measuring system a higher speed is possible.
DINT[2]	RESOLUTION	2..65536	measuring system resolution
DINT[3]	INC_SECOND	1..10000	Speed in Impulses i.e. Increments per second.
DINT[4]	HALT_INPUT	0 - Number of_NSW_inputs	Halt - input (enableling). A high Signal at this input sets the simulator to go, a low signal at this input stops the simulator. If you do not want a Halt input, simple enter a 0 here.
DINT[5]	CLEAR_INPUT	0 - Number of_NSW_inputs	Clear - input A high signal at this input sets the timer to **"0"**. If you do not want a Clear - input, simply enter a "0" here.
DINT[6]	RES1		Reserve 1
DINT[7]	RES2		Reserve 2

This datarange can be copied directly to the beginning of the data-range of the TAG "DC_1_SYSTEM_CONFIG" by using the "copy" command or directly enter the values into the TAG: DC_1_SYSTEM_CONFIG. After a transmission of this data record the simulator - special measuring system.

6.3.6.9. TAG: "DC_1_SYSTEM_CONFIG_ENC_9_HIPER"

Type	Name	Data	Description
DINT[0]	REC	-1	always 1 as Recognition for special measure systems
DINT[1]	TYP	9	Type 9 = HIPER - measure systems with Roll - Over - Function This special measuringh system is used if the DICAM is equiped with a HIPER - Face - or Incremental - measuring system-input and an odd translation of the gear would cause an adding measuring error..
DINT[2]	MUL	1..9999	Multipliertfor the HIPER - gear.
DINT[3]	DIV	1..4095	Divisor for the HIPER - gear.
DINT[4]	RESOLUTION	2..131072	Enter here the maximum required number of impulses. This values is the resolution to which the CamCon is evaluated. If more impulses than the set resolution value are counted, the Camcon re-starts counting at 0. If the moving system was set to **"linear"** (TAG = measuring system_moving), the CamCon switches to "Clear" respective "Err: 3", a case in which the resolution has to be set to a greater value or the actual value has to be reset by creating a Clear- or Preset-signal.
DINT[5]	MODE	0..7	Clear Modes, 0=C1&C2, 1=/C1&C2...... 7=C2 neg. edge or C1 Set the aditional input's C1 and C2 functions here. You can choose between 8 possible types of functions : "**C1 & C2**" If input C1 is high and C2 high, the counter is set to 0. "**/C1 & C2**" If input C1 is low and C2 high, the counter is set to 0. "**C1 & /C2**" If input C1 is high and C2 low, the counter is set to 0. "**/C1 & /C2**" If input C1 is low and C2 low, the counter is set to 0. "**C1 : W**" If input C1 is high, the counter is set to 0. If input C2 is high, no more impulses will be countedt (Wait). "**/C1 : W**" If input C1 is low, the counter is set to 0.If input C2 is high ist, no more impulses will be countedt (Wait). "**C1 or á C2**" The counter is set to 0, if input C1 is high or the signal at the input C2 changes from low to high. "**C1 or â C2**". The counter is set to 0, if input C1 is high or the signal at the input C2 changes from high to low.
DINT[6]	RES1		Reserve 1
DINT[7]	RES2		Reserve 2

Copy this data range, using the "COP" command to the begining of the datarange of the TAG "DC_1_SYSTEM_CONFIG" or transfer the values directly into the TAG: DC_1_SYSTEM_CONFIG. After the transmission of this data record, the HIPER - special measuring system.

Note: Please also regard chapter "4.9.3.3. Incremental Hiperface measuring system input with SINCOS level" on page 19.

6.3.7. TAG "DC_1_SYSTEM_CONFIG_PLC[X]"

The company Digitronic Automationsanlagen GmbH has been known for a long time within the industry as a supplier and developer of electronic cam-switch mechanisms. Long-standing experience gained in a close working relationship with the users with regard to linking PLC control systems and cam-switch mechanism have been taken into account in the development of the CamCon PLC Logic Module. The result is a PLC Software which works in the CamCon parallel to the cam-switch mechanism. The input and outputs of the cam-switch mechanism are linked without external logic and without requiring hardware, such as locking mechanisms, timers, Set - Reset functions, counters, markers and therefore work within the same cycle time as the cam-switch mechanism. This combination guarantees the best way of exploiting the Speed Compensation of the cam-switch mechanism and of the logic of the PLC, without loss of switching speed through slower external switching components (for example relays, units of time, central PLC control with high cycle times).

The tags DC_1_SYSTEM_CONFIG_PLC[X] provide the programming of the PLC - Logic - Module of the CamCon 1756-DICAM. Before you switch on and program the PLC - Logic - Module, it is essential that you consult the user instruction manual for the PLC - Logic - Modules. You can access this instruction manual in the Internet at http://www.digitronic.com as a PDF file.

Type	Name	Data	Description
DC_1_SYSTEM_CONFIG_PLC[X]	Index X	1.. 2*200 + 2*248	Array for PLC - Logic - Module, one component for each network
DC_9_HEADER	ADR	216,0,36	Address Note: at the present time only write is possible
DINT[0]	TYP_OPMX	0..1015	Type in the PLC - Logic - Module Range O = 0 Range P = 256 Range M = 512 Range X = 768 + Number
DINT[1]	FUNK	0..9	Function 0 = Standard, 1=SR-FlipFlop, 2=Data-FlipFlop...
DINT[2]	VALUE_1	0..999999	Preset value for Timer, Counter, signal number or length of shift register
DINT[3]	VALUE_2	0..65536	Reset field or DTC Value 1 (ON) for shift register
DINT[4]	VALUE_3	0..65536	DTC Value 2 (OFF) for shift register
DINT[5]	VALUE_4	0..65536	Shift register Mode 0 = standard, DTC, 1 = DTC ON / OFF, 2 = time cam
DINT[6]	R0_S0	0..65536	1. Path symbol 0
DINT[7]	R0_S1	0..65536	2. Path symbol 0
DINT[8]	R0_S2	0..65536	3. Path symbol 0
DINT[9]	R0_S3	0..65536	4. Path symbol 0
DINT[10]	R0_S4	0..65536	5. Path symbol 0
DINT[11]	R0_S5	0..65536	6. Path symbol 0
DINT[12]	R1_S0	0..65536	1. Path symbol 1
DINT[13]	R1_S1	0..65536	2. Path symbol 1
DINT[14]	R1_S2	0..65536	3. Path symbol 1
DINT[15]	R1_S3	0..65536	4. Path symbol 1
DINT[16]	R1_S4	0..65536	5. Path symbol 1
DINT[17]	R1_S5	0..65536	6. Path symbol 1
DINT[18]	R2_S0	0..65536	1. Path symbol 2
DINT[19]	R2_S1	0..65536	2. Path symbol 2
DINT[20]	R2_S2	0..65536	3. Path symbol 2
DINT[21]	R2_S3	0..65536	4. Path symbol 2
DINT[22]	R2_S4	0..65536	5. Path symbol 2
DINT[23]	R2_S5	0..65536	6. Path symbol 2
DINT[24]	R3_S0	0..65536	1. Path symbol 3
DINT[25]	R3_S1	0..65536	2. Path symbol 3
DINT[26]	R3_S2	0..65536	3. Path symbol 3
DINT[27]	R3_S3	0..65536	4. Path symbol 3
DINT[28]	R3_S4	0..65536	5. Path symbol 3
DINT[29]	R3_S5	0..65536	6. Path symbol 3
DINT[30]	R4_S0	0..65536	1. Path symbol 4
DINT[31]	R4_S1	0..65536	2. Path symbol 4
DINT[32]	R4_S2	0..65536	3. Path symbol 4
DINT[33]	R4_S3	0..65536	4. Path symbol 4
DINT[34]	R4_S4	0..65536	5. Path symbol 4
DINT[35]	R4_S5	0..65536	6. Path symbol 4

For the output ranges O and P up to 200 and for the register ranges M and X up to 248 Logic - networks can be programmed. You can develop the required Logic OFFLINE with the DIGISOFT 2000 Program V2.03 or later. This program is able to print out the necessary data, which have to be entered into this TAG, as decimal numbers.

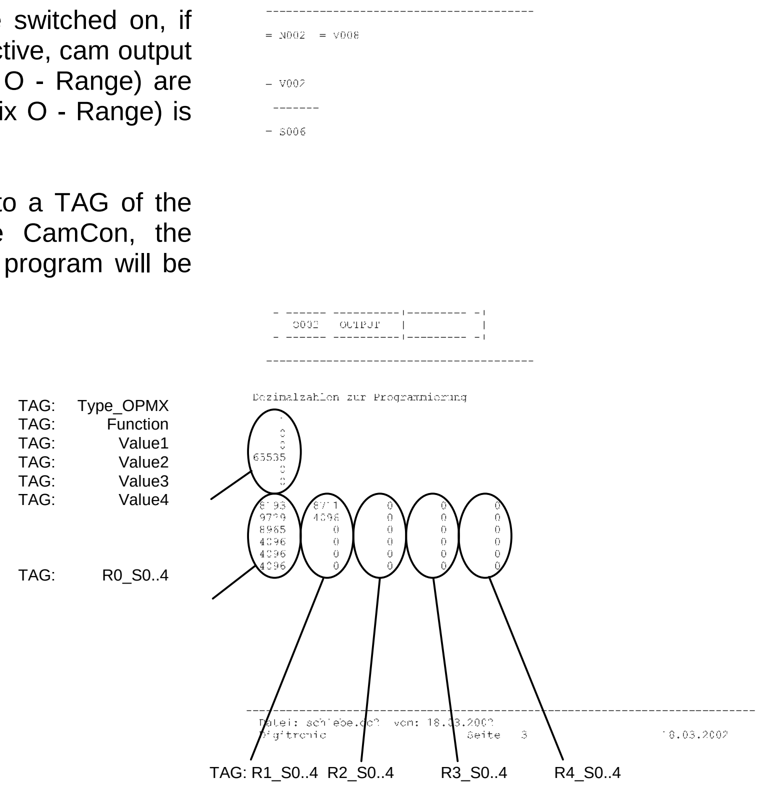
You can then enter these data into the respective tag and transfer these to the CamCon.

! TIP: With the DIGISOFT 2000 Version 2.16 or later, an L5K - file can be created, that can be imported into the RSLogix 5000 Program. This requires the English handling components.

Example:

In this example output 2 can only be switched on, if input S006 (ControlLogix in RUN) is active, cam output 2 and the V002 - input (ControlLogix O - Range) are active or the V008 - input (ControlLogix O - Range) is active.

If you enter the following numbers into a TAG of the array and send the dataset to the CamCon, the network will be programmed and the program will be executed immediately.



6.3.7.1. TAG: DC_1_SYSTEM_CONFIG_PLC_OK"

This TAG is set by the DICAM1756 - program, if in **all** of the TAG: DC_1_SYSTEM_CONFIG_PLC[X]'s elements, the Bit "ADR.CMD.OK" is set.

Now you are able to detect if all elements of the PLC-Logic-program have been written without any errors into the CamCon 1756 DICAM.

6.3.8. TAG "DC_1_SYSTEM_SET_ACTUAL_VALUE"

Type	Name	Data	Description
DC_9_HEADER	ADR	201,0,1	Adress
DINT[0]	ACTUAL_VALUE	minimum.. maximum possible actual value	Set actual value If this dataset is transferred, then on the CamCon the actual value is set to the transmitted value.. This is identical with the preset function. See Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[16]" on page 32. **Note:** If an incremental or Hiperface input is used as measuring system, then the error message **"Pos-Err:3"** or **"Clear.."** can be confirmed through this dataset and the CamCon started. **Warning:** The setting of the actual value can be stored in the EEProm at zero current. See Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[17]" on page 32. This is not meaningful however with an incremental - and/or a Hiperface input.

6.3.9. TAG "DC_2_PRG_CAM[X].CAM[Y]"

Type	Name	Data	Description
DC_2_PRG_CAM[X]	Index X	8.. Number_cam_outputs	Array cam outputs, one component for each output
DC_9_HEADER	ADR	XXX,1,YYY	Address, XXX = 1..200 = Output 1..200, YYY = 2..124 maximum 62 cams Array for cams, one component for each output XXX = Index + 1 YYY = Number of components from DC_2_PRG_CAM_CAM * 2, z.B. 3 * 2 = 6
DC_2_PRG_CAM_CAM CAM[Y]	Index Y (z.B. = 3)	1..62	Array for cams - one component for each cam DC_2_PRG_CAM_CAM for example 3. Maximum 62 cams can be transferred
DC_2_PRG_CAM_CAM	Index	0	Cam 1
DINT[0]	ON	minimum.. maximum-possible actual value	Switch-on point for cam 1 For minimum possible actual value see Chapter "6.3.13. TAG "DC_3_STATUS_FULL" Value: DINT[27]" on page 42. For maximum possible actual value see Chapter "6.3.13. TAG "DC_3_STATUS_FULL" Value: DINT[28]" on page 42.
DINT[1]	OFF	minimum.. maximum-possible actual value	Switch-off point for cam 1
DC_2_PRG_CAM_CAM	Index	1	Cam 2
DINT[0]	ON	minimum.. maximum-possible actual value	Switch-on point for cam 2
DINT[1]	OFF	minimum.. maximum-possible actual value	Switch-off point for cam 2
DC_2_PRG_CAM_CAM	Index	2	Cam 3
DINT[0]	ON	minimum.. maximum-possible actual value	Switch-on point for cam 3
DINT[1]	OFF	minimum.. maximum-possible actual value	Switch-off point for cam 3

If one of these datasets is transferred, all previously programmed cams on this output are erased and replaced by new cam values. If during the transfer the error Bit "DC_5_STATUS_COMM_ERROR" is set, please check for free storage space in the EEProm. See Chapter "6.3.13. TAG "DC_3_STATUS_FULL" Value: DINT[20]" on page 42.

Note: Programming is always performed in the actually running program (online) or in the product program. That means a changed cam becomes active instantly.

6.3.9.1. TAG: DC_2_PRG_CAM_OK"

This TAG is set by the DICAM1756 - program, if in **all** elements of the TAG: DC_2_PRG_CAM[X] the Bit "ADR.CMD.OK" is set.

By this you are able to detect if all elements i.e. Cams have correctly been entered into the CamCon 1756-DICAM.

6.3.10. TAG "DC_2_PRG_CHANGE"

Type	Name	Data	Description
DC_9_HEADER	ADR	201,2,1	Adress
DINT[0]	Program_number	0..32767	Actual program number or product number when reading If this dataset is written, the program number or product number is set to the sent value. See also Chapter "DINT[36]" on page 33.

6.3.11. TAG "DC_2_PRG_DTC[X]"

Type	Name	Data	Description
DC_2_PRG_DTC[X]	Index X	8.. Number_outputs_with_DTC	Array for delay time values, one component for each output
DC_9_HEADER	ADR	XXX,251,3	Address, XXX = 1..200 = delay time for output 1..200 XXX = Index + 1
DINT[0]	DTC_TYP	0..2	Configuration of Speed Compensation 0 = Standard or Speed Compensation for switch-on and switch-off points equal. 1 = Speed Compensation for switch-on and switch-off different 2 = The output is set to time - cam Notes about the effects of Speed Compensation can be found in Chapter "2.1. Speed Compensation" on page 7
DINT[1]	DTC1	0.. maximum possible DTC	Value 1 Type = 0 = Delay time value for switch-on and switch-off points in 100µs Type = 1 = Delay time value for switch-on points in 100µs Type = 2 = Delay time value for switch-on points on time - cam in 100µs
DINT[2]	DTC2	0.. maximum possible DTC or switch time	Value 2 With Type = 0 = not used With Type = 1 = delay time value switch-on and switch-off points in 100µs With Type = 2 = switch-on time in 100µs. The switch-on time applies to all switch points (cams) on the cam path (output).

If one of these datasets is transferred, all previously programmed cams on this output are erased and replaced by new cam values. If during the transfer the error bit "DC_5_STATUS_COMM_ERROR" is set, please check for free storage space in the EEProm. See Chapter "6.3.13. TAG "DC_3_STATUS_FULL" Value: DINT[20]" on page 42.

Note: Programming is always performed online or in the product program. That means a changed delay time becomes active instantly.

6.3.11.1. TAG: DC_2_PRG_DTC_OK"

This TAG is set by the DICAM1756 - program, if in **all** elements of the TAG: DC_2_PRG_DTC[X] the Bit "ADR.CMD.OK" is set.

By this you are able to detect that all elements i.e. delay times have been entered correctly into the CamCon 1756-DICAM.

6.3.12. TAG "DC_3_STATUS"

Type	Name	Data	Description
DC_9_HEADER	ADR	201,34,1	Adress
DINT[0]	Status	0..8, 255	This dataset should be read in cycles. An error message will be shown adjacent to the CamCon. Note: reading only possible 0 = Status OK no error message 1 = Pos Error 1 2 = Pos Error 2 3 = Pos Error 3 4 = Output Error 5 = Pos Error 5 6 = EEProm write overload 7 = not defined 8 = RAM FULL 255 = EE-Prom Error See Chapter "7. Error messages and removal of errors (FAQ)" on page 44. **Note:** If a safety output parameters (RUN - Control) has been created, then read is not necessary as long as this is active. See Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[25]" on page 32

Note: In the DICAM1756 - program this TAG is read every 5 seconds, if the safety output i.e. the Run-controll-Bit are not active. If a value unequal 0 or an error-message is detected as status the preogram tries to acknowledge this error-message by the writing of the TAG: "DC_4_QUIT_ERROR" automatically.

6.3.13. TAG "DC_3_STATUS_FULL"

Type	Name	Data	Description
DC_9_HEADER	ADR	201,0,37	Address This dataset should be read when the system configuration is changed. In this the minimum and maximum possible actual value is entered. Note: This dataset can only be read.
DINT[0]	Actual_value	minimum.. maximum-possible actual value	Current actual value
DINT[1]	Speed	minimum.. maximum-possible Speed.	Current speed
DINT[2]	Programm_number	0..32767	Current program number
DINT[3]	Analog_value_1	0	Analog value on analog cam ...
DINT[4]	Analog_value_2	0	"
DINT[5]	Analog_value_3	0	"
DINT[6]	Analog_value_4	0	"
DINT[7]	Analog_value_5	0	"
DINT[8]	Analog_value_6	0	"
DINT[9]	Analog_value_7	0	"
DINT[10]	Analog_value_8	0	"
DINT[11]	Analog_value_9	0	"
DINT[12]	Analog_value_10	0	"
DINT[13]	Analog_value_11	0	"
DINT[14]	Analog_value_12	0	"
DINT[15]	Analog_value_13	0	"
DINT[16]	Analog_value_14	0	"
DINT[17]	HW_Plc	0	This value is always 0 in CamCon 1756-DICAM
DINT[18]	CPU_68332	0	This value is always 0 in CamCon 1756-DICAM
DINT[19]	Temp	-20..+80	Current temperature in the device **Warning:** The permitted temperature range lies between 0 and +50°. Outside this range error functions can occur.
DINT[20]	Free_cams	0..ca.10000	Number of cams or delay times for Speed Compensation which can still be stored Delay times for separate switch-on and switch-off points require double storage space.
DINT[21]	Use_cams	0..ca.10000	Number of programmed cams
DINT[22]	DTC_max	0..10000	Maximum possible Speed Compensation in ms. **Warning:** Delay times must not be longer than this value
DINT[23]	Ram_size	1048576	Size of built-in RAM storage Currently: 1048576 Byte
DINT[24]	Ram_free	0.. 1048576	Size of free Ram storage in bytes
DINT[25]	EEProm_ser	8,16,32,48,64,128 KByte	Size of the EEProm 8,16,32,48,64,128 Kbyte
DINT[26]	EEProm_par	0	This value is always 0 in CamCon 1756-DICAM
DINT[27]	Min_actual_value	-999999.. +999999	Minimum possible actual value. **Warning:** Each cam value or parameter value must not be smaller than this value.
DINT[28]	Max_actual_value	-999999.. +999999	Maximum possible actual value. **Warning:** Each cam value or parameter value must not be equal to or greater than this value..
DINT[29]	Prog_max	32768	Maximum number of programs (products) which can be administered **Note:** The number of programmable cams depends on the size of EEProm storage capacity.
DINT[30]	Use_DTC	0..10000	Number of programmed delay times for Speed Compensation
DINT[31]	Firmware_Z_1_4	'18.0'	Firmware data character 1..4",
DINT[32]	Firmware_Z_5_8	'3.20'	Firmware data character 5..8",
DINT[33]	Firmware_Z_9_12	'02$00§00'	Firmware data character 9..12", e.g.: '18.03.2002'
DINT[34]	Status	0..8, 255	See Chapter "6.3.12. TAG "DC_3_STATUS"" on page 41.
DINT[35]	EE_write_Counter	0.. 2.000 Million	EEProm write counter **Warning:** If a value greater than 1 Million is reached here, there is the danger of loss of data.
DINT[36]	CPU_Type	1	Coldfire CPU Type Currently Type 1

6.3.14. TAG "DC_4_QUIT_ERROR"

Type	Name	Data	Description
DC_9_HEADER	ADR	205,3,1	Adress
DINT[0]	DATA	-1	If this dataset is transferred, an error message **"Pos-Err: 1,2,3,5", "Output-Error"** adjacent to the CamCon must be confirmed. Note: write only possible

Note: Using the DICAM1756 - program the TAG "DC_3_STATUS" is read every 5 seconds, if the safety output i.e. the Run - controll - Bit is not active.
If an error message is detected, the program tries by writing this TAG, to acknowledge them automatically.

6.3.15. TAG Range "DC_5_...."

Type	Name	Data	Description
INT	DC_5_OUTPUT_ENABLE_1_16	local:X:0.Data[0]	Alias for the O - Range in which the enable for output 1 - 16 must be entered.
INT	DC_5_OUTPUT_ENABLE_17_32	local:X:0.Data[1]	Alias for the O - Range in which the enable for output 17 - 32 must be entered.
INT	DC_5_OUTPUT_ENABLE_33_48	local:X:0.Data[2]	Alias for the O - Range in which the enable for output 33 - 48 must be entered.
INT	DC_5_OUTPUT_ENABLE_49_64	local:X:0.Data[3]	Alias for the O - Range in which the enable for output 49 - 64 must be entered.
DINT	DC_5_PRG_ACTUAL	0..32767	Program number to be introduced. If this and the value in TAG "DC_2_PRG_CHANGE" is different, a program change is created.
INT	DC_5_STATUS_COMM_RANGE	local:X:I.Data[2]	Alias for the I - Range in which the Status Bits of the CamCon lie.
BOOL	DC_5_STATUS_COMM_ERROR:	0..1	Bit which is set when an error has occurred during data transfer. This must be monitored by the user program and reset.
BOOL	DC_5_STATUS_COMM_TIMEOUT	0..1	Bit which is set when a timeout has occurred during data transfer. The dataset is re-sent. This bit is reset as soon as the data transfer has been successful.
INT	DC_5_STATUS_OUTPUT_1_16	local:X:I.Data[3]	Alias for the I - Range in which the bits for Output 1 - 16 lie.
INT	DC_5_STATUS_OUTPUT_17_32	local:X:I.Data[4]	Alias for the I - Range in which die bits for Output 17 - 32 lie.
INT	DC_5_STATUS_Realtime_Actual_value	local:X:I.Data[6]	Alias for the I - Range in which the current actual value of the CamCon in realtime lies. Note: **This variables position changes correspponding to the number of adjusted outputs.**
DINT	DC_5_STATUS_Realtime_Speed	-32767..+32767	Current speed in realtime
INT	DC_5_STATUS_Realtime_Speed_Help	local:X:I.Data[5]	Alias for the I - Range in which the current speed of the CamCon in realtime lies. Note: **This variables position changes correspponding to the number of adjusted outputs.** This will be re-calculated and will then lie in DC_5_STATUS_Realtime_Speed.
BOOL	DC_5_STATUS_RUN_CONTROLL shows: DC_5_STATUS_OUTPUT_17_32.15	0..1	Alias for the I - Range in which the bits for the safety output (RUN_CONTROL) lie.
BOOL	DC_5_STATUS_V0_OUTPUT shows: DC_5_STATUS_OUTPUT_17_32.13	0..1	Alias for the I - Range in which the bits for the idling output lies.
BOOL	DC_5_STATUS_VR_OUTPUT shows: DC_5_STATUS_OUTPUT_17_32.14	0..1	Alias for the I - Range in which the bits for the turning direction output lie.

6.3.16. TAG Range "DC_9_...."

Type	Name	Data	Description
MESSAGE	DC_9_MSG_ADR_R:	-	"CIP Generic Messages" TAG for addresses write when reading.
MESSAGE	DC_9_MSG_ADR_W:	-	"CIP Generic Messages" TAG for adresses write when writing.
DC_9_MSG_BUFFER	DC_9_MSG_BUFFER_TMP:	-	Temporary messages buffer for reading and writing consists of 1 * DC_9_HEADER and 126 * DINTs. This will be used for **each** write or read message as send or receive buffer.
MESSAGE	DC_9_MSG_DATA_R:	-	"CIP Generic Messages" TAG for data reading
MESSAGE	DC_9_MSG_DATA_W:	-	"CIP Generic Messages" TAG for data writing.

6.4. Transferring actual value and speed into realtime

The CamCon 1756-DICAM cam-switch unit is able to provide the actual value and the speed value of the ControlLogix as an input word in realtime.

6.4.1. Speed

The realtime speed output is switched ON or OFF. See Chapter 6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[39]. If realtime transfer is switched on, a 16 bit wide value is entered after the last CamCon output in the I - Range of the ControlLogix. From the transferred value the scaling of the CamCon must be calculated. First a value of 32768 must be subtracted (SUB) and the intermediate result **INT** (SPEED_HELP) must be stored. This value is then recalculated to result in the actual speed value by use of a CPT command and the 100% speed value (Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[19]" on page 32).

Current speed (DINT) = SPEED_HELP * DINT[19] / 32768

6.4.2. Actual value

The realtime actual value output is switched ON or OFF. See Chapter 6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[26]. If the realtime transfer is switched on (DINT[26] = 2), a 32 bit wide value will be entered behind the last CamCon output or, if switched on, behind the realtime speed value in the I-Range of the ControlLogix. This value can be used further immediately without recalculation. If the maximum actual value is larger than 32767 or smaller than -32767, then a conversion of the 2 INTs from the I - Range to a DINT must be made.

7. Error messages and removal of errors (FAQ)

The error messages appear on the standard display or in CamCon DC16, 90, 115, 300 and 1756-DICAM without a display of their own through the status LED or status bits. See also Chapter 6.3.12. TAG "DC_3_STATUS" on page 41.

7.1. Problem: "Pos - Err:1".

Possible causes:
The measuring system has not been correctly connected.
Solution:
Please check the wiring to the measuring system. Please consult the instruction manual to the measuring system.

If the error is eliminated, the error-message can be deleted by Absetzen der Error Quittierung

7.2. Problem: "Pos - Err:2".

Possible causes:
The measuring system is faulty or not connected.
The setting of the error bits in the special measuring system setting is not correct.
Solution:
Check the wiring to the measuring system.
Check the inputs of the measuring system resolution.
Consult the instruction manual of your measuring system.

If the error is eliminated, the error-message can be deleted by Absetzen der Error Quittierung

7.3. Problem: "Pos - Err:3".

Possible causes:
The resolution of the connected measuring system is not in accord with the input resolution. The measuring system is faulty. The actual value is outside the range which was entered in the menu path setting for linear systems. See Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[12]" on page 32. If an incremental measuring system is set, then this report is an alternative for the message ***"Clear..."***.
Solution:
Check the input of the measuring system setting and the cable length setting.
Consult the instruction manual of your measuring system.
Consult Chapter ***"Problem: Clear..."***.

If the error is eliminated, the error-message can be deleted by Absetzen der Error Quittierung

7.4. Problem: "Pos - Err:5".

Possible causes:
The measuring system control is activated. The CamCon has registered a large unacceptable actual value jump. The measuring system is possibly faulty.
Solution:
Check the input of the measuring system setting and of the setting of the cable length or increase the permitted actual value jump. Consult Chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[9]" on page 31. Consult the instruction manual of your measuring system.

If the error is eliminated, the error-message can be deleted by Absetzen der Error Quittierung

7.5. Problem: An "Pos-Error:" occurs during operation.

The monitor displays "Pos-Err:1", "Pos-Err:2", "Pos-Err:3" or "Pos-Err:5".

Possible causes:
The connection cable of the measuring system or the measuring system itself is defective. A cable without screening or without dual strand was used. The laying of a connection cable in the vicinity of a strong electromagnetic source of interference (e.g. high voltage cable, motor cable) can lead to an pos error.
Solution:
Check the wiring to the measuring system. Replace the measuring system.
Take measures for screening.
Lay the connection lead in another location.
Consult the instruction manual of your measuring system.

If the error is eliminated, the error-message can be deleted by Absetzen der Error Quittierung

7.6. Problem: "RAM-Full" = RAM memoryis full.

Possible causes:
The resolution of the measuring system is too large.
The number of outputs is too high.
The number of Speed Compensated outputs is too high.
Solution:
Check the input of the measuring system setting.
Reduce the measuring system resolution.
Reduce the number of Speed Compensated outputs.

Please contact your customer service representative if you require a RAM memory extension.

7.7. Problem: The EEProm memory is full.

Cause:
Too little memory space available in the EEPROM for the storage process.
Solution:
Please contact your customer service representative if you require an EEProm storage extension.
Also consult Chapter "8. Calculation EEPROM cam storage on page 48.

7.8. Problem: Outputs will not activate

Possible causes:
An error message is active. The outputs are not connected to power supply. A programed Cam is to short or gets to short by increasing rotation speed. The enable - Input is not set.

Solution:
Check the error message.Program a longer Cam. A Cam with delay-time/speed-compensation must at least have the length of two steps.
Enable Outputs at the enable-Input, see also chapter 6.3.15. TAG Range "DC_5_...." Enable_1_64 on page 43
Enable the outputs through the ControlLogix PLC.
Send the device in to be repaired.

7.9. Problem: "Out - Error".

Possible causes:
Your outputs are overloaded or short-circuited. Check the wiring and the connection output as well as possible inductive loads which have no zero setting or are driven by a cancellation component.
The number of set inputs is not correct.
Power failure at an external interface module (e.g. DC91/IO or DC16/IO).
Solution:
See chapter "4.10. The outputs" on page 21.
See chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[30]" on page 32.
See chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[47]" on page 33.

If the error is eliminated, the error-message can be deleted by Absetzen der Error Quittierung
Here the attempt to reset outputs is done

Warning: *Wires crossing behind the outputs, if the cables leading towards the switch-OFF of the outputs are in an awkward position, can lead to a switch-OFF of the outputs, since in an open situation a potential is built up which, when the contacts are closed, is led back into the outputs.*
In inductive loads the outputs must be organised with a flywheeling diode. Protection or induction in the switch cabinet in the immediate vicinity of the device or due to their wiring have an effect on the device or its wiring and must be organised with cancellation components.

7.10. Problem: Error in the EEPROM.

Possible causes:
The data of the EEPROM was changed or destroyed by interference.
One of the existing data carriers (EEPROM or EPROM) was renewed or is defective.
The power supply was switched OFF during alteration of the data.
Solution:
Transfer the DC_0_CLEAR_ALL instruction. All data will be erased and must be re-entered.
Should these errors occur repeatedly, please contact your customer service.

7.11. Problem: "Error ???"

Possible causes:
An unpredictable error has occurred.
Solution:
Please contact your customer service.

7.12. Problem: "Clear...."

Cause:
The CamCon is waiting for the arrival of the Clear signal in an incremental measuring system.
Solution:
Set the Clear signal ON or activate an actual value Preset. The result is the immediate release of the Cam Switch Unit.

Note: The incremental measuring system is only available as an option for CamCon DC16, DC50/51, DC115, DC300 and CamCon 1756-DICAM.

See chapter "6.3.6.3. TAG "DC_1_SYSTEM_CONFIG_ENC_2_INK"" on page 35.

8. Calculation EEPROM cam storage

In the CamCon you have the opportunity to extend the **EEPROM** Cam storage. The storage space required for programming is influenced by the following factors:

1. Basic requirement	= 256 Bytes
2. Per cam	= 12 Bytes
3. Per set delay time for Speed Compensation	= 12 Bytes
4. Per name for an output	= 24 Bytes
5. Per set key / code	= 66 Bytes
6. For a special measuring system	= 66 Bytes
7. For direct or ”actual” program selection	= 12 Bytes
8. Per set program name	= 48 Bytes
9. Per line of the OP function	= 72 Bytes

The value is generated by the CamCon with the following formula:

Storage requirements in Bytes	=	Basic needs
	+	Number of cams * 12
	+	Number of delay times for Speed Compensation * 12
	+	Number of output names * 24
	+	Number of user keys * 66
	+	66 when the special measuring system is available.
	+	12 when "on Pos" program selection is set.
	+	48 * number of set program names.
	+	72 * number of set lines of the OP function.

<u>Example 1:</u> The Cam Switch Unit is supposed to have 8 Programs each with 16 cams and Speed Compensation for 16 outputs.

Storage requirement in Bytes = 256 Bytes + (8 Programs * 16 * 12 Bytes) + (16 * 12 Bytes)

Storage requirement = 1984 Bytes

<u>Example 2:</u> The Cam Switch Unit is supposed to have 20 programs each with 16 cams and 16 delay times for Speed Compensation.

Storage requirement in Bytes	=	256 Bytes
	+	(20 Programs * 16 * 12 Bytes)
	+	(16 TZK * 12 Bytes)
	+	(16 Output names * 24 Bytes)
	+	(1 User keys * 66 Bytes)

Storage requirement = 4738 Bytes

Warning: Through alterations in the storage structure of the CamCon software, the extent to which storage capacity is used up can differ from software version to software version!

9. Calculation the RAM storage-requirement for CamCon

The required **RAM**-main storage (not similar to the constand value - Camstorage or the EEPROM) depends on 7 factors:

1. Standard consumption	(approximately 100000 Byte)
2. Number of outputs	(8 to 200 in steps of 8 outputs).
3. Cycle time	(displayed in miliseconds).
4. Actual value/measuring system resolution	(displayed in impulses)
5. Maximal Speed-compensation	(0 to 9999.9 in steps of 100 microseconds).
6. Mode of program selection	(the double ammount of storage is required). (See also chapter "6.3.5. TAG "DC_1_SYSTEM_CONFIG" Value: DINT[36]" on page 33).
7. Size of the EE-Prom storage	(EE-Prom - storage size in Byte for Cache).

The RAM - storage requirement is calculated by the following formula:

storage requirement in Bytes = standard consumption +

$$\frac{\text{Number of outputs * IActual value resolution.* (2 If program Mode not slow)}}{8} +$$

$$\frac{\text{max. delay-time * 4}}{\text{cycletime}} + \text{EE-Prom size}$$

Example 1: The camswitch with a resolution of 360°, an EE-Promstorage of 32kByte, 16 outputs, a speed-compensation of 1000ms and a cycletime of 250µs needs:

$$\text{Storage requirement in Bytes} = 100000 + \frac{16 * 360}{8} + \frac{1000 * 4}{0.250} + 32768$$

Storage requirement in Bytes = 100000 + 720 + 16000 + 32768

Storage requirement in Bytes = 149488 = ca. 150kByte

Example 2: The camswitch with a resolution of 8192°, an EE-Promstorage of 48kByte, 64 outputs, a speed-compensation of 500ms and a cycletime of 250µs, needs:

$$\text{Storage requirement in Bytes} = 100000 + \frac{64 * 8182}{8} + \frac{500 * 4}{0.250} + 49152$$

Storage requirement in Bytes = 100000 + 65536 + 8000 + 49152

Storage requirement in Bytes = 222688 = ca. 220kByte

Note: If the required RAM - storage requirement greater than the CamCons total ammount of storage, you need to reduce the measuring system's resolution.

Attention: Changings in the storage-structure of the CamCon software the storage requirement can alternate at different software-versions!

10. Technical Data

Application..ControlLogix 1756 PLC
Display ....32 * Status LED for each Output, 1 * Status LED
Interfaces ....ControlLogix 1756 back plane bus,
optional RS485 but only for testing purposes.
Number of outputs ....24, electrolytically separated for ControlLogix (extendable to 200 through external Interface Option X).
Number of inputs..no/ optional 8, electrolytically separated for ControlLogix, of these Input 1 - 8
are linked with output 17 - 24 (extendable to 200 through external Interface Option X).
Number of programmable cams ....1200 or optional 4000, 10000 cams
Data saving/storage ....EEPROM (16K, 48K or 128K)
Number of programs...32768
cycle time, (switchover speed)............................from 70µs this is adjusted to requirements (optimised).
Speed or Delay Time Compensation (DTC) ....can be set individually for each output, depending on measuring system and storage space.
Setting range of the DTC ....0 up to maximum 9999.9ms, depending on measuring system and storage space.
Accuracy of the DTC...+0 up to -1 step
Measuring system - Input....................................synchronous serial (SSI) grey coded, optional incremental data input, PLL data input, time related data input or pure incremental Hiperface input.
Resolution of the measuring systems ....can be set in 360 steps (Standard), otherwise depending on measuring system and storage space.
Measuring system (SSI)......................................AAG60007, AAG612-2048, AAG612-4096, AAG612-8192, AAG615, AAG626 oder AAG66107.
Measuring system (incremental).........................ADG60/24/500.
Cut-off frequency of incremental input................approx. 100kHz
Input level of incremental input ....24V PNP.
Number of revolutions of the Hiperface input......max. 3000 min $^{-1}$ with 512 Impulse revolution,
max. 1500 min $^{-1}$ with 1024 Impulse revolution.
Zero point correction of the measuring system...is programmed in CamCon
Turning direction of the measuring system ....is programmed in CamCon
Length of the connecting cable
between measuring system and CamCon ....at SSI up to maximum 300m (optional up to1000m)
Power supply...24V DC ±20 %
Measuring system - power supply.......................with 24V DC via the power supply of the outputs (24V on pin 2,5 or 6).
Current intake from the back plane.....................type 450mA
Current intake periphery......................................type 100mA without measuring system and outputs
Output ....24V DC, switching to plus
Output current ....0,2Amp. for each output or 0.4amp. for each output at 50% on switch time, short-circuit proof
Programming ....via back plane bus with "Messages" and "User-Defined".
Connections for:
Power supply, measuring system
and cam outputs ....via screw-pin, 36 poles
AB Order Nr.: 1756-TBCH (not contained in the delivery range of the CamCon 1756-DICAM).
Assembly...see Chapter "3. Installation" on page 12.
Type of protection IP20
Working/operational temperature ....0°C ... + 55° C
Weight...approx. 350g without connection plug

11. Keyword register